

PROJECT MANUAL

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

Prepared For:

**RHODE ISLAND DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT**

SEPTEMBER 2023

CAPUTO AND WICK LTD.

1150 Pawtucket Avenue
Rumford, RI 02916

SECTION 00 0002 - PROJECT DIRECTORY

OWNER:

State of Rhode Island
Department of Administration
One Capitol Hill
Providence, Rhode Island 02908

USER AGENCY:

State of Rhode Island and Providence Plantations
Department of Environmental Management
Division of Planning and Development
235 Promenade Street
Providence, Rhode Island 02908
(401) 222-2776

DESIGN CONSULTANTS:

Caputo and Wick Ltd.
1150 Pawtucket Avenue
Rumford, RI 02916
(401) 434-8880

George S. Burman
66 Highland Road
Bristol, RI 02809
(617) 901-0304

Sterling Engineering Co., Inc.
79 Main Street
Sturbridge, MA 01566
(508) 347-9101

Wilkinson Associates Inc.
615 Jefferson Boulevard
Warwick, RI 02886
(401) 737-6386

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SECTION 00 0115 – SCHEDULE OF DRAWINGS**GENERAL**

The drawings for this project represent an integral part of the contract documents and should not be considered as a separate entity. They, along with the technical specifications, form a complete process of disseminating specific information required to perform the work of this project.

The following schedule indicates the drawings of this project, ordered for convenience only, and do not obligate the Contractor to perform the work in any specific sequence, nor construed as specific work for a specific trade, subcontractor or supplier.

DRAWING

<u>NUMBER</u>	<u>TITLE</u>
1 of 106	Cover Sheet
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END OF SECTION 00 0115

SECTION 00 5000 – CONTRACTING FORMS

PART 1 GENERAL

1.1 Contractor is responsible for obtaining a valid license to use all copyrighted documents specified or included in the Project Manual.

1.2 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. See Section 00 5200 for the Agreement form to be executed.

B. See Section 00 7200 for the General Conditions.

1.3 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.

B. Bond Forms:

1. Performance Bond and Payment Bond Forms: AIA A312

C. Release of Lien:

1. Release of Liens Form: AIA G706A

D. Insurance certificate, supplementary attachment:

1. ACORD Certificate of Insurance Form: AIA G715

1.4 REFERENCE STANDARDS

A. AIA G706A – Release of Liens: 1994.

B. AIA A312 - Performance Bond: 2010 and Payment Bond: 2010.

C. AIA G715 – ACORD Certificate of Insurance: 1991.1.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION 00 5000


SECTION 00 5200 –AGREEMENT FORM

AIA Document A101, Standard Form of Agreement Between Owner and Contractor – 2017 Edition, and as amended, forms the basis of Contract between the Owner and Contractor, is included following this page, as an integral part of the Bid Documents. Provisions not amended or supplemented remain in full force and effect.

END SECTION 00 5200

RIDEM and Contractor to execute and insert AIA Document A101 here.

Sample glimpse

 **AIA[®] Document A101[™] – 2017**

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the _____ in the year _____
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address, telephone and facsimile numbers, and website)

**State of Rhode Island, acting by and through the Department of Administration,
Division of Purchases, on behalf of the User Agency One Capitol Hill, Second Floor
Providence, Rhode Island 02908-5855
401.578.8100 (telephone); 401.574.8387 (facsimile)
www.puchasing.ri.gov**

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left

SAMPLE PAGE

SECTION 00 7000 – GENERAL CONDITIONS

AIA Document A201, General Conditions of the Contract for Construction – 2007 Edition, is included, following this page, as an integral part of the Bidding and Contract Documents. Provisions not amended or supplemented remain in full force and effect.

END OF SECTION 00 7000

Insert AIA Document A201 here.

Sample glimpse



AIA[®] Document A201[™] – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

The State of Rhode Island, acting by and through the Department of Administration
Division of Purchases, on behalf of the User Agency
One Capitol Hill, Second Floor
Providence, Rhode Island 02908-5855
(401) 574-8100 (telephone)
(401) 574-8387 (facsimile)
www.purchasing.ri.gov

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author

SECTION 00 8500 – PREVAILING WAGE

The State of Rhode Island, Department of Labor, Division of Professional Regulation General Decision Modification is an integral part of the Bid Documents for prevailing wage rate requirements.

An available copy is on the following State of Rhode Island website:

www.ridop.ri.gov

All contractors working on State of Rhode Island prevailing wage projects must adjust hourly rates for their employees every July 1, in accordance with Davis Bacon updated rates, which are indicated on the following website:

www.sam.gov

US Government prevailing wage tables can be found on the following website:

www.sam.gov/wage-determination/RI20220001/8

Applicable Rhode Island Labor Laws can be found on the following website:

www.dlt.ri.gov/pw/

END OF SECTION 00 8500

SECTION 01 1000 – SUMMARY OF WORK**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Overview: Contractor to provide all labor, materials, and equipment to remove the existing bathhouses, miscellaneous site improvements and onsite wastewater treatment systems and to construct 6 new bathhouses and onsite wastewater treatment systems with associated site improvements at the Burlingame State Park and Campground, in accordance with the contract drawings and specifications listed in the Project Manual.
- B. General Requirements:
1. Contractor shall perform the Work of the Contract under a stipulated sum Contract with the Owner in accordance with the Conditions of Contract.
 2. Vendor is responsible for obtaining and paying for any required Local and State licenses, Permits and inspections.
 3. Contractor to include all Bond costs in their Bid.
 4. Before starting work, all Contractor workers and Subs are required to obtain and submit a current (within 2 months) BCI of State residing in along with RI BCI and State-approved picture ID.
 5. All onsite workers are to be OSHA 10 certified. Copies of this certification along with driver licenses are required on the first day of work.
 6. The Contractor is responsible for providing their workers with all personal protection equipment. At a minimum, this includes hard hats, reflective vests, eye protection, harnesses and ear protection.
 7. All completed work must be inspected and approved by RIDEM and the Design Agent.
 8. There will be mandatory bi-weekly progress meetings onsite with four week look-ahead schedules to be furnished to RIDEM and Design Agent.
 9. Contractor and/or its subcontractors are to be licensed as required by RI Department of Labor.

10. All contractors and subcontractors to sign in each employee at the Vendor site office at the start of each shift.
11. Deliveries to be coordinated with RIDEM and to occur at convenient times for RIDEM.
12. The Successful Bidder is to submit the names and resumes of the onsite supervisors for review and acceptance to work on the project by the RIDEM team. RIDEM reserves the right to reject any proposed onsite supervisors.
13. RIDEM is not responsible for security of materials, tools, etc.
14. Contractors are not permitted to display a project sign anywhere on the park grounds.
15. Contractor must come to terms with all vendors and subcontractors prior to submitting their bid.
16. All noisy demolition shall be performed between 7:30am and 3:30pm.

1.02 ALTERNATES

- A. None at time of bid.

1.03 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Owner intends to fully occupy the areas outside of the project limits indicated on the project plans during the period of construction.
- B. Construction Operations: Limit work areas within the facility as agreed with RIDEM. Coordinate with Owner to insure delivery and completion per the schedule identified on the Bid Form. Include all costs of this coordination, including all premium time wages that may be required to meet these requirements, in the Base bid.
- C. Provide access to and from site as required by law and by Owner:
 1. Do not obstruct roadways, sidewalks, or other public ways without permission from the Owner.
- D. Utility Outages and Shutdown:

1. Do not disrupt or shut down site power without 7 days' notice to Owner and authorities having jurisdiction.
 2. Prevent accidental disruption of utility services to other facilities.
- E. Protect all existing surfaces from damages. Any damages to the existing surfaces requiring replacement and or repair will be at this vendor's expense.
- F. At all times and at the completion of the Project, construction areas are to be kept in a clean, safe and acceptable condition on a daily basis.
- G. Vendor is responsible for removing all project debris off site including all costs associated with waste containers and proper disposal of waste. Vendor is responsible to coordinate with RIDEM for the temporary placement of a waste container.
- H. Vendor is to have all equipment necessary to perform the work required to construct and install all improvements including tools, staging, lift truck, etc. No RIDEM equipment or tools will be available.

1.04 ITEMS PROVIDED BY OWNER INSTALLED BY CONTRACTOR

- A. None

1.05 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion. Some items include:
1. None

1.06 OWNER REQUIRED SUBCONTRACTORS

- A. None

1.07 ITEMS TO BE SALVAGED

- A. None

1.08 ALLOWANCES

- A. Include an allowance of \$20,000 for unknown concealed work.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

- A. Submit monthly waivers of lien for all vendors and subs.
- B. Submit certified payrolls to RIDEM.
- C. Submit monthly MBE Reports w/cancelled checks to RIDEM with each invoice for payment.

END OF SECTION 01 1000

Office of Diversity, Equity and Opportunity (ODEO)
MBE Compliance Office
1 Capitol Hill, 3rd Floor
Providence, RI 02908

(401) 574-8670
<http://odeo.ri.gov/>

Pursuant to RIGL 37-14.1 as well as the regulations promulgated thereto, the MBE Compliance Office requires that you complete the following table. Please note that these figures will be verified with the MBEs identified. If there are outstanding issues, such as retainage or a dispute, please indicate and attach supporting documentation for same. Also note that copies of invoice and cancelled checks for payment to all MBE subcontractors and suppliers are required.

Contractor/Vendor Name:

Project Name & Location:

Original Prime Contract Amount: \$ _____ Current Prime Contract Amount: \$ _____ % Complete: _____

MBE/WBE Subcontractor	Original Contract Amount	Change Orders	Revised Contract Value	% Completed To Date	Amount Paid To Date	Amount Due	Retainage %	Retainage Amount	Explanation

I declare, under penalty of perjury, that the information provided in this verification form and supporting documents is true and correct.

 Signature

 Date

 Printed Name

Notary Certificate:

Sworn before me this _____ day of _____, 20__.

 Notary Signature

 Commission Expires

SECTION 01 1005 – ADMINISTRATIVE PROVISIONS

PART 1 - GENERAL

1.00 GENERAL REFERENCE

- A. The General Conditions, Supplementary General Conditions and Division 1 of these specifications are hereby included as part of this section.

1.01 REQUIREMENTS INCLUDED

- A. Title of Work, and type of Contract.
- B. Contractor Use of Premises.
- C. Applications for Payment
- D. Field Engineering.
- E. Reference Standards.
- F. Cutting and Patching
 - 1. Requirements and limitations for cutting and patching of Work.
- G. Supervision
- H. Miscellaneous Administrative Items

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. All equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the Rhode Island Uniform Building Code.
- B. The contractor must provide all material, labor, tools, plant supplies, equipment, transportation, superintendence, temporary construction of every nature and all other services and facilities necessary to complete the construction for the Owner, including all incidental work as required or described in the contract documents.

1.03 CONTRACT METHOD

- A. Construction of the Work under single Lump Sum contract.
- B. Items noted "NIC" (Not in Contract) and other items as indicated will be furnished and installed by Owner.

1.04 APPLICATIONS FOR PAYMENT

- A. Submit three copies of each application under procedures of Section 01300 on AIA G702 - Application and Certificate for Payment.
- B. Content and Format: That specified for Schedule of Values in Section 01300.
- C. The contractor must submit a payment schedule and Lump Sum breakdown with their Lump Sum Bid. The State will hold 5% of Lump Sum until Final Acceptance.
- D. Contractor shall refer to Section 00700 - General Conditions, for additional requirements.

1.05 CONTRACTOR USE OF PREMISES

- A. Limit use of premises for Work and for construction operations, to allow for work by other Contractors. The contractor shall develop a phasing plan that must be submitted and approved by owner prior to any work on site.
- B. The contractor shall provide for the necessary protection of the work area from the general public and the working staff utilizing the parking lot during construction.
- C. Limit access to site and work areas as directed by the Owner.
- D. The contractor shall not use private property to store equipment or materials without written approval of the property owner.

1.06 JOB SAFETY AND ACCIDENT PREVENTION

- A. All construction work on this project must be performed in compliance with the Occupational Safety and Health Act of 1970 or with local or State occupational safety and health regulations enforced by an agency of the locality or State under a plan approved by the U.S. Department of Labor Occupational Safety and Health Administration (OSHA).
 - 1. All contractors and subcontractors shall comply with requirements of the Occupational Safety and Health Act of 1970 or revisions thereto, which are applicable during the term of this contract and hold the Owner and Architect and/or their agents harmless from any claim or loss that may result from violations of or claims under this act.
- B. See the General Conditions for further requirements.

1.07 FIELD ENGINEERING

- A. Provide field engineering services; establish grades, lines, and levels, by use of

recognized engineering survey practices.

- B. Contractor shall not deviate from established grades and lines, except by written approval of the Architect or obvious error exists in designated grades and lines.
- C. Contractor shall establish bench marks as required to properly perform work of this project.
- D. Contractor shall layout partition lines and other significant reference lines or points which will enable mechanical, electrical and other trades to accurately locate boxes, openings, sleeves, conduits, hangers, inserts and other devices.
- E. Prior to start of any work, the contractor shall confirm and verify the location, adequacy and elevations of all existing conditions that are being disturbed for a complete installation. Contractor shall pay all costs associated with any modifications required by his failure to follow this requirement.
- F. All Construction layout, Survey and as-built drawings will be incidental to this contract.

1.08 REFERENCE STANDARDS

- A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes. All RIDOT Standards Specifications and Material testing requirements apply to this contract.
- B. The date of the standard is that in effect as of date of Contract Documents when there are no bids, except when a specific date is specified. If governing codes reference standard date then code reference date shall be in effect.
- C. Obtain copies of standards when required by Contract Documents. Maintain copy at jobsite during progress of the specific work.

1.09 CUTTING AND PATCHING

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural or security integrity of any element of Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.10 EXISTING UTILITIES AND STRUCTURES

- A. Contractor shall be responsible for injury or damages to any utility piping, drains, sewers, electrical wiring and conduits, buildings and other structures that may be met within the prosecution of the work. Contractor shall be liable for any damages to items

resulting from work of this Contract. To include injury or damages caused by Subcontractors, sub-subcontractors and material manufacturers.

- B. Shore or sling in place and prevent any damage to above mentioned items. Maintain them in constant operation except as may be required to connect or disconnect from them.
- C. All existing utilities are NOT indicated on the drawings. Contractor to use caution during construction.

1.11 SUPERINTENDENCE OF SUBCONTRACTORS

- A. The contractor must supervise subcontractors in accordance with the provisions of General Conditions. A project superintendent shall be on site whenever any work is being performed. Contractor to submit resume of proposed project super for Design Team's approval.

1.12 COORDINATION

- A. Prior to commencement of subcontract work, a designated representative of each subcontractor shall meet with project superintendent, Owner and Engineer at the site to discuss requirements and scope of Work.
- B. The General Contractor and all subcontractors will be required to attend a preconstruction conference at a date and time set by the Owner.

1.13 BEHAVIOR OF PERSONNEL

- A. If in the opinion of the Owner, any employee of the Contractor or his subcontractors is physically or mentally unfit for work or exhibits behavior incompatible with work site environment, said employee may be required to leave property and may be refused re-admittance.

1.14 SUBSTITUTIONS

- A. In all cases where a proprietary designation is used in connection with materials or articles to be furnished under this contract and the phrase "or equal" is not used, the Contractor shall furnish the specified item, unless a written request for a substitute has been submitted by the Contractor and reviewed by the Architect to his satisfaction.

1.15 CODES, RULES AND REGULATIONS

- A. All work is to be in accord with the latest requirements of:
 - 1. Federal, State and Municipal Laws
 - 2. Rhode Island Building and Fire Code
 - 3. National Plumbing Code
 - 4. National Electric Code

5. Any prevailing rules, regulations pertaining to adequate protection and/or guarding of any moving parts or otherwise hazardous locations.
- B. Reference in Specifications or Drawings shall mean and intend the latest edition of such, as published at date of submission of bids.
- C. Reference to technical society organizations or body is made per the following abbreviations:
- | | |
|-------|---|
| AIA | American Institute of Architects |
| AISE | American Institute of Electrical Engineers |
| AISC | American Institute of Steel Construction |
| ASA | American Standards Association |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society of Testing and Materials |
| AWSC | American Welding Society |
| CS | Commercial Standard of U.S. Dept. of Commerce |
| FS | Federal Specifications |
| NBFU | National Board of Fire Underwriters |
| NBS | National Bureau of Standards |
| NEC | National Electric Code |
| UBC | Uniform Building Code |
| UL | Underwriters' Laboratories, Inc. |
| AASHO | American Assoc. of State Highway Officials |
- D. Nothing in the Specification or Drawings is to be construed to allow work not in accord with the above requirements. When requirements shown or specified are less than those in the codes listed above, the Contractor is to furnish and/or install the larger size or higher standard without extra cost to the Owner.

1.16 DRAWINGS AND SPECIFICATIONS

- A. All work drawn on Plans and not specified or all work specified and not drawn are part of Contract Work required to be done and are to be executed as fully as if described in both of these ways. Only work specifically noted in the following manner shall be considered as not being in the contract:
- ".....by Owner".
- ".....NIC (Not In Contract)".
- B. If, after examination of Contract Drawings and Specifications, or after a visit to the premises, any discrepancies, omissions, ambiguities, or conflicts are found in or amount contract documents or there is doubt as to their meaning, Architect is to be notified at the earliest possible date. Where information sought is not clearly indicated or specified,

the Architect will issue addendum to the Contractor clarifying conditions, which addendum will become part of the Contract Documents. Neither the Owner nor the Architect will be responsible for any oral instructions.

- C. If there are two ways and/or instruction in drawings and/or specifications, it shall be assumed that the Contractor has based his base bid price on the most expensive way.
- D. If duplication is shown on drawings and/or specifications of work by more than one trade, Architect shall determine which trade shall do work and rebate shall be due from the other trades to Owner.
- E. Drawings DO NOT include any necessary components for construction safety.
- F. In all work shown on Drawings, figured dimensions are to be followed in all cases, though they may differ from scaled measurements. Before beginning the work, Contractor is to check through and verify all dimensions/elevations and call to the attention of the Architect any apparent or manifest discrepancy.
 - 1. Contractor shall verify all dimensions with existing and actual field conditions, prior to start of any work.
- G. All work and materials shown on drawings shall be interpreted by the Contractor as being new work and materials to be furnished and installed unless are specifically indicated as being existing to remain.

1.17 MANUFACTURER'S DIRECTIONS

- A. It is intended that manufactured articles, materials, and equipment be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with manufacturer's printed directions unless specifically specified to the contrary.
- B. If there is a conflict between the Contract Documents and manufacturer's directions, the Contractor shall notify the Architect in writing. Contractor shall not proceed with work until Architect has reviewed the conflicting data and provide the Contractor with a decision on which specification to follow.

1.18 GENERAL SPECIFICATION NOTE

- A. The paragraph entitled "WORK INCLUDED" in each section of the technical section shall be considered general in nature and NOT all inclusive. The intent of the paragraph is to provide a general guide of what is included in the section.
- B. The paragraph entitled "RELATED WORK" in each section of the technical section shall be considered general in nature and NOT all inclusive. The intent of the paragraph is to provide a general guide of what work is related to work included in this section.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing work, inspect conditions affecting performance of Work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Provide all required temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.

3.03 CUTTING AND PATCHING

- A. Execute cutting, fitting, and patching including excavation and fill to complete work.
- B. Fit products together, to integrate with other work.
- C. Remove and replace defective or non-conforming work.
- D. Provide openings in the Work for penetration of mechanical and electrical work.

3.04 PERFORMANCE

- A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- B. Cut rigid materials using saws or core drill. Existing interior window casings and trim scheduled to be removed shall be saw cut at location where removed materials meet existing materials scheduled to remain. Pneumatic tools not allowed without prior approval of the Architect.
- C. Restore work with new Products in accordance with requirements of Contract Documents.
- D. Fit work tight to adjacent surfaces and refinish all work back to its original condition. Refinish all surfaces to match adjacent finish. For continuous surfaces, refinish to

nearest intersection or natural break. For an assembly, refinish entire unit.

- E. At penetrations of fire rated walls, partitions, ceiling, and all floor construction, completely seal voids with fire rated materials to full thickness of the penetrated element.

END OF SECTION 01 1005

SECTION 01 1006 – CONSTRUCTION PHASING AND SCHEDULING**PART 1 - GENERAL****1.00 GENERAL REFERENCE**

- A. The General Conditions, Supplementary General Conditions and Division 1 of these specifications are hereby included as part of this section.

1.01 REQUIREMENTS INCLUDED

- A. Coordination.
- B. Work Hours.
- C. Work Sequence and Scheduling.

1.02 RELATED REQUIREMENTS

- A. Section 01005 - Administrative Provisions: Cutting and patching.
- B. Section 01300 - Submittals: Construction schedules.
- C. Section 01500 - Construction Facilities and Temporary Controls: Temporary enclosures, protection of completed work, and cleaning.

1.03 COORDINATION

- A. Coordinate work of the various sections of specifications and all drawings, to assure efficient and orderly sequence of installation of construction elements, and with provisions for accommodating items installed later.
- B. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

- E. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming work, provide openings for penetrations of existing surfaces, and provide samples for testing. Seal all penetrations through floors, walls, and ceilings.

1.04 WORKING HOURS

- A. In no case shall Contractor or any Subcontractor perform any work on project, except during regular working hours without in each instance, notifying the Owner's Representative in order that they may be present to assist during work. This shall not be interpreted as a measure to prevent the Contractor from working "overtime" under any circumstances, but merely to insure that the Owner's Representative may have the opportunity to be on hand to assist the Contractor, as may be required, to interpret Contract Documents, Plans or Specifications and to insure that construction operations will not interfere with Owner's Operations.
 - 1. Normal working hours for the purpose of this construction project shall be 7:00am to 3:00pm daily. Work performed outside of these hours must be approved by the Engineer and Owner prior to performing work. The Owner's operations will take precedence over the Contractor's operations. Any noisy work shall be completed between 7:00am to 3:00pm.
- B. If found necessary to reach a proper stopping place in any portion of the work, or to complete work within the Contract time limit, the Contractor shall work his forces and forces of his Subcontractors overtime without addition to the Contract Price. The Contractor shall insure that installation of Work under any subcontract does not interfere with nor delay progress of the building work, nor with progress of any independent contracts running concurrently.

1.05 GENERAL WORK SEQUENCE and SCHEDULING REQUIREMENTS

- A. Contractor shall schedule and construct work to accommodate Owner's continuous use of the facility during the construction period.
- B. The park may be occupied during all of the construction process. The construction schedule shall be developed around the understanding that some of the existing bathhouses may need to remain open while demolition and construction is occurring at alternate bathhouses.
 - 1. Construction schedule shall be approved by the Owner.

END OF SECTION 01 1006

SECTION 01 1200 – PROJECT MEETINGS

PART 1 - GENERAL

1.00 GENERAL REFERENCE

- A. The General Conditions, Supplementary General Conditions and Division 1 of these specifications are hereby included as part of this section.

1.02 REQUIREMENTS INCLUDED

- A. Contractor participation in preconstruction conferences and progress meetings.
- B. Contractor administration of pre-installation conferences.

1.03 RELATED REQUIREMENTS

- A. Section 01006 - Construction Phasing: Coordination of Work, Scheduling and Phasing.

1.04 PRECONSTRUCTION CONFERENCES

- A. Owner shall administer preconstruction conference for execution of Owner - Contractor Agreement and exchange of preliminary submittals.
- B. Engineer shall administer site mobilization conference at Project site for clarification of Owner and Contractor responsibilities in use of site and for review of administrative procedures.

1.05 PROGRESS MEETINGS

- A. Contractor will schedule and administer project meetings throughout progress of the Work at weekly intervals.
- B. Contractor shall make physical arrangements for meetings. Contractor shall be responsible for recording meeting minutes and distribution to all concerned parties. Minutes shall be typed and distributed within two working days of the meeting.
- C. Attendance: Contractor, job superintendent, major subcontractors and suppliers; Owner's Representative, Engineer and others as appropriate to agenda topics for each meeting.

1.06 PRE-INSTALLATION CONFERENCES

- A. When required in individual specification Section, Contractor shall convene a pre-installation conference prior to commencing work of the Section.
- B. Require attendance of entities directly affecting, or affected by, work of the Section.
- C. Review conditions of installation, preparation and installation procedures, and coordination with related work.

END OF SECTION 01 1200

SECTION 01 1300 - SUBMITTALS

PART 1 - GENERAL

1.00 GENERAL REFERENCE

- A. The General Conditions, Supplementary General Conditions and Division 1 of these specifications are hereby included as part of this section.

1.01 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction schedules.
- C. Proposed Products list.
- D. Shop drawings.
- E. Product data.
- F. Manufacturers' instructions.
- G. Manufacturers' certificates.
- H. Schedule of Values.
- I. Progress Reports
- J. Construction Cost Estimate

1.02 GENERAL SUBMITTAL PROCEDURES

- A. Schedule of Submittals
 - 1. Within 30 days after receiving a notice to proceed the contractor must submit to the Engineer, in duplicate, a schedule listing all items that must be furnished for review and approval by the Owner.
- B. Transmit each submittal with AIA Form G810 or Design Agent accepted form.
- C. Sequentially number the transmittal forms. Resubmittals to have original number

with an alphabetic suffix.

D. Contractor Review:

1. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
2. Coordinate submittals with requirements of Work and of Contract Documents.
3. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite the Project.

1. Transmit submittals in accordance with approved Progress Schedule and in such sequence to avoid delay in the Work or work of other contracts. Failure to do so will not justify an extension in contract time.
2. Coordinate submittals into logical groupings to facilitate interrelation of the several items.

F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

G. Provide space for Contractor and Engineer review stamps.

H. Revise and resubmit submittals as required, identify all changes made since previous submittal. Failure to do so will be reason to reject submittal.

I. Distribute copies of reviewed submittals to concerned parties.

1.03 CONSTRUCTION SCHEDULES

A. The contractor is responsible for the scheduling of construction and must prepare a scheduling and charting system described below. This schedule is to ensure adequate planning and execution of the work by the contractor and to assist the Owner in appraising the reasonableness of the schedule and evaluating work progress.

B. General Requirements of Schedule

1. Submit initial schedule in duplicate within 10 days after date of Owner-Contractor Agreement for Design Agent review.

2. Revise, update and resubmit 3 copies with monthly requisition.

C. Format

1. Horizontal bar chart with separate line for each section of Work, identifying first work day of each week.
2. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.
3. Provide legend for symbols and abbreviations used.
4. Major milestones must be indicated on the schedule, such as the Notice to Proceed date, 50 percent completion, substantial completion for liquidated damages purposes, and project completion. In addition, the schedule must indicate when utility connections are to be made, permits to be obtained, and all other internal or external activities that affect the work flow (including all activities of the Owner that affect progress and contract-required dates to be completed).

D. Coordinate contents with Schedule of Values.

E. Participate in joint review and evaluation of schedule.

F. After review, revise as necessary as result of review, and resubmit 6 copies within 10 days.

G. See General Conditions for additional requirements.

1.04 PROPOSED PRODUCTS LIST

- A. Within 10 days after date of Owner-Contractor Agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number or each product.

1.05 SHOP DRAWINGS

- A. Submittal of shop drawings and related data must conform to the requirements of the general contract clauses and as specified in this section. The contractor must make any corrections required by the Architect. If the contractor considered any correction indicated on the drawings to constitute a change to the contract drawings or specifications, notice must be given to the Engineer. The approval of the drawings must not be construed as a complete check but indicates only that the general method

of construction and detailing is satisfactory. Approval of the shop drawings does not relieve the contractor of the responsibility for any error that may exist because the contractor is responsible for the dimensions and design of adequate connections and details and satisfactory construction of all work.

- B. Present in a clear and thorough manner. Title each drawing with Project name and number; identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.
- C. Identify field dimensions; show relation to adjacent or critical features or Work or products.
- D. Minimum Sheet Size: Multiples of 8-1/2 x 11 inches.
- E. Number and type of copies as follows:
 - 1. Submit reproducible transparency.
 - 2. Submit the number of opaque reproductions which Contractor requires, plus three copies which will be retained by Architect.
 - 3. After review, reproduce and distribute in accordance with Article on Procedures above and for Record Documents described in Section 01700 - Contract Close-Out.

1.06 PRODUCT DATA

- A. Submit the number of copies which the Contractor requires, plus three copies which will be retained by the Engineer.
- B. Mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities, wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
- C. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.
- D. Supplement manufacturers' standard data to provide information unique to this Project.

1.07 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification Sections, submit manufacturers' printed

instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

- B. Identify conflicts between manufacturers' instructions and Contract Documents. Perform no work until conflict has been satisfactorily resolved.

1.08 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturers' certificate for review, in quantities specified for Product Data. The contractor must review all certificates before submissions are made to ensure compliance with the contract specification requirements and to ensure that the affidavit is properly executed prior to submission to the contracting officer. Certification must not be construed as relieving the contractor from furnishing satisfactory material if, after tests are performed on selected samples, the material is found not to meet the specific requirements.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.09 SCHEDULE OF VALUES

- A. Requirements included:
 - 1. Contractor shall submit a schedule of values allocated to the various portions of the work, within twenty days after the award of contract.
- B. Form and Content of Schedule of Values
 - 1. Per General Conditions.
 - 2. Schedule shall list the installed value of the component parts, by phase, of the work in sufficient detail to serve as a basis for computing values for progress payments during construction
 - 3. For each major line item list sub-values of major products or operations under the item.
 - a. List all items that have a value of \$5,000 or more break out labor and material cost.
 - b. For items on which progress payments will be requested for stored materials, break down the value into:

1. The cost of the materials, delivered and unloaded.
2. The total installed value.

4. The sum of all values listed in the schedule shall equal the total contract sum.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

- A. Failure of Contractor to follow submittal requirements specified herein will serve as reason to reject the submittal, material, product or work in place.

- B. Performing any work, ordering or furnishing materials/products prior to review will serve as justification to reject and refusal to make payment of same.

END OF SECTION 01 1300

SECTION 01 1400 – QUALITY CONTROL

PART 1 - GENERAL

1.00 GENERAL REFERENCE

- A. The General Conditions, Supplementary General Conditions and Division 1 of these specifications are hereby included as part of this section.
- B. The contractor is responsible for the overall quality of all its own work and the work performed by the subcontractors working under this contract. The quality of any part of the work installed must not be less than that required by the contract documents. If the Engineer or Owner determines that the quality of work does not conform to the applicable specifications and drawings, the contractor will be advised in writing of the areas of nonconformance and within 7 days the contractor must correct the deficiencies and advise the Engineer and Owner in writing of the corrective action taken.

1.01 SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. References.
- C. Field samples.
- D. Inspection and testing laboratory services.

1.02 RELATED SECTIONS

- A. Section 01300 - Submittals: Submission of Manufacturers' Instructions and Certificates.
- B. Section 01600 - Material and Equipment: Requirements for material and product quality.

1.03 CONTRACTOR QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.04 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract

Documents.

- B. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 INSPECTION AND TESTING LABORATORY SERVICES

- A. All inspection and testing services to be provided by Contractor and included in Base Bid costs.
- B. Limits of Testing Laboratory Authority
 - 1. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Laboratory may not approve or accept any portion of the Work.
 - 3. Laboratory may not assume any duties of Contractor.
 - 4. Laboratory has no authority to stop the Work.
- C. Contractor Responsibilities
 - 1. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturer's facilities.
 - 3. Provide incidental labor and facilities to provide access to Work to be tested, to obtain and handle samples at the site or at source of Products to be tested, to facilitate tests and inspections, storage and curing of test samples.

END OF SECTION 01 1400

SECTION 01 1500 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.00 GENERAL REFERENCE

- A. The General Conditions, Supplementary General Conditions and Division 1 of these specifications are hereby included as part of this section.
- B. The contractor must provide all temporary facilities and services required to complete the work and to comply with OSHA and other applicable regulations.

1.01 SCOPE OF WORK THIS SECTION

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water, fire protection and sanitary facilities.
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, water control and snow and ice control, dust control and hazards control. Maintenance of required means of egress from existing structure.
- C. Vendor is not allowed to put up a construction or project sign.

1.02 RELATED SECTIONS

- A. Section 01005 - Administrative Provisions.
- B. Section 01006 - Construction Phasing and Scheduling: Phasing and sequencing construction.
- C. Section 01700 - Contract Close-Out: Final cleaning.

1.03 TEMPORARY ELECTRICITY

- A. Connect to existing power service. Power consumption shall not disrupt Owner's need for continuous service.
- B. Provide temporary electric feeder from existing electrical service at location as directed.
- C. Owner will pay cost of energy used.
- D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required.

- E. Provide feeder switch at source distribution equipment.
- F. Permanent convenience receptacles may be utilized during construction work in the building.
- G. Provide all labor, materials and equipment required for installation of temporary electric lighting and power.
- H. Temporary power for hoisting, welding or compressor equipment shall be provided and paid for by the Contractor.
- I. Each subcontractor shall furnish all extension cords, sockets, lamps, motors, and accessories required for the execution of his work.
- J. Lighting fixtures, lamps, feeders, and branch circuit wiring as indicated on contract plans shall not be used for temporary lighting.
 - 1. Safety: The contractor must provide and maintain lights and signs to prevent damage or injury and must illuminate all hazardous areas. Safety lights must be kept burning from dusk to dawn, coordinate with RIDEM.
- K. At the end of the day's work, close all lights and power other than the minimum required for exterior security lights.
- L. During construction the Contractor shall maintain the existing electrical system in operating condition in all areas. Contractor shall furnish and pay for all labor and materials required to maintain this system in a full operating condition.

1.04 TEMPORARY SANITARY FACILITIES

- A. Vendor to provide port-a-johns.

1.05 BARRIERS AND BARRICADES

- A. Provide and maintain barriers to prevent unauthorized entry to construction areas, to allow for the continued uninterrupted use of existing buildings and sites, to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public access and use of existing buildings.
- C. Provide barriers to protect non-owned vehicular traffic, stored materials, site and

structures from damage.

- D. Provide guardrails, barricades, handrails, and covers for floor, roof, and wall openings.
- E. Comply with OSHA with regard to standards and requirements for guardrails, openings and stairways.

1.06 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Prohibit traffic from onsite wastewater treatment systems and landscaped areas.

1.07 SECURITY

- A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.
- B. Contractor shall keep all unauthorized visitors off construction site by such legal/approved means as they selects.

1.08 STORAGE AREAS

- A. Construction material storage, offices, shops, etc. shall be located as directed and assigned by the Owner. Contractor shall relocate any material storage areas, temporary trailers, etc., as required during work execution.

1.09 PROGRESS CLEANING AND JANITORIAL SERVICES

- A. The contractor must furnish janitorial services for the project site and must perform any required maintenance of facilities and grounds deemed necessary by the Owner's Representative during the entire term of the contract. Services must be performed at such a time and in such a manner as to least interfere with the operations. Services must be performed to the satisfaction of the Owner's Representative. The contractor must provide daily trash collection and cleanup of the buildings and adjacent outside areas, and disposal of all discarded debris, aggregate samples and concrete test samples in a manner approved by the Owner's Representative. No separate payment may be made for these contractor- furnished services; all costs are incidental to the contract.
- B. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

- C. Maintain premises and properties free from accumulation of waste, debris and rubbish caused by operations.
- D. Collect and deposit debris in such collation facilities.
- E. Remove all debris from the job site on a regular basis. Do not allow trash and debris to accumulate or remain on the site for longer than 7 days.

1.10 TEMPORARY FIRE PROTECTION

- A. The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services and shall comply with all reasonable recommendations regarding fire protection made by the Owner's Representatives or by the local fire chief or fire marshal.

1.11 HOISTING FACILITIES

- A. Provide hoisting facilities as required for the vertical movement of all materials.
- B. Comply with OSHA for all hoists, conveyers, and elevators and maintain the facilities in compliance with the law.

1.12 TEMPORARY CONTROLS

- A. Dust Control
 - 1. The contractor must keep all work areas within or outside the project boundaries free from the dust that would cause the standards of air pollution to be exceeded or that would cause a hazard or nuisance to others. Dust must be controlled as the work proceeds and whenever a dust nuisance or hazard occurs. No separate or direct payment is made for dust control, and its cost is considered incidental to and included in the contract price.
- B. Hazards Control
 - 1. Store volatile wastes in covered metal containers and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- C. Cleaning and Disposal
 - 1. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

2. Do not burn or bury rubbish and waste materials on project site.
3. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drain.
4. Do not dispose of wastes into streams or waterways.
5. Maintain cleaning until project, or portion thereof, is occupied by Owner.

D. Parking

1. All contractor employees and subs shall park in an area designated by the Owner.

PART 2 PRODUCTS - NOT USED

END OF SECTION 01 1500

SECTION 01 2200 – UNIT PRICES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 RELATED REQUIREMENTS

Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

- A. Take all measurements and compute quantities. Measurements and quantities will be verified by Owner.
- B. Assist by providing necessary equipment, workers, and survey personnel as required.

1.06 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.

1.07 SCHEDULE OF UNIT PRICES

- A. Item: Bedrock and Boulder Removal.
 - 1. The Contractor and Subcontractors shall note that the unit costs presented below are for materials that be encountered during the project work not part of the original Base Bid Price that affects the work issued by changes in scope of work,

or otherwise clearly not part of the original scope of work. These materials include bedrock, boulder removal/disposal, and the removal of debris such as a tree stump.

Quantity classification delineated below shall be determined based on the scope of work being performed and may be considered cumulative for work that is being performed in localized areas of the project, and/or project wide depending on the circumstances and/or phase of work underway. The Contractor and Owner shall review the status of work underway and mutually agree on the unit costs to be carried as the project progresses and shall adjust the unit cost accordingly based on the overall work effort undertaken and determination that multiple mobilizations and/or unique and/or separate set up efforts were required to perform the work.

Unit Price Number	Description of Service
<p style="text-align: center;">1</p> <p style="text-align: center;">2</p>	<p style="text-align: center;">Ledge/Rock Removal and Disposal with Hammer</p> <p style="text-align: center;">0-1500 CY per Cubic Yard</p> <p style="text-align: center;">1500 cy and Above per Cubic Yard</p>
<p style="text-align: center;">3</p> <p style="text-align: center;">4</p>	<p style="text-align: center;">Boulder Removal</p> <p style="text-align: center;">Excavate, Load and Haul Boulders Less than 1 CY per Cubic Yard</p> <p style="text-align: center;">Excavate, Load and Haul Boulders Greater than 1 CY and Less than 3 CY per Cubic Yard</p>

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 03 3000 - CAST-IN-PLACE CONCRETE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Concrete toppings.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
- E. Samples: For waterstops and vapor retarder.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer, and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- D. Material Test Reports: From a qualified testing agency indicating compliance with requirements.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Epoxy-Coated Reinforcing Bars: Deformed bars, ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.
- C. Plain-Steel Wire: ASTM A 82/A 82M.
- D. Deformed-Steel Wire: ASTM A 496/A 496M.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, steel wire into flat sheets.
- F. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I, Type II.
 - a. Fly Ash: ASTM C 618, Class F or C.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fortifiber Building Systems Group; Moistop Ultra 6.
 - b. Raven Industries Inc.; Griffolyn.
 - c. Stego Industries, LLC; Stego Wrap, 10 mil Class A.
- B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick.
- C. Bituminous Vapor Retarder: 110-mil- (2.8-mm-) thick, semiflexible, 7-ply sheet membrane consisting of reinforced core and carrier sheet with fortified asphalt layers, protective weathercoating, and removable plastic release liner. Furnish manufacturer's accessories including bonding asphalt, pointing mastics, and self-adhering joint tape.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Meadows, W. R., Inc.; Premoulded Membrane Vapor Seal.
 2. Water-Vapor Permeance: 0.00 grains/h x sq. ft. x inches Hg (0.00 ng/Pa x s x sq. m); ASTM E 154.
 3. Tensile Strength: 140 lbf/inch (24.5 kN/m); ASTM E 154.
 4. Puncture Resistance: 90 lbf (400N); ASTM E 154.
- D. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- E. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.7 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anti-Hydro International, Inc.; Emery.
 - b. Dayton Superior Corporation; Emery Tuff Non-Slip.
 - c. Lambert Corporation; EMAG-20.
 - d. L&M Construction Chemicals, Inc.; Grip It.
 - e. Metalcrete Industries; Metco Anti-Skid Aggregate.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
 - b. BASF Construction Chemicals - Building Systems; Confilm.
 - c. ChemMasters; SprayFilm.
 - d. Conspec by Dayton Superior; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film (J-74).
 - f. Edoco by Dayton Superior; BurkeFilm.
 - g. Euclid Chemical Company (The), an RPM company; Eucobar.
 - h. Kaufman Products, Inc.; Vapor-Aid.
 - i. Lambert Corporation; LAMBCO Skin.
 - j. L&M Construction Chemicals, Inc.; E-CON.
 - k. Meadows, W. R., Inc.; EVAPRE.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group; MONOFILM.
 - n. Sika Corporation; SikaFilm.
 - o. SpecChem, LLC; Spec Film.
 - p. Symons by Dayton Superior; Finishing Aid.
 - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
 - r. Unitex; PRO-FILM.
 - s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. BASF Construction Chemicals - Building Systems; Kure 200.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec by Dayton Superior; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - f. Edoco by Dayton Superior; Res X Cure WB.
 - g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
 - h. Kaufman Products, Inc.; Thinfilm 420.

- i. Lambert Corporation; AQUA KURE - CLEAR.
- j. L&M Construction Chemicals, Inc.; L&M Cure R.
- k. Meadows, W. R., Inc.; 1100-CLEAR.
- l. Nox-Crete Products Group; Resin Cure E.
- m. Right Pointe; Clear Water Resin.
- n. SpecChem, LLC; Spec Rez Clear.
- o. Symons by Dayton Superior; Resi-Chem Clear.
- p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
- q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
- D. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.

- C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 PROPORTIONING AND DESIGN OF MIXES

- A. The design of the exact proportions for the mix, including amounts of admixtures and water to meet all specification requirements shall be the responsibility of the concrete supplier.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 30 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.
- C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
1. 4000-psi, 28-day compressive strength, maximum size of aggregate as specified below, minimum cement content 611 pounds per cubic yard.
 - a. Foundations and Walls: 1-1/2" maximum aggregate size.
 - b. Slabs: 3/4" maximum aggregate size.
 2. 3500-psi, 28-day compressive strength, 3/4" maximum size of aggregate, 540 pounds per cubic yard minimum cement content.
 3. 3000-psi, 28-day compressive strength, 1-1/2" maximum size of aggregate, 470 pounds per cubic yard minimum cement content.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

2.13 ADMIXTURES

- A. Use mid-range or high-range water-reducing admixture (Superplasticizer) in concrete as required for placement and workability.
1. Use mid-range water-reducing admixture in pumped concrete, concrete for slabs, and concrete with water/cement ration of 0.50 or less.
 2. Use high-range water-reducing admixture in concrete required to be watertight and concrete with water/cement ratio of 0.40 or less.

- B. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).
- C. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 4.5 to 6.5 percent. Interior slabs shall have a maximum air content of 3 percent.
- D. Use corrosion inhibitor admixture in the elevated slab concrete. Add admixture at the manufacturer's recommended rate of 3 gal./yd.
- E. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.
- F. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
 - 1. Reinforced concrete subjected to brackish water, salt spray, deicers, or to be watertight, W/C 0.40.
 - 2. Subjected to freezing and thawing, W/C 0.45.
 - 3. All other concrete, W/C 0.50.
- G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 - 1. Ramps, slabs, and sloping surfaces: Not more than 3 inches.
 - 2. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.
 - 3. Concrete containing plant-added mid-range water reducing admixture: 4-inch to 6-inch slump at time of arrival at the site.
 - 4. Concrete containing high-range, water-reducing admixture (Superplasticizer): Not more than 8 inches after addition of high-range, water-reducing to site-verified 2-inch to 3-inch slump concrete. Concrete containing plant added high-range, water-reducing admixture shall arrive at the site with a 5-inch to 8-inch slump.
 - 5. Other concrete: Not more than 4 inches.

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Construct forms tight enough to prevent loss of concrete mortar.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- G. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 48 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.
- C. Granular Course: Cover vapor retarder with granular fill, fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).
 1. Place and compact a 1/2-inch- (13-mm-) thick layer of fine-graded granular material over granular fill.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration

to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent

formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 - d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
 - 2. Finish and measure surface so gap at any point between concrete surface and an unveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps.
- H. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm)

clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
 - F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 1. Steel reinforcement placement.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Unit Weight: ASTM C 567, 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 mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
10. Test results shall be reported in writing to Architect, 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 mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 3000

SECTION 04 2200 - CONCRETE UNIT MASONRY**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Concrete Masonry Units (CMU's).
2. Steel reinforcing bars.

1.2 PRECONSTRUCTION TESTING**A. Preconstruction Testing Service:** Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.3 ACTION SUBMITTALS

- A. Product Data:** For each type of product indicated.
- B. Shop Drawings:** For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates:** For each type and size of product indicated. For masonry units include data on material properties and material test reports substantiating compliance with requirements.
- B. Mix Designs:** For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

- A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- B. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- C. Integral Water Repellent: Provide units made with liquid polymeric, integral water repellent admixture that does not reduce flexural bond strength.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACM Chemistries, Inc.; RainBloc.
 - b. BASF Aktiengesellschaft; Rheopel Plus.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
- D. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
2. Density Classification: Normal weight.

2.3 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout.

2.4 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C 91.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capital Materials Corporation; Flamingo Color Masonry Cement.
 - b. Cemex S.A.B. de C.V.
 - c. Essroc, Italcementi Group.
 - d. Holcim (US) Inc.
 - e. Lafarge North America Inc.
 - f. Lehigh Cement Company.
 - g. National Cement Company, Inc.; Coosa Masonry Cement.
- F. Mortar Cement: ASTM C 1329.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lafarge North America Inc.
- G. Aggregate for Grout: ASTM C 404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACM Chemistries, Inc.; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
- J. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 1. Interior Walls: Hot-dip galvanized, carbon steel.
 2. Exterior Walls: Hot-dip galvanized, carbon stainless steel.
 3. Wire Size for Side Rods: 0.187-inch (4.76-mm) diameter.
 4. Wire Size for Cross Rods: 0.187-inch (4.76-mm) diameter.
 5. Wire Size for Veneer Ties: 0.187-inch (4.76-mm) diameter.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick, steel sheet, galvanized after fabrication.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
 3. Corrugated Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.075-inch- (1.90-mm-) thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch (25 mm) of masonry face.
- C. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- E. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
 2. Use Portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.
 3. For exterior masonry, use Portland cement-lime, masonry cement or mortar cement mortar.

4. For reinforced masonry, use Portland cement-lime, masonry cement, or mortar cement mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270.
1. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 2. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.2 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.4 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
1. Space reinforcement not more than 16 inches (406 mm) o.c.
 2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.5 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.6 FLASHING

- A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

- B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At lintels, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.7 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.8 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to

perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

- B. Testing Prior to Construction: One set of tests.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.9 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch (19 mm).
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.10 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 04 2200 - CONCRETE UNIT MASONRY**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Pre-faced concrete masonry units.
4. Steel reinforcing bars.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- C. Samples: For each type and color of the following:
 1. Exposed CMUs.
 2. Epoxy coated CMUs.
 3. Mortar.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

- A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
 - 1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches x 60 inches long by 36 inches high by full thickness.

1.6 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. Integral Water Repellent: Provide units made with integral water repellent at all exposed shower stall walls.
- C. CMUs: ASTM C90.
 - 1. Density Classification: Normal weight unless otherwise indicated.
- D. Concrete Building Brick: ASTM C55.

1. Density Classification: Normal weight
 - a. Stack Bond Pattern (also known as soldier course pattern), natural face finish.. The use of stack bond layup facilitates insertion of plumbing and conduit within the wall.

- E. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- F. Aggregate for Mortar: ASTM C144.
 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C404.
- H. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- J. Water: Potable.

2.4 REINFORCEMENT

- A. Galvanized Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M,

- B. Reinforcing Bar Positioners: Galvanized Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from **0.148-inch** steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: **0.148-inch** diameter.
 - 4. Wire Size for Cross Rods: **0.148-inch** diameter.
 - 5. Spacing of Cross Rods: Not more than **16 inches** o.c.
 - 6. Provide in lengths of not less than **10 feet** with prefabricated corner and tee units.

2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 - 3. Galvanized Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Adjustable Anchors for Connecting to Structural Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Tie Section: Triangular-shaped wire tie made from **0.187-inch** diameter, hot-dip galvanized-steel wire.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from **0.060-inch**-thick steel sheet, galvanized after fabrication.
 - 2. Tie Section: Triangular-shaped wire tie made from **0.187-inch**-diameter, hot-dip galvanized-steel wire.
 - 3. Corrugated-Metal Ties: Metal strips not less than **7/8 inch** wide with corrugations having a wavelength of **0.3 to 0.5 inch** and an amplitude of **0.06 to 0.10 inch** made from **0.060-inch**-thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.
- D. Partition Top Anchors: **0.105-inch**-thick metal plate with a **3/8-inch**-diameter metal rod **6 inches** long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Rigid Anchors: Fabricate from steel bars **1-1/2 inches** wide by **1/4 inch** thick by **24 inches** long, with ends turned up **2 inches** or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M

2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, **0.016 inch (0.40 mm)** thick.
 2. Fabricate continuous flashings in sections **96 inches** long minimum, but not exceeding **12 feet**. Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate metal drip edges from stainless steel. Extend at least **3 inches** into wall and **1/2 inch** out from wall, with outer edge bent down 30 degrees and hemmed.
 4. Fabricate metal sealant stops from stainless steel. Extend at least **3 inches** into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for **3/4 inch** and down into joint **1/4 inch** to form a stop for retaining sealant backer rod.
 5. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
- B. Flexible Flashing: Use **one of** the following unless otherwise indicated:
 1. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than **0.030 inch**
 2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 3. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D4637/D4637M, **0.040 inch** thick.
- C. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406] and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.8 MASONRY-CELL FILL

- A. Loose-Fill Insulation: Perlite complying with ASTM C549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- B. Lightweight-Aggregate Fill: ASTM C331/C331M.

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use **masonry cement** mortar unless otherwise indicated.
 - 3. For exterior masonry, use **masonry cement** mortar.
 - 4. For reinforced masonry, use **masonry cement** mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C270, Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use **Type S**.
 - 2. For reinforced masonry, use **Type S**.
 - 3. For mortar parge coats, use **Type S**.
 - 4. For all exterior, above-grade, load-bearing and nonload-bearing walls for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use **Type S**.
- C. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476,
 - 3. Provide grout with a slump of **8 to 11 inches** as measured in accordance with ASTM C143/C143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus **1/2 inch (12 mm)** or minus **1/4 inch (6 mm)**.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus **1/2 inch (12 mm)**.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus **1/4 inch (6 mm)** in a story height or **1/2 inch (12 mm)** total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than **1/4 inch in 10 feet (6 mm in 3 m)**, or **1/2-inch (12-mm)** maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2-inch (12-mm)** maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2-inch (12-mm)** maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2-inch (12-mm)** maximum.
5. For lines and surfaces, do not vary from straight by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2-inch (12-mm)** maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**, with a maximum thickness limited to **1/2 inch (12 mm)**.
2. For head and collar joints, do not vary from thickness indicated by more than plus **3/8 inch (9 mm)** or minus **1/4 inch (6 mm)**.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface STACK bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and

offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in STACK bond; do not use units with less-than-nominal **4-inch (100-mm)** horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between structural frames and masonry solidly with mortar unless otherwise indicated.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- F. Fill cores in hollow CMUs with grout **24 inches (600 mm)** under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive epoxy coating, plaster or other direct-applied finishes unless otherwise indicated.

3.5 MASONRY-CELL FILL

- A. Pour into cavities to fill void spaces except for concrete filled block courses. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than **20 feet (6 m)**.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of **5/8 inch (16 mm)** on exterior side of walls, **1/2 inch (13 mm)** elsewhere. Lap reinforcement a minimum of **6 inches (150 mm)**.
1. Space reinforcement not more than **16 inches (406 mm)** o.c.
 2. Space reinforcement not more than **8 inches (203 mm)** o.c. in foundation walls and parapet walls.
 3. Provide reinforcement not more than **8 inches (203 mm)** above and below wall openings and extending **12 inches (305 mm)** beyond openings[**in addition to continuous reinforcement**].
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units or rigid galvanized steel anchors.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
1. Provide an open space not less than [**1/2 inch (13 mm)**] wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than **24 inches (610 mm)** o.c. vertically and **36 inches (915 mm)** o.c. horizontally.

3.8 FLASHING

- A. General: Install embedded flashing at ledges and other obstructions to allow downward flow of water in wall where indicated.
- B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At lintels, extend flashing a minimum of **6 inches (150 mm)** into masonry at each end. At heads and sills, extend flashing **6 inches (150 mm)** at ends and turn up not less than **2 inches (50 mm)** to form end dams.

3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing **1/2 inch (13 mm)** back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.9 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than [**60 inches (1520 mm)**] [**12.67 ft. (3.86 m)**] <Insert height>.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements is done at Contractor's expense.
- B. Inspections: Special inspections in accordance with TMS 402/ACI 530/ASCE 5.
1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.

- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.
- G. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019..

3.11 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.12 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.13 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 04 4313.13 - ANCHORED STONE VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone masonry veneer anchored to unit masonry backup.
2. Clear Epoxy Sealing of exterior stone veneer within the outdoor shower stalls

B. Products Installed but Not Furnished under This Section Include:

1. Precast concrete lintels in unit masonry.
2. shelf angles for supporting unit masonry.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for weather barrier, concealed flashing, horizontal joint reinforcement and veneer anchors.

1.2 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

1. For stone type indicated.
2. For color of mortar required.

1.3 FIELD CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F (4 deg C)** and above and will remain so until masonry has dried.

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 NATURAL LEDGESTONE – also referred to as natural ledgerstone

Material Standard: Comply with ASTM C616, C629 C1526 , C568, C568M AND C 1527

1. Classification: density minimum 166 lb/cu. ft. (2400 kg/cu. m) minimum; 1.17% water absorption, 2.66 specific gravity

B. Varieties and Sources: Subject to compliance with requirements,

Only natural locally sourced limestone, dolomites, mica schist , goshen stone, or mixed quartzite material , 4 sq.ft. sample acceptable to project manager and architect.

Natural Sandstone or artificially produced or fabricated stone products are not acceptable.

As supplied by a RI-DEM approved Rhode Island or Massachusetts quarry

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.

1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in stone masonry mortar.

E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix produces color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments do not exceed 10 percent of portland cement by weight.

F. Colored Masonry Cement Mix: Packaged blend of masonry cement and mortar pigments. Mix produces color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments do not exceed 5 percent of masonry cement by weight.

G. Aggregate: ASTM C144 and as follows:

1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

H. Water: Potable.

2.3 VENEER ANCHORS

A. Materials:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M; with ASTM A153/A153M, Class B-2.
2. Stainless Steel Wire: ASTM A580/A580M, [Type 304] [Type 316].
3. Hot-Dip Galvanized-Steel Sheet: ASTM A1008/A1008M, cold-rolled, carbon-steel sheet, hot-dip galvanized after fabrication to comply with ASTM A153/A153M, Class B-2.
4. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [Type 304] [Type 316].

B. Size: Sufficient to extend at least halfway, but not less than **1-1/2 inches (38 mm)**, through stone masonry and with at least a **5/8-inch (16-mm)** cover on exterior face.

C. Wire Veneer Anchors: Wire ties formed from W1.7 or **0.148-inch- (3.8-mm-)** diameter, **hot-dip galvanized** steel wire.

D. Corrugated-Metal Veneer Anchors: Not less than **0.030-inch** thick by **7/8-inch- (22-mm-)** wide [**hot-dip galvanized**] [**stainless**] steel sheet with corrugations having a wavelength of **0.3 to 0.5 inch (7.6 to 13 mm)** and an amplitude of **0.06 to 0.10 inch (1.5 to 2.5 mm)**.

E. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a **100-lbf (445-N)** load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of **1/16 inch (1.5 mm)**.
2. Fabricate sheet metal anchor sections and other sheet metal parts from [**0.075-inch- (1.90-mm-)**] thick steel sheet, galvanized after fabrication
3. Fabricate wire ties from [**0.187-inch- (4.76-mm-)**] diameter, [hot-dip galvanized-steel]] wire unless otherwise indicated.
4. Fabricate wire connector sections from **0.187-inch- (4.76-mm-)** diameter, hot-dip galvanized-steel wire.
5. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
6. Masonry-Veneer Anchors; Double-Pintle Plate: Rib-stiffened, sheet metal anchor section with screw holes at top and bottom, projecting horizontal leg with slots for vertical legs of double pintle wire tie. Provide with seismic tie, clip, and continuous wire in veneer.
7. Masonry-Veneer Anchors; Slotted Plate: Sheet metal anchor section, with screw holes at top and bottom; and raised rib-stiffened strap, stamped into center to provide a slot between strap and base for wire tie. Use self-adhering tape to seal penetration behind anchor plate.
8. Masonry-Veneer Anchors; Slotted Plate with Prongs: Sheet metal anchor section, with screw holes at top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation; and raised rib-stiffened strap, stamped into center to provide a slot between strap and base for wire tie. Use self-adhering tape to seal penetration behind anchor plate.

- F. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Stainless Steel: ASTM A240/A240M, Type 304, **0.016 inch (0.4 mm)** thick.
 2. Fabricate continuous flashings in sections **96 inches (2400 mm)** long minimum, but not exceeding **12 feet (3.7 m)**. Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate metal drip edges from stainless steel. Extend at least **3 inches (76 mm)** into wall and **1/2 inch (13 mm)** out from wall, with outer edge bent down 30 degrees **and hemmed**.
 4. Fabricate metal sealant stops from stainless steel. Extend at least **3 inches (76 mm)** into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for **3/4 inch (19 mm)** and down into joint **1/4 inch (6 mm)** to form a stop for retaining sealant backer rod.
 5. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
- G. Flexible Flashing: For flashing unexposed to the exterior, use the following unless otherwise indicated:
1. Rubberized-Asphalt or Butyl Flashing: Composite flashing product consisting of a pliable, adhesive, rubberized-asphalt compound, bonded to a high-density, cross-laminated, polyethylene film to produce an overall thickness of not less than [**0.030 inch (0.76 mm)**] [**0.040 inch (1.0 mm)**].

2.4 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.
- B. Cementitious Damp-proofing: Cementitious formulation recommended by ILI and nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.
- C. Asphalt Dampproofing: Asphalt emulsion complying with ASTM D1227, Type III or Type IV.
- D. Weep/Vent Products: Use **one of** the following unless otherwise indicated:
1. Round Plastic Tubing: Medium-density polyethylene, **3/8-inch (10-mm)** OD by thickness of stone masonry.
 2. Mesh Weep Holes/Vents: Free-draining mesh; made from polyethylene strands, full width of head joint and **2 inches (50 mm)** high by thickness of stone masonry; in color selected from manufacturer's standard.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Provide one of the following configurations:
 - a. Strips, full depth of cavity and **10 inches (250 mm)** wide, with dovetail-shaped notches **7 inches (175 mm)** deep that prevent mesh from being clogged with mortar droppings.

- b. Strips, not less than **[3/4 inch (19 mm)] [1-1/2 inches (38 mm)]** thick and **10 inches (250 mm)** wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.

2.5 MASONRY CLEANERS & SEALERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.
- B. Proprietary sealer ; Use Pro Industrial grade low gloss High Performance Epoxy polyamine clear transparent sealer or equivalent low sheen silicone sealer product applied in 3 coats within the exposed masonry surface of the outdoor shower stalls.
- C. Provide small sample section for approval by architect and project manager before proceeding with full application.

2.6 FABRICATION

- A. Split or Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.
 1. Shape stone specified to be laid in three-course, random range ashlar pattern with **split** beds using appropriate sized stones.
- B. Thickness of Sloped Stone: Provide 4 1/2" minimum veneer thickness at top of wall and 12" thickness at the base. Provide fully jointed corner stones at intersections and exposed corners
- C. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples.
 1. Finish: Sloped face of stone veneer to be smooth jointed with waterproof mortar at outdoor shower stalls and sealed with three coats of clear silicone or high performance epoxy waterproofing as specified. .
 2. The mortar and stone of the sloped wall surface to be troweled smooth and free of bumps or projections where the stall partitions are to be fastened to the sloped walls.
 3. The holes for fastening the steel partition supports are to be waterproofed with silicone sealant bedding to avoid water penetration at the fastening points.
 4. Layup pattern : The layup pattern for the sloped stone veneer walls will be as per the 8 sq.ft. sample prepared and approved on site by the architect and project manager.

2.7 MORTAR MIXES

- A. General: Do not use admixtures unless otherwise indicated.

1. Do not use calcium chloride.
 2. Use masonry cement mortar unless otherwise indicated.
 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Mortar for Stone Masonry: Comply with ASTM C270, Proportion Specification.
1. Mortar for Setting Stone: [**Type S**] [**Type N**].
 2. Mortar for Pointing Stone: [**Type N**] [**Type O**].
- C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments do not exceed 10 percent of portland cement by weight.
 2. Pigments do not exceed 5 percent of masonry cement by weight.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coat concrete and unit masonry (CMU) backup with asphalt damp proofing.

3.2 INSTALLATION OF STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
1. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
 2. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in broken-range ashlar pattern with non-uniform course heights, random lengths, and uniform joint widths.
- D. Arrange stones in **coursed** pattern with joint widths within tolerances indicated. Insert small stones into spaces between larger stones as needed to produce joints as uniform in width as practical.
- E. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

- F. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than [1/4 inch (6 mm)] at narrowest points or more than [3/8 inch (10 mm)] at widest points.
- G. Provide sealant joints of widths and at locations indicated.
1. Keep sealant joints free of mortar and other rigid materials.
 2. Sealant joints are specified in Section 079200 "Joint Sealants."
- H. Install embedded flashing **and weep holes** at base flashings, shelf angles, lintels, ledges, other obstructions to direct downward flow of water in wall, and where indicated.
1. At concrete unit masonry (CMU) backing, extend flashing through stone masonry, turned up a minimum of **12 inches (300 mm)**, and insert in reglet provided. Reglets are specified in Section 076200 "Sheet Metal Flashing and Trim."
 2. At lintels and shelf angles, extend flashing full length of angles but not less than **6 inches (150 mm)** into masonry at each end.
 3. At sills, extend flashing not less than **4 inches (100 mm)** at ends.
 4. At ends of head and sill flashing, turn up not less than **2 inches (50 mm)** to form end dams.
 5. Extend sheet metal flashing **1/2 inch (13 mm)** beyond masonry face at exterior, and turn flashing down and hemmed to form a drip.
 6. Install metal flashing termination beneath flexible flashing at exterior wall face. Stop flexible flashing **1/2 inch (13 mm)** back from exterior wall face and adhere flexible flashing to top of metal flashing termination.
- I. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
1. Use round vinyl tubing inserted with downward **slope** to form weep holes.
 2. Space weep holes **24 inches (600 mm)** o.c.
- J. Coat limestone with cementitious damp proofing as follows:
1. Stone at Grade: Beds, joints, and back surfaces to at least **12 inches (300 mm)** above finish-grade elevations.
 2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed **1/4 inch in 10 feet** or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed **1/4 inch in 20 feet (6 mm in 6 m)** or more.
- B. Variation from Level: For[**bed joints and**] lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed **1/4 inch in 20 feet (6 mm in 6 m)** or **1/2 inch in 40 feet (13 mm in 12 m)** or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed **1/2 inch in 20 feet (13 mm in 6 m)** or more.

3.4 INSTALLATION OF ANCHORED STONE MASONRY

- A. Anchor stone masonry to unit masonry (CMU) with galvanized corrugated-metal veneer anchors unless otherwise indicated. Embed anchors in unit masonry mortar joints or grouted cells at a distance of at least one-half of unit masonry thickness.
- B. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than **1-1/2 inches (38 mm)**, through stone masonry and with at least a **5/8-inch (16-mm)** cover on exterior face.
 - 1. Install continuous wire reinforcement in horizontal joints and attach to seismic veneer anchors as stone is set.
- C. Space anchors not more than **18 inches (450 mm)** o.c. vertically and **32 inches (800 mm)** o.c. horizontally, with not less than one anchor per **2.67 sq. ft. (0.25 sq. m)** of wall area. Install additional anchors within **12 inches (300 mm)** of openings, sealant joints, and perimeter at intervals not exceeding **12 inches (300 mm)**.
- D. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.
- E. Provide **1-inch (25-mm)** cavity between stone masonry and backup construction unless otherwise indicated. Keep cavity free of mortar droppings and debris.
 - 1. Slope beds toward cavity to minimize mortar protrusions into cavity.
 - 2. Do not attempt to trowel or remove mortar fins protruding into cavity.
- F. Rake out joints for pointing with mortar to depth of not less than **3/4 inch (19 mm)** before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.5 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than **3/8 inch (10 mm)** deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers of not more than **3/8 inch (10 mm)** deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Joint Profile: Smooth, flat face slightly below edges of stone as per sample of stone veneer approved by Architect and project manager.

3.6 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.

- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
 3. Protect adjacent stone and non masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 5. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.7 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
1. Do not dispose of masonry waste as fill within **18 inches (450 mm)** of finished grade.

END OF SECTION 044313.13

SECTION 06 1600 - SHEATHING

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing including fiber cement siding
2. Plywood Roof sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

B. Sustainable Design Submittals:

Submit sustainable design text and Leeds Certification data for all products and materials of this section.

Submit sustainable design qualifications for all manufacturers and vendors of products and materials covered in this section for quality assurance purposes.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preserved-treated plywood.

PART 2 - PRODUCTS

2.1 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction , Use Category UC3b for exterior construction .
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood unless otherwise indicated
- D. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

2.2 WALL SHEATHING

- A. Plywood Sheathing grade: Exterior, Structural I

- B. This sheathing, 1/2" thickness, is required as backing beneath all interior wall and exterior wall surfaces clad in fiber cement paneling and wood shingle cladding as shown on the drawings.

2.3 ROOF SHEATHING

- A. Plywood Sheathing: Exterior, Structural I grade Tongue and Groove preservative treated roof sheathing in 3/4" (minimum) thickness.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

2.5 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

END OF SECTION 061600

SECTION 06 2020 –FINISH CARPENTRY (Interior & Exterior)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes but is not limited to :

1. Interior trim, including hollow metal or fiberglass or solid core-wood interior doors, installation of hardware and setting of door and window frames.
2. Installation of washroom accessories, coat-hooks, mirrors, shower curtains and backing for all wall mounted accessories, (except those included in toilet partition installation).
3. Interior Shelving and sloped wood shingle roofs over supply closets. (see wood shingles sect.073129)
4. Installation of rough sawn cedar plank window trim
5. Installation of solid cellular PVC roof fascias (AZEK). (see spec. sect. 066500)
6. Installation of all interior and exterior wood shingle wall cladding as specified in section 073149
7. Exterior trim including rough sawn cedar planks installed over fiber cement cladding panels
8. Installation of wall mounted Access panels for maintenance purposes (see section 092000)

B.1. Excluded is work pertaining to suspended cedar plank ceilings, (part of a manufactured system). This work is specified in section 095426 suspended wood ceilings to be performed by trades specialized in this work.

2. Excluded is the installation of fiber cement wall cladding and soffits. This work is specified in section 074646 fiber cement cladding and is to be performed by trades specialized in this work.

3. Exclude installation of high density polyethylene (HDPE) pipe-chase walls and solid laminate tops to these pipe-chases and all removable access panels. This installation is to be provided as part of bathroom partitions work (see section 102113) .

1. 4. Installation and fitting of pre-molded solid surface sinks and countertops, aprons and thermoformed cove backsplashes, all work to be performed by specialized experienced craftsmen .(See Section 06616)

1.2 DEFINITIONS

A.MDF: Medium-density fiberboard.

B.MDO: Plywood with a medium-density overlay on the face.

C.PVC: Polyvinyl chloride.

D.HDPE High density polyethylene

E. AZEK Trademark of proprietary composite PVC product

1.3 ACTION SUBMITTALS

A.Product Data: For each type of process and factory-fabricated product.

B.Sustainable Design Submittals:

Submit sustainable design text pertaining to all materials and products of this section.

Submit sustainable design qualifications documentation for all manufacturers and vendors .

Submit descriptive text background of experience and qualifications of the foremen, skilled craftsmen and lead carpenters proposed for this work, for the approval and acceptance of the Architect and the Project Manager.

C.Samples: Submit full samples for each exposed product and for each color and texture specified.

1.4 Shop Drawings

Submit fully detailed shop drawings based on site dimensions for each element or fabricated product for approval according to the procedures set out in the General Conditions for all items covered by this specification. The shop drawings shall fully describe the installation methods and all products to be used in the installation .

1.5 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber, mark grade stamp on end or back of each piece .

B.Softwood Plywood: DOC PS 1.

C.Hardboard: ANSI A135.4.

D.MDF: ANSI A208.2, Grade 130..

E.Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: To Be determined as selected by Architect from manufacturer's full range.

1.6 INTERIOR TRIM

A.Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade:
 - a. Eastern white pine; NeLMA or NLGA Finish grade
 - b. Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NLGA or WWPA Finish grade
 - c. Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NeLMA, NLGA, or WWPA Finish grade
 - d. Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or WWPA] finish.
 - e. Western red cedar; NLGA, WCLIB, or WWPA Finish Grade
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Face Surface: **smooth**.

B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: Red oak Finish Grade
2. Maximum Moisture Content: **13** percent.
3. Finger Jointing: Not allowed.
4. Gluing for Width: Not allowed
5. Veneered Material: Not allowed
6. Face Surface: smooth.
7. Matching: Selected for compatible grain and color.

C. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade:
 - a. Eastern white pine; NeLMA or NLGA Finish
 - b. Species and Grade: Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or "Maximum Moisture Content for Softwoods"
2. Maximum Moisture Content for Softwoods: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Maximum Moisture Content for Hardwoods: [**13**] [**10**] [**9**] <Insert number> percent.
4. Finger Jointing: [**Allowed**] [**Not allowed**].
5. Face Surface: [**Surfaced (smooth)**] [**Saw textured**].
6. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.

D. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): MMPA WM 4, N-grade wood moldings made to patterns included in MMPA's "HWM/Series Hardwood Moulding Patterns."

1. Species: Red oak or sustainably sourced equivalent.
2. Maximum Moisture Content: 9 percent.
3. Finger Jointing: Not allowed.
4. Matching: Selected for compatible grain and color.
5. Optional Material: Kiln-dried softwood or MDF, with exposed surfaces veneered with species indicated, may be used in lieu of solid wood.

E. Moldings for Opaque Finish (Painted Finish): Made to patterns included in MMPA's "WM/Series Softwood Moulding Patterns."

1. Softwood Moldings or exterior and interior trim boards:
 - a. Species: Western red cedar; NLGA, WCLIB, or WWPA **Grade A**
 - b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
2. Hardwood Moldings: MMPA WM 4, P-grade.
 - a. Species: Aspen , soft maple, tupelo, or yellow poplar.
 - b. Maximum Moisture Content: 9 percent.
3. Finger Jointing: Not allowed.
4. Optional Material: Primed MDF.
5. Finish: transparent, UV-resistant, protective finish
6. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
7. Pattern: V-joint, tongue and groove, NeLMA EWP 4 or WWPA WP 4.
8. Net Coverage Width: Not less than **4" inches**

1.7 SHELVING AND CLOTHES RODS

A. Closet Utility Shelving: Made from **3/4 inch (19 mm)** thick: Melamine-faced exterior grade plywood with applied-PVC front edge 12" wide.

B. Adjustable Shelf Brackets: BHMA A156.9, B04112; **natural aluminum**.

1.8 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior & Interior Finish Carpentry: Epoxy coated stainless steel Nails, screws, and other anchoring devices of type, size, material, required for application indicated to provide secure attachment, concealed where possible.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

C. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

PART 2 - EXECUTION

2.1 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

2.2 INSTALLATION, GENERAL

A. Install finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts .
3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of **1/8 inch in 96 inches** for level and plumb. Install adjoining interior finish carpentry with **1/32-inch** offset for flush installation and **1/16-inch** maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

2.3 INSTALLATION OF STANDING AND RUNNING TRIM

A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.

1. Do not use pieces less than 24 inches (610 mm) long, except where necessary.
2. Stagger joints in adjacent and related standing and running trim.
3. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
4. Use scarf joints for end-to-end joints.
5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
7. Install trim after fiber-cement joint finishing operations are completed.
8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
9. Fasten to prevent movement or warping.
10. Countersink fastener heads on exposed carpentry work and fill holes.

2.4 INSTALLATION OF PLYWOOD BACKING PANELS

1. Leave **1/4-inch (6-mm)** gap to be covered with trim at top, bottom, and openings.
2. Install with uniform tight joints between panels.
3. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners.
4. Space fasteners and adhesive as recommended by panel manufacturer.
5. Conceal fasteners to greatest practical extent.

6. Arrange panels with grooves and joints over supports.

2.5 INSTALLATION OF SHELVING

A. Cut shelf cleats at ends of shelves about **1/2 inch (13 mm)** less than width of shelves and sand exposed ends smooth.

1. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled.
2. Space fasteners not more than **24 inches** c/c.
3. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing.
4. Remove adhesive that is squeezed out after fastening shelf cleats in place.

B. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than **36 inches (900 mm)** o.c. and within **6 inches (150 mm)** of ends of shelves. Fasten to framing members, or use toggle bolts or hollow wall anchors.

C. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.

1. Install shelves, fully seated on cleats, brackets, and supports.

END OF SECTION 062023

**SECTION 06 6116 -SOLID SURFACING FABRICATIONS INCLUDING BATHHOUSE
COUNTERTOPS, INTEGRAL MOLDED SINKS, ADA SINKS, APRONS
AND BACKSPLASHES**

GENERAL

1.01 SUMMARY

- A. Section Includes: Provide solid surfacing fabrications including but not limited to following:
1. Pipe-chase tops.
 2. Bathroom countertops tops with integral sink bowls, front aprons and thermoformed cove backsplashes.
 3. ADA sinks
 4. Wireless charging units.
- B. Related Sections: Following description of work is included for reference only and shall not be presumed complete:
1. Provision of faucets, drains, plumbing and plumbing fixtures: [Division 22, Plumbing] .

1.02 REFERENCES

- A. Abbreviations and Acronyms:
1. LEED®: Leadership in Energy and Environmental Design; www.cagbc.org.
 2. MDF: Medium Density Fiberboard.
 3. VOC: Volatile Organic Compound.
- B. Definitions:
1. Solid Surface: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.
- C. Reference Standards:
1. ASTM D790-10 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 2. CSA B45.5-11/
IAPMO Z124-2011 - Plastic Plumbing Fixtures
 3. NFPA 255-06 - Standard Method of Test of Surface Burning Characteristics of Building Materials

-
4. SCAQMD Rule 1168 - Adhesive and Sealant Applications (amended January 2005)
 5. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials
 6. UL Environment/
Materials, - Standard for Chemical Emissions for Building
UL Environment/
Building Materials, - Gold Standard for Chemical Emissions for

1.03 SUBMITTALS

- A. Product Data: Indicate Product description including solid surface sheets, sinks, bowls and illustrating full range of standard colors, fabrication information and compliance with specified performance requirements. Submit Product data with resistance to list of chemicals.
- B. Shop Drawings: Submit Shop Drawings for work of this Section in accordance with Section 01 30 00. Indicate plans, sections, dimensions, component sizes, edge details, thermosetting requirements, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in solid surface.
- C. Coordination Drawings: Submit coordination drawings indicating plumbing and miscellaneous steel work indicating locations of wall rated or non-rated, blocking requirements, locations and recessed wall items and similar items.
- D. Samples: Submit samples in accordance with Section 01 30 00. Submit minimum 6" x 6" samples. Cut sample and seam together for representation of inconspicuous seam. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.
- E. Test and Evaluation Reports: Submit flammability test reports

1.04 CLOSEOUT SUBMITTALS

- A. Operational and Maintenance Data:
 1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in Project closeout documents.
 2. Provide a commercial care and maintenance kit and video. Review maintenance procedures and warranty details with Owner upon completion.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 1. Installers: Provide work of this Section executed by competent installers with minimum 5 years experience in the application of Products, systems and

assemblies specified and with approval and training of the Product manufacturers.

B. Mock-Ups:

1. Prior to final approval of Shop Drawings, erect 1 full size mock-up of each component at Project site demonstrating quality of materials and execution for Architect review.
2. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from Project site.
3. Approved mock-up will be used as standard for acceptance of subsequent work.
4. Approved mock-ups may remain as part of finished work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Deliver no components to Project site until areas are ready for installation.

B. Storage and Handling Requirements:

1. Store components indoors prior to installation.
2. Handle materials to prevent damage to finished surfaces.

1.07 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's standard warranty for material only for period of 10 years against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Architect and at no expense to Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer List: Products of following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:

1. Corian® by DuPont; www.corian.com
2. Samsung Chemical USA; www.staron.com
3. Wilsonart Contract; www.wilsonartcontract.com

B. This Specification is based on Corian® Products. Comparable Products from manufacturers listed herein will be accepted provided they meet requirements of this Specification.

2.02 MATERIALS

1. Provide Product with regional content if applicable.

- 2. EQc4.1: Provide adhesives and sealants with VOC quantities lower than stated in SCAQMD Rule 1168. Ensure VOC quantities for sealants do not exceed 250 g/l under any circumstances.

B. Performance/Design Criteria:

	Property	Requirement (min or max)	Test Procedure
1.	Solid Surface Based Products:		
a.	Tensile Strength	6000 psi min	ASTM D638
b.	Tensile Modulus	1.5 x 10 ⁶ psi min	ASTM D638
c.	Tensile Elongation	0.4% min.	ASTM D638
d.	Flexural Strength	10000 psi min	ASTM D790
e.	Flexural Modulus ASTM D790	1.2 x 10 ⁶ psi min	
f.	Hardness	>85-Rockwell "M" scale min.	ASTM D785
g.	Thermal Expansion	2.2 x 10 ⁻⁵ in./in./°F	ASTM E228
h.	Fungi and Bacteria G21 & G22	Does not support microbial growth	ASTM
i.	Microbial Resistance	Highly resistant to mold growth	UL 2824
j.	Ball Impact NEMA LD 3, Method 3.8 drop	No fracture - 1/2 lb. Ball:	6 mm slab - 36" drop 12 mm slab - 144"
k.	Weatherability	ΔE*94<5 in 1,000 hrs	ASTM G155
l.	Flammability 255 723		ASTM E84, NFPA & UL
m.	Flame Spread	<25	<25
n.	Smoke Developed	<25	<25
o.	Class Safety	A	A NFPA 101®, Life

C. Solid Surface Material:

D. Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:

E. Flammability: Class 1 and A when tested to UL 723.

- F. Pipe chase tops and sills: 1/2" thick solid surfacing material, adhesively joined with inconspicuous seams, rounded edge details as indicated on Drawings. Color selected later by Architect from manufacturer's full color range.
- G. Counter Perimeter Frame: Ensure 1/2" [3/4"] thick, moisture resistant cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive, Fir or Poplar plywood, veneer core only. [MDF core conforming to ANSI/NPA A208.2 balanced design, manufactured from recycled materials, meeting ANSI Standards for emissions, of minimum density of 48 lb/cu ft and surface character to match sample approved by Architect. Ensure fire retardant Product contains fire-retardant chemicals injected with raw materials during manufacturing and achieves a maximum flame-spread rating of 25 with a maximum smoke development of 200 when tested to ASTM E84.
- H. Ensure countertop and backsplash is thermoformed covered as selected by Architect. Integral sink bowls are to be similar or equal to Corian model 802P of same color as countertops .
- I. Countertops Tops with Integral Bowls: Molded countertop of solid polymer material minimum thickness of 1/2" in full length pieces no less than 22-1/2" , complete with integrally molded bowl[s] of solid polymer material; edge details as indicated on Drawings. Provide with thermoformed covered backsplash and end-splashes as shown on Drawings.
- J. Bathhouse sinks (except for mop sinks in mechanical rooms-see MEP sections) are to be similar or equal to Corian model "Simplicity 881P" and ADA accessible sinks are to be similar or equal to Corian model "Accessible 5610".
- K. Wireless Charging Unit: A complete, self-contained system with a dual-mode transmitter that is compliant with PMA and WPC Qi standards.

Acceptable Product: "DuPont™ Corian® Charging Unit – Individual" by DuPont.

- L. Fabrication:
 - 1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Provide factory cutouts for plumbing fittings and bath accessories as indicated on Drawings.
 - 2. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.
 - 3. Ensure no blistering, whitening and cracking of components during forming.

4. Fabricate backsplashes from solid surfacing material with optional radius cove where counter and backsplashes meet as indicated on Drawings. Backsplashes are to be prefabricated as per the techniques in Dupont Technical Bulletin K-28235 *Thermoformed Backsplash*.
5. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint. Reinforcing strip of solid polymer material is not required when using DuPont™ Joint Adhesive 2.0.
6. Provide holes and cutouts for plumbing and bath accessories as indicated on Drawings.
7. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.
8. Finish: Ensure surfaces have uniform finish:
 - a. Matte, with a 60° gloss rating of 5 - 20.
9. Fabrication Tolerances:
 - a. Variation in Component Size: +/-1/8".
 - b. Location of Openings: +/-1/8" from indicated location.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

1. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Verify actual site dimensions and location of adjacent materials prior to commencing work.
3. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0".
4. Notify Architect in writing of any conditions which would be detrimental to installation.

B. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.02 INSTALLATION

- A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.
- B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.

-
- C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.
 - D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.
 - E. Seal between wall and components with joint sealant as specified herein and in Section 07 92 00, as applicable.
 - F. Provide thermoformed coved backsplashes and end-splashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.
 - G. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.
 - H. Coordinate connections of plumbing fixtures with [Division 22] [Mechanical]. Make plumbing connections to sinks in accordance with [Division 22] [Mechanical].

3.03 REPAIR

- A. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's "Technical Bulletins".

3.04 SITE QUALITY CONTROL

- A. Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Architect at no cost to Owner.

3.05 CLEANING

- A. Remove excess adhesive and sealant from visible surfaces.
- B. Clean surfaces in accordance with manufacturer's "Care and Maintenance Instructions".

3.06 PROTECTION

- A. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.
- B. Protect surfaces from damage until date of Substantial Completion of the Work.

END OF SECTION

SECTION 06 6500 – Simulated Wood Trim**Plastic Simulated Wood Trim****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Cellular PVC trim boards for:
 - 1. Corner boards
 - 2. Soffits
 - 3. Fascia

1.2 RELATED SECTIONS

- A. Section 06 20 00 – Finish Carpentry

1.3 REFERENCES

- A. ASTM D792 - Density and Specific Gravity of Plastics by Displacement.
- B. ASTM D570 - Water Absorption of Plastics.
- C. ASTM D638 - Tensile Properties of Plastics.
- D. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- E. ASTM D1761 - Mechanical Fasteners in Wood.
- F. ASTM D3679 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

1.4 SUBMITTALS

- A. General: Submit under provisions of Section 01 30 00 – Administrative Requirements.
- B. Product Data: Manufacture's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and methods.
 - 4. Code compliance reports.
- C. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
- D. Samples: For each product specified, two samples, minimum size 6 inches long, representing actual product, color, finish.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum of 15 years producing PVC trim products.

- B. Installer Qualifications: Installer with a minimum of 3 years experience with the installation of PVC trim products.
- C. Regulatory Requirements: Check with Local Building Code for installation requirements.
- D. Allowable Tolerances:
 - 1. Variation in component length: -0.00 / +1.00"
 - 2. Variation in component width: $\pm 1/16$ "
 - 3. Variation in component thickness: $\pm 1/16$ "
 - 4. Variation in component edge cut: $\pm 2^\circ$
 - 5. Variation in Density -0% + 10%
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designed by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by architect.
 - 3. Refinish mock-up area as required to produce acceptable work.
 - 4. Accepted mock-ups shall be comparison standard for remaining work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners.
- B. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

1.7 WARRANTY

- A. Provide manufacturer's Limited Lifetime warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

2.1 PRODUCT MANUFACTURERS

2.2

Note : The term AZEK is used for convenience in these specifications and in the drawings. Notwithstanding that other fully tested and equivalent performance, appearance, and finish products will be considered.

- A. products: AZEK[®] Trimboards manufactured by The AZEK[®] Company, located at: 888 N Keyser Ave Scranton, PA 18508
- B. Substitutions: Products or manufacturers with fully tested and rated equivalent materials
- C. Requests for substitutions will be considered if accompanied by full supporting test documentation acceptable to project manager and the architect.

D.

2.3 MATERIALS

- A. PVC: Free foam cellular PVC material with a small cell microstructure and density of .55

grams/cm³.

- Material shall have a minimum physical and performance properties specified in the following Section C.

C. Performance and physical characteristic requirements:

Property	Units	Value	ASTM Method
PHYSICAL			
Density	g/cm3	0.55	D 792
Water Absorption	%	0.15	D 570
MECHANICAL			
Tensile Strength	psi	2256	D 638
Tensile Modulus	psi	144,000	D 638
Flexural Strength	psi	3329	D 790
Flexural Modulus	psi	144,219	D 790
Nail Hold	Lbf/in of penetration	35	D 1761
ASTM Method			
Property	Units	Value	ASTM Method
Screw Hold	Lbf/in of penetration	680	D 1761
Staple Hold	Lbf/in of penetration	180	D 1761
Gardner Impact	in-lbs	103	D5420
Charpy Impact (@23°C)	ft-lbs	4.5	D256
THERMAL			
Coefficient of Linear Expansion	in/in/°F	3.2 x 10 ⁻⁵	D 696
Burning Rate	in/min	No burn when flame removed	D 635
Flame Spread Index	--	25	E 84
Heat Deflection Temp 264 psi	°F	150	D 648
Oil Canning (@140°F)	°F	Passed	D 648

2.4 SIMULATED WOOD TRIM

A. PVC Trimboard: AZEK® Trimboard with Sealed Edge, designed with a smooth finish.

1. Size:
 - a. Nominal Width:
 - 1) 6 inches

- 2) 8 inches
 - 3) 10 inches
 - 4) 12 inches
 - b. Nominal Thickness:
 - 1) 5/8 inch (5/8 inch actual size)
 - c. Length:
 - 1) 12 feet
 - 2) 18 feet
2. Finish:
 - a. Traditional/Smooth finish
Nominal Corner Size:
 - 1) 4 inches
 - 2) 6 inches
 - 3) 8 inches
 - b. Nominal Thickness:
 - 1) 5/8 inch
 - c. Length:
 - 1) 10 feet
 - 2) 20 feet

2.5 SIMULATED WOOD TRIM

A. PVC Trimboard: AZEK[®] Trimboard, designed for purpose of a roof fascia.

- a. Nominal Width:
 - 1) 4 inches
 - 2) 6 inches
 - 3) 8 inches
 - b. Nominal Thickness:
 - 1) 5/4 inch (1 inch actual size)
 - c. Length:
 - 1) 18 feet
2. Finish:
 - a. Traditional/Smooth finish
 - b.

2.6 SIMULATED WOOD TRIM FINISH

These products are to be self-finishing and for this purpose are not to be coated or painted. All joints are to be minimally visible and all adhesive used are to be non-damaging to smooth surfaced product.

2.7 ACCESSORY PRODUCTS

A. Fasteners:

1. AZEK[®] Cortex for Trim
2. Use fasteners design for wood trim and wood siding (thinner shank, blunt point, full roundhead) with AZEK[®].
3. Use only a highly durable fastener such as epoxy coated stainless steel
4. Staples, small brads and wire nails must not be used as fastening members.
5. The fasteners should be long enough to penetrate the solid wood substrate a minimum of 1 1/2".

6. Standard nail guns work well with AZEK® trim products and are acceptable.
7. Use 2 fasteners per every framing member for trimboard applications. Trimboards 12" or wider, as well as sheets, will require additional fasteners.
8. Fasteners must be installed no more than 2" from the end of each board.
9. AZEK® should be fastened into a flat, solid substrate. Fastening AZEK® into hollow or uneven areas must be avoided.
10. Pre-drilling is typically not required unless a large fastener is used or product is installed in low temperatures.
11. 3/8" and 1/2" sheet product is not intended to be ripped into trim pieces. These profiles must be glued to a substrate and mechanically fastened.

B. Adhesives:

1. Glue all AZEK® to AZEK® joints such as window surrounds, long fascia runs, etc. with AZEK® Adhesive, a cellular pvc cement, to prevent joint separation.
2. The glue joint should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
3. AZEK® Adhesive has a working time of 10 minutes and will be fully cured in 24 hours.
4. If standard pvc cements are used, keep in mind these products typically cure quickly which will result in limited working time and may reduce adhesive strength.
5. Surfaces to be glued should be smooth, clean and in complete contact with each other.
6. To bond AZEK® to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.

C. Sealants:

1. Use urethane, polyurethane or acrylic based sealants without silicone.

2.8 FINISHES

- A. AZEK products do not require paint for protection as such will remain unpainted.

PART III EXECUTION

3.01 INSTALLATION

A. Manufacturer instructions:

1. Comply with manufacturer's product catalog installation instructions and product technical bulletin instructions.

B. Cutting:

1. AZEK® products can be cut using the same tools used to cut lumber.
2. Carbide tipped blades designed to cut wood work well. Avoid fine tooth metal cutting blades.
3. Rough edges from cutting may be caused by excessive friction, poor board support, or worn or improper tooling.

C. Drilling:

1. AZEK® products can be drilled using the same tools used to drill lumber.

2. Drilling AZEK® products is similar to drilling a hardwood. Care should be taken to avoid frictional heat build-up.
3. Use standard woodworking drills. Do not use drills made for normal rigid pvc.
4. Periodic removal of AZEK® shavings from the drill hole may be necessary.

D. Milling:

1. AZEK® products can be milled using standard milling machines used to mill lumber.
2. Relief Angle 20° to 30°
3. Cutting speed to be optimized with the number of knives and feed rate.

E. Routing:

1. AZEK® products can be routed using standard router bits and the same tools used to rout lumber.
2. Carbide tipped router bits are recommended.

F. Edge Finishing:

1. Edges can be finished by sanding, grinding or filing with traditional woodworking tools.

G. Nail Location:

1. Use 2 fasteners per every framing member for trimboard applications.
2. Trimboards over 12" or wider, as well as sheets, will require additional fasteners.
3. Fasteners must be installed no more than 2" from the end of each board.

H. Thermal Expansion and Contraction:

1. AZEK® products expand and contract with changes in temperature.
2. Properly fastening AZEK® material along its entire length will minimize expansion and contraction.
3. When properly fastened, allow 1/8" per 18 foot of AZEK® product for expansion and contraction.
4. Joints between pieces of AZEK® should be glued to eliminate joint separation. When gaps are glued on a long run of AZEK®, allow expansion and contraction at ends of the run.

END OF SECTION

SECTION 07 2500 – WEATHER BARRIERS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Air Barriers for exterior walls .
- B. Asphaltic coatings on concrete foundations
- C. Roofing membrane

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-In-Place Concrete: Vapor barrier under concrete slabs on grade.

1.03 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
- B. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.05 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS**2.01 WEATHER BARRIER ASSEMBLIES**

- A. Air Barrier:
 - 1. On outside surface of CMU exterior walls use Tyvek or equivalent air barrier.

2.02 AIR BARRIER MATERIALS

- a. W.R.Grace Construction Products; Perm-A-Barrier VP: www.graceconstruction.com.
- b. Hohmann and Barnard, Inc.; Textroflash Liquid VP: www.h-b.com.
- c. W.R. Meadows, Inc.; Air-Shield LMP: www.wrmeadows.com.
- d. Dupont Tyvek

2.03 Roofing Membrane

Install one full layer of W.R. Grace Ice N' Water Shield HT membrane as per manufacturer's instructions over all exposed plywood roof sheathing prior to installation of standing seam metal roofing.

2.04 ACCESSORIES

- A. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970,

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
 - 2. Use flashing to seal to adjacent construction and to bridge joints.
- D. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches (100 mm) wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
 - 4. At head of openings, install flashing under weather barrier extending at least 2 inches (50mm) beyond face of

- jamb; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

- A. Do not cover installed weather barriers until required inspections have been completed.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 3129 CEDAR SHINGLES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wood shingles.
- B. Installation on walls and on-site finish..
- C. Associated metal flashings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Roof sheathing.
- B. Section 072500 Weather Barriers
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Edge and cap flashings.

1.03 REFERENCE STANDARDS

- A. CSSB (WEB) - [Grade Standards as posted at www.cedarbureau.org]; Cedar Shake and Shingle Bureau; current edition.
- B. CSSB (WMAN) - Exterior and Interior Wall Manual; 2011.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

PART 2 PRODUCTS**SHINGLES MANUFACTURER**

Re-squared and rebuted pre-bleached or natural untreated shingles by Maibec Inc

SPECIES:

- Eastern White Cedar – *Thuja occidentalis*
- Pre-bleached Nantucket grade shingles to be used for exterior & interior application

MANUFACTURING

- Stellite-tipped blades: minimize raised grain
- Kiln-dried to 12% - 16% moisture content

QUANTITY Area to cover: 1,000 ft² For 5" exposure, add 3% to the area to cover 1,000 ft² x 1.03 Each box covers around 25 sq. ft at 5" exposure.

Product : Clear transparent prebleached white cedar shingles

FACTORY-PRE-BLEACHING

- Every shingle is factory-coated on all sides in a controlled environment for maximum bleach

absorption and retention.

- Following the bleach application, the shingles are sent through a state of the art drier for curing. this drier cures the shingle from the inside out. The shingles are then cooled down and packaged.

INSTALLATION

Manufactured shingles feature a fastening reference line found 6 1/4" from the base of the shingle.

For the 5" required shingle exposure, fasten just below the reference line to respect the installation requirement. Each individual shingle is marked on one side. Consult manufacturers Shingles installation guides to know all installation requirements.

STAPLES • Stainless steel or aluminum staple with minimum 7/16" crown, minimum 16 gauge • Two fasteners per shingle, regardless of its width

NAILS • Stainless steel or hot dipped galvanized • Ring shank blunt tip nail with minimum 7/32" head • Two fasteners per shingle, regardless of its width
. Standard round wire shingle type, of Stainless Steel, of sufficient length to penetratethrough sheathing or 3/4 inch (19 mm) into sheathing.

EXECUTION

Install in full accordance with this specification and all applicable building Codes whichever is most stringent.

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Install in accordance with Manufacturers Instructions

Verify existing substrate before starting work.

Install using not less than two fasteners per shingle.

Install to produce straight coursing pattern with 5" weather exposure to produce double thickness.

END OF SECTION

SECTION 07 4113 - STANDING SEAM METAL ROOFING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Metal roofing, including flashing and accessories.
- B. Metal soffit panels.
- C. Preformed metal rain gutters

1.2 RELATED SECTIONS

- A. Section 07 62 00 - Sheet Metal Flashing and Trim [07 62 00] - Sheet Metal Flashing and Trim.
- B. Section 07 71 13 - Manufactured Copings [07 71 00] - Manufactured Roof Specialties: Coping and gravel stops.
- C. Section 07 90 00 - Joint Protection [07 92 00] - Joint Sealers.

1.3 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2001.
- B. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991 (Reapproved 1999).
- C. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000.
- D. ASTM E 408/C - 1371: "Standard Test Method for Total Normal Emittance of Surfaces Using inspection - Meter Techniques.
- E. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995.
- F. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems; 1995.
- G. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; 1994.
- H. UL2218: Class 4 Impact Resistance Rating.
- I. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors National Association; 1993.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors and textures.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Operation and Maintenance Data: Include methods for maintaining installed products and precautions relating to cleaning materials and methods that might be detrimental to finishes and performance.
- H. Close Out: Warranty documents specified herein.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer with documented experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.
- B. Pre-Installation Meeting: Conduct pre-installation meeting to acquaint installers of roofing and related work with project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging with identification labels intact until ready for installation.
- B. Store materials protected from exposure to harmful conditions. Store material in dry, above ground location.
 - 1. Stack pre-finished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture to run off.
 - 2. Prevent contact with material that may cause corrosion, discoloration or staining.
 - 3. Do not expose to direct sunlight or extreme heat trim material with factory applied strippable film.

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.

1.8 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard warranty document executed by authorized company official covering finish, including color, fade, chalking and film integrity.
- B. Warranty Period: 20 years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Petersen Aluminum Corp
- B. Everlast Metals
- C. Wrisco Industries
- D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 SHEET METAL ROOFING

- A. General: Factory fabricated panels; panels fabricated on site using portable roll former are prohibited.
 - 1. Performance Requirements: Provide natural color aluminum sheet metal roofing that has been manufactured, fabricated and installed to achieve the following performance without defects, damage, failure or infiltration of water.
 - a. Wind Uplift: Provide UL 580 Class 90 rated assembly.
 - b. FM: Test Requirements for Class 1 panel roofs.
 - c. Static Air Infiltration: 0.06 cu ft/min/sq ft (1.1 cu m/h/sq m) at 6.24 lb/sq ft (300 Pa) air pressure differential, maximum, when tested in accordance with ASTM E 283 or ASTM E 1680.
 - d. Water Infiltration: No evidence of water penetration at inward static air pressure differential of 12.0 lb/sq ft (575 kPa), when tested in accordance with ASTM E 331 or ASTM E 1646.
 - e. Thermal Movement: Accommodate movement expected due to ambient and surface temperature ranges likely to occur at project site.
 - 2. Panel Lengths: As indicated on drawings; panels 55 feet (16.76 m) and less fabricated in one continuous length.
 - 3. Texture: Bright brushed texture, dull matte specular gloss 25 to 35 percent at 60 degrees F (15.5 degrees C).
 - a. Finish: Factory finish: Class I, Bright Brushed Clear Anodic Finish: AA-M12C22A41 Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611. 12" x 12" Sample of material and finish to be approved by architect and project manager.
 - 4. Panel Fasteners: Non-penetrating type, as required to achieve wind uplift rating or otherwise as recommended by manufacturer.
- B. Roof Panels: Aluminum Panels; tension leveled flat panels with separate seam cover.

1. Type: High standing seam, with 2" seam height.
 2. Material: 0.040 inch aluminum, ASTM B 209 3105-H14 alloy.
 3. Panel Width: 16 inches (279 mm), center to center.
- C. Roof Panels:; tension-leveled panels with 2-5/8 inch (67 mm) high mechanically crimped standing seams.
1. Seam Style: Continuous interlock.
 2. Material: 0.040 inch (0.1mm) aluminum, ASTM B 209 3105-H14 alloy.
 3. Panel Type: natural brushed aluminum color Smooth Panel.
 4. Panel Width: 16 inch (406 mm), center to center.
 5. Sealant Bead: Factory applied sealant bead.
- D. Flashing and Trim: Manufacturer's standard flashing and trim profiles, factory formed; fabricated as recommended in SMACNA Architectural Sheet Metal Manual.
1. Material: 0.040 inch (0.1mm) aluminum, ASTM B 209 3105-H14 alloy.
 2. Finish: To match roof panels.
 3. Color: To match roof panels.

2.3 ACCESSORY MATERIALS

- A. Underlayment: ASTM D 226, Type II No. 30 asphalt saturated organic roofing felt.
- B. Plywood Deck: 3/4 inch (16 mm) nominal thickness tongue n' groove waterproof plywood; as specified in Section 06 10 00 - Rough Carpentry.
- C. Sealant: Elastomeric.
- D. Bituminous Coating: Cold-applied asphaltic mastic, free of asbestos fibers, sulfur, and other harmful impurities.
- E. Touch-Up Paint: Approved by panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrates are acceptable for roofing installation in accordance with manufacturer's instructions.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate metal roofing with other work, including but not limited to drainage, flashing and trim, deck substrates, parapets, copings, walls, and other adjoining work.
- C. Install metal roofing panels to profiles, patterns and drainage indicated, in accordance with manufacturer's instructions, and as necessary to achieve specified

performance and a leak-free Installation. Allow for structural and thermal movement.

- D. Separate dissimilar metals using bituminous coating to prevent galvanic action.
- E. Use fasteners recommended by panel manufacturer; conceal fasteners wherever possible; cover and seal exposed fasteners.
- F. Provide uniform, neat seams; provide sealant-type joint where indicated and form joints to conceal sealant.

3.3 FIELD QUALITY CONTROL

- A. Post Installation Testing: Owner reserves right to perform post installation testing of installed sheet metal roofing.
- B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.4 CLEANING

- A. Remove temporary coverings and protection of adjacent work areas.
- B. Touch-up, repair or replace damaged products.
- C. Clean in accordance with manufacturer's instructions prior to Substantial Completion.
- D. Remove construction debris from project site and legally dispose of debris.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 4243 – FIBER CEMENT SIDING

1.1 SUMMARY

A. Section Includes:

1. Exterior panelized fiber-cement cladding system and accessories.
2. Interior panelized fiber-cement cladding system and accessories.
3. Composite poly-ash siding

1.2 MANUFACTURERS

- A. Nichiha Products Ltd.
- B. James Hardie Products
- C. Boral Composite Inc.
- D. Everlast Composite Siding

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**. If needed, insert list of conference participants not mentioned in Section 13100 "Project Management and Coordination."
 1. Review methods and procedures related to composite panel installation, including manufacturer's written instructions.
 2. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 3. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect composite panels.
 4. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 5. Review temporary protection requirements for composite panel assembly during and after installation.
 6. Review procedures for repair of panels damaged after installation.
 7. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Laboratory Test Reports: For ceilings and walls, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings:
 - 1. Include details of panel dimensions, profiles, edge conditions, joints, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage, at a scale of not less than **1-1/2 inches per 12 inches (1:10)**.
- D. Samples for Initial Selection: For each type of composite panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Composite Panels: **12 inches (305 mm)** long by actual panel width. Include fasteners, closures, and other composite panel accessories. Submit custom color samples in paint manufacturer's standard size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
 - 1. Composite Manufacturer's Material Test Reports: Certified test reports showing compliance with specific performance or third-party listing documenting compliance to comparable code sections IBC 1404.16.1 and IBC 1703.5.
 - 2. Composite Panel System Fabricator's Certified System Tests Reports: Certified system test reports showing system compliance with specific performance or third-party listing documenting compliance code section. Base performance requirements on composite panel system type provided.
- C. *Field quality*-control reports.
- D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For composite panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by composite panel fabricator.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for composite panel fabrication and installation.
 - 1. Build mockup of typical composite panel assembly as indicated on Drawings including corner, soffits, supports, attachments, and accessories.
 - 2. Water-Spray Test: Conduct water-spray test of mockup of composite panel assembly, testing for water penetration in accordance with AAMA 501.2.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, composite panels, and other manufactured items so as not to be damaged or deformed. Package composite panels for protection during transportation and handling.
- B. Unload, store, handle, and erect composite panels in a manner to prevent bending, cracking, warping, twisting, and surface damage.
- C. Stack composite panels on platforms or pallets no more than two pallets high, covered with suitable weathertight and ventilated covering.
- D. Store composite panels to ensure dryness, with positive slope for drainage of water. Do not store composite panels in contact with other materials that might cause staining, denting, or other surface damage. Ensure panels are fully dry before installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of composite panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate composite panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Warranty on Panel Material: Manufacturer agrees to replace fiber cement that fails within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer agrees to repair finish or replace composite panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Finish Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.
- B. Products shall comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Products shall comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Products shall comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.
- E. Products shall comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Physical Performance: Provide composite panel system in accordance with ASTM C1186.
 1. Wet Flexural Strength: Result: **1418 psi (9777 kPa)**, Lower Limit: **1015 psi (6998 kPa)**.
 2. Water Tightness: No water droplets observed on any specimen.
 3. Freeze-Thaw: No damage or defects observed.
 4. Warm Water: No evidence of cracking, delamination, swelling, or other defects observed.
 5. Heat-Rain: No crazing, cracking, or other deleterious effects, or surface or joint changes observed in any specimen.
- G. Structural Performance: Provide composite panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E330/E330M:
 1. Design Wind Loads: Minimum **58 psf (2.78 kPa)**
 2. Deflection Limits: For wind loads, panel deflection no greater than L/120 of the span.
- H. Thermal Expansion: Maximum **0.00000318 deg F to minus 1 (0.000005724 deg C to minus 1)** when tested in accordance with ASTM E228.

- I. Air Leakage: **1.53 cfm/sq. ft. (7.78 L/s/sq. m)** or less in accordance with AAMA5094.
- J. Water Penetration under Static Pressure: No water penetration to room side of assembly when tested for 15 minutes in accordance with ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: [**2.86 lbf/sq. ft. (137 Pa)**] [**6.24 lbf/sq. ft. (300 Pa)**].
- K. Fire Propagation Characteristics: Composite panel wall assembly passes NFPA 285.
- L. Surface-Burning Characteristics: Provide composite panels that meet the following values when tested in accordance with ASTM E84:
 - 1. Flame-Spread Index: Zero.
 - 2. Smoke-Developed Index: 5.
- M. Fire Resistance: Composite panel wall assembly passes ASTM E119.
- N. Ignition Resistance: Composite panel passes NFPA 268.

2.2 COMPOSITE WALL PANELS

- A. Composite Wall Panel Systems: Provide factory-formed and -assembled, composite wall panels fabricated from a pressed, stamped, and autoclaved mix of portland cement, fly ash, silica, recycled rejects, and wood fiber bundles; formed into profile for installation method indicated. Include attachment assembly components and accessories required for weathertight system.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Nichiha Architectural Wall Panels; Architectural Wall Panels or comparable product by one of the following:
 - a. Cembrit.
 - b. MEW USA Inc.
 - c. Swisspearl.
- B. Smooth, Matte finish Grooved Composite Wall Panels <
 - 1. Panel Dimensions: Maximum uncut panel sizes to suit installation.
 - 2. Panel Thickness: **5/8 inch**.
 - 3. Panel: Factory sealed on all six sides.
 - 4. Profiles: (Nichiha or equivalent) Vintagewood spruce , matte finish or Rough sawn smoke, or vintagewood ash.
 - 5. Color: As above
 - 6. Accessory Components: Manufactured corners **with 3-1/2-inch (89-mm) returns**

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: **Class AZ50 (Class AZM150)** aluminum-zinc-alloy coating designation unless otherwise indicated. Provide Fabricator's standard sections as required for support and alignment of composite panel system.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Nichiha Architectural Wall Panels; Ultimate Horizontal Starter Track or comparable product by one of the listed alternate manufacturers.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of composite panels unless otherwise indicated.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Nichiha Architectural Wall Panels; Ultimate Clip System or comparable product by or comparable product by one of the listed alternate manufacturers.
- C. Flashing and Trim: Provide anodized aluminum flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers.
 1. Aluminum Trim: Formed with 0.040-inch (1.00-mm-) thick, coil-coated aluminum sheet facings.
 2. Color: to match panel color and finish
- D. Panel Fasteners: Provide corrosion-resistant fasteners as required for construction method used.
- E. Panel Sealants: ASTM C920, Class 35; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in composite panels and remain weathertight; and as recommended in writing by composite panel manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, composite panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by composite panel manufacturer.
 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by composite panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and assemblies penetrating composite panels to verify actual locations of penetrations relative to seam locations of composite panels before installation.

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

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with composite panel manufacturer's written instructions.

3.3 COMPOSITE PANEL INSTALLATION

- A. General: Install composite panels in accordance with Fabricator's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor composite panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving composite panels.
 - 2. Flash or seal composite panels at perimeter of all openings. Fasten flashing with manufacturer-approved fasteners. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by composite panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as composite panel work proceeds.
 - 6. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Composite Panels: Use hot-dip galvanized, ceramic-coated, or stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Attachment Assembly, General: Install attachment assembly required to support composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
 - 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
- D. Panel Installation: Attach composite wall panels to supports at locations, at spacings, and with fasteners recommended in writing by Fabricator to achieve performance requirements specified.
- E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete composite panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by composite panel Fabricator; or, if not indicated, provide types recommended in writing by composite system Fabricator.

- F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, or SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 ft. (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

- A. Site Verifications of Conditions:
1. Verify that conditions of substrate previously installed under other Sections are acceptable for composite system installation. Provide documentation indicating detrimental conditions to composite system performance.
 2. Once conditions are verified, composite system installation tolerances are as follows:
 - a. Shim and align composite wall panel units within installed tolerance of 1/4 inch in 20 ft. (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: **Owner will engage** a qualified testing agency to perform tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly **indicated on Drawings** for water penetration in accordance with AAMA 501.2.
- C. Fabricator's Field Service: Engage a factory-authorized service representative to test and inspect completed composite wall panel installation, including accessories.
- D. Composite wall panels will be considered defective if they do not pass test and inspections.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings, if any, as composite panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of composite panel installation, clean finished surfaces as recommended by composite panel manufacturer. Maintain in a clean condition during construction.
- B. After composite panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace composite panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074243

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings and counterflashings.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood nailers.
- B. Section 07 6100 - Sheet Metal Roofing.
- C. Section 08 6300 - Metal-Framed Skylights: Metal curbs.

1.03 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012)e1.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Samples: Submit two samples 6x6 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Clear anodized bright brushed Aluminum: ASTM B209 (ASTM B209M); 0.032 inch (0.8 mm) thick;
 - 1. Color: to match aluminum roofing material

2.02 ACCESSORIES

- A. Fasteners: Aluminum or Stainless Steel, with soft neoprene washers.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I ("No. 15").
- C. Slip Sheet: Rosin sized building paper.
- D. Primer: Zinc chromate type.
- E. Protective Backing Paint: Zinc molybdate alkyd.
- F. Sealant: Type specified in Section 07 9005.
- G. Plastic Cement: ASTM D4586, Type I.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

- D. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE

- A. Through-Wall Flashing in Masonry:
Material: Prefinished aluminum sheet 0.040
- B. Cedar Shingle termination and Window Head Flashings: Pre-Finished Aluminum

END OF SECTION

SECTION 07 8400 - FIRESTOPPING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Firestopping systems.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. With minimum 3 years documented experience installing work of this type.

1.04 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

PART 2 PRODUCTS**2.01 FIRESTOPPING - GENERAL REQUIREMENTS**

- A. Manufacturers:
 - 1. A/D Fire Protection Systems Inc: www.adfire.com.
 - 2. 3M Fire Protection Products: www.3m.com/firestop.
 - 3. Hilti, Inc: www.us.hilti.com.
 - 4. Nelson FireStop Products: www.nelsonfirestop.com.
 - 5. Specified Technologies, Inc: www.stifirestop.com.
- B. Firestopping: Any material meeting requirements.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.
- D. Fire Ratings: See Drawings for required systems and ratings.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.04 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9005 – JOINT SEALERS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sealants and joint backing.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping: Firestopping sealants.
- B. Section 09 2116 - Gypsum Board Assemblies: Acoustic sealant.

1.03 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2010.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with other sections referencing this section.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Gunnable and Pourable Sealants:
 - 1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
 - 2. Bostik Inc: www.bostik-us.com.
 - 3. Dow Corning Corporation: www.dowcorning.com.

4. Hilti, Inc: www.us.hilti.com.
 5. Pecora Corporation: www.pecora.com.
 6. Tremco Global Sealants: www.tremcosealants.com.
 7. Sherwin-Williams Company: www.sherwin-williams.com.
 8. W.R. Meadows, Inc: www.wrmeadows.com.
- B. Preformed Compressible Foam Sealers:
1. EMSEAL Joint Systems, Ltd: www.emseal.com.
 2. Sandell Manufacturing Company, Inc: www.sandellmfg.com.
 3. Dayton Superior Corporation: www.daytonsuperior.com.
 4. Tremco Global Sealants: www.tremcosealants.com.

2.02 SEALANTS

- A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.
1. Color: Match adjacent finished surfaces.
 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
 3. Polyurethane Products:
 - a. Pecora Corporation; DynaTrol I-XL General Purpose One Part Polyurethane Sealant: www.pecora.com.
 - b. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant: www.sherwin-williams.com.
 - c. Sherwin-Williams Company; Stampede 1H Hybrid Sealant: www.sherwin-williams.com.
 - d. Sherwin-Williams Company; Stampede 2NS Polyurethane Sealant: www.sherwin-williams.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- C. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
1. Color: Match adjacent finished surfaces.
 2. Applications: Use for:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
 3. Products:
 - a. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: www.pecora.com.
 - b. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com.
 - c. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- D. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
1. Applications: Use for:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
 - b. Joints between kitchen and bath countertops and wall surfaces.
 2. Products:
 - a. Pecora Corporation; 898NST Sanitary Silicone Sealant - Class 50: www.pecora.com.

- b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Acoustical Sealant for Concealed Locations:
 - 1. Applications: Use for concealed locations only:
 - a. Sealant bead between top stud runner and structure and between bottom stud track and floor.
 - 2. Products:
 - a. Pecora Corporation; AIS-919 Acoustical and Insulation Latex Sealant: www.pecora.com.
 - b. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: www.pecora.com.
 - c. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- F. Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component.
 - 1. Approved by manufacturer for wide joints up to 1-1/2 inches.
 - 2. Color: Match adjacent finished surfaces.
 - 3. Applications: Use for:
 - a. Expansion joints in floors.
 - 4. Products:
 - a. Pecora Corporation; NR-201 Self-Leveling Traffic and Loop Sealant: www.pecora.com.
 - b. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: www.sherwin-williams.com.
 - c. Sherwin-Williams Company; Stampede 2SL Polyurethane Sealant: www.sherwin-williams.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.

- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION

- A. Protect sealants until cured.

END OF SECTION

SECTION 08 1113 - HOLLOW METAL DOORS and FRAMES
PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Plastic laminate finished hollow steel doors and frames.
- B. Hollow Metal sliding barn doors, stainless steel rolling hardware and HM frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 09 9000 - Painting and Coating: Field FinishingC.

1.03 REFERENCE STANDARDS

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council;2009.
- B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames;2003.
- C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2011).
- D. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames;2006.
- E. NAAMM HMMA 840 - Guide Specifications for Installation andStorage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.
- F. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; currentedition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorageand fastening methods, and finishes; and one copy of referencedgrade standard.
- C. Shop Drawings: Details of each opening, showing elevations,glazing, frame profiles, and identifying location of different finishes, if any.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimumthree years documented experience.
- B. Maintain at the project site a copy of all reference standards

dealing with installation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Doors and Frames: plastic laminate surfaced hollow metal doors
 - 1. Republic Doors: www.republicdoor.com.
 - 2. Steelcraft Doors, an Allegion brand: www.allegion.com/us.
 - 3. All approved equivalent substitutions
- B. Custom fabricated hollow metal sliding barn door with rough sawn cedar wood trim on face over plastic laminate finish ,steel louvers in place of vision panel with insect screen on interior side.

(Please note : The hardware for this sliding barn door is specified in Section 087100 with stainless steel roller glides , stainless steel support rail ,locking Hardware, pull handle and floor guides)

Trim sliding barn door door with ½"x4" rough sawn cedar planks bonded to door surface as per dwg. A-10 and elevations. The wood trim-planks are to be treated with three coats of wood preservative (see Section 09900).

The wall opening to be fitted with hollow metal door frame as per details. Stainless steel door bottom door guide to be located where door sliding will occur and locking mechanism for both open and shut positionsto be provided keyed to master key system.

2.02 DOORS AND FRAMES

- A. Requirements for All Doors and Frames:
 - 1. Accessibility: Comply with ANSI/ICC A117.1.
 - 2. Door Top Closures: Flush with top of faces and edges.
 - 3. Door Edge Profile: Beveled on both edges.
 - 4. Door Texture: factory bonded plastic laminate .
 - 5. Glazed Lights: Non-removable stops on non-secure side;sizes and configurations as indicated on drawings.
 - 6. Hardware Preparation: In accordance with BHMA A156.115,with reinforcement welded in place, in addition to other requirements specified in door grade standard.
 - 7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated(galvannealed), manufacturer's standard

coating thickness.

8. Finish: Factory installed plastic laminate.

B. Steel Doors,

Steel stiffened core construction using 20 gauge stiffeners (18/16 gauge options) located 6" apart and welded 5" max OC the height of each stiffener, filled with 1 pound fiberglass batting (polystyrene option) between stiffeners

The standard stiffened core with fiberglass batting for sound absorption.

Square edge design allows for non-handed inventory control in local distribution.

Optional lock edge bevel 1/8" over 2" (~3°)

Hinge and lock edges are reinforced with continuous 16 gauge steel channel the full height of the door, welded at a max 5" OC (optional 10 gauge hinge and 14 gauge lock channel with DE Series)

Universal standard/heavy weight hinges are used with hinge fillers

Standard visible edges may be filled seamless, intermittently stitch welded and filled, or continuously welded and filled

Top flush and bottom inverted channels with 16 gauge steel channels, projection welded at a max 2-1/2" OC

Standard 14 gauge inverted top and bottom channels

16 gauge mortise or cylindrical lock reinforcements are of an integral type in accordance with ANSI A115 standards

Fire Rated Doors : Mechanical room Door D26

Grade ANSI 250.8 level physical performance level B Model 1 with laminated safety glass vision panel Fire rating : 1 hour with ULC rating label attached to door and frame.

Concealed vertical rod panic Hardware (see Section 087100)

2.03 STEEL FRAMES

A. General:

1. Comply with the requirements of grade specified for corresponding door.
 - a. ANSI A250.8 Level 1 Doors: 16 gage frames.
2. Finish: Same as for door.
3. Frames Wider than 48 Inches (1200 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

- #### B. Door Frames, Non-Fire-Rated, acoustic insulated except for door D26 to mechanical room which is a one hour fire rated door and frame.

2.04 ACCESSORY MATERIALS

- A. Glazing: Provide factory installed laminated safety glass for all vision panels with frosted laminated safety glass for vestibule doors (D03, D04)
- B. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- C. Temporary Frame Spreaders: Provide for all frames

2.05 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's instructions

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

- A. Install in accordance with the requirements of the specified door grade standard and NAAMMMHMA 840.
- B. In addition, install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Coordinate installation of hardware.

3.03 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

3.04 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 1613**FIBERGLASS LOUVER DOORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Provide Solid Core Fiberglass reinforced plastic (FRP) doors for all indoor and outdoor shower stalls.

Note : These doors are to be installed complete with all hardware and accessories as part of the scope of work of Section 102116 Plastic Shower Compartments (including installation of doors and frames for outdoor shower stalls).

The supplier of the fiberglass louver doors is to template and prepare the doors for all door stainless steel hardware or accessories to be supplied or installed by others.

- B. For locations see A-2 or Ab-2 floor plans :
Provide interior bifold doors #D-18 & D-19 (see A-2a) and bifold doors #D-10 & D-11 (see Ab-2a) for accessible bathrooms.
Provide 8 exterior doors for outdoor shower stalls for all (6) Camps.
Provide 10 interior doors for shower stalls in each of Mills Camp, A & B Camps)
Provide 8 interior doors for shower stalls in each of Main Camp, Fish Camp & Legion Town).
- C. Provide Prefinished welded reinforced fiberglass door frames (jambs only) for the outdoor showers (8 per building).
- D. Fiberglass Louvers (fixed angle) set in door panels are to be factory installed.
- E. Provide fiberglass louver bifold closet doors for the supply closets in each Camp.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Other door hardware.
- B. Section 102116 – Plastic Shower Compartments.

1.03 REFERENCE STANDARDS

- A. ANSI A250.4 - American National Standard Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings; 2011.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2010.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.
- B. Fiberglass Shower Stall Doors and hardware to be coordinated with shower stall suppliers.

C. MANUFACTURERS

Or approved substitutions as per specifications.

- A) Pella
- B) Etco
- C) Jen-Weld

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard details, installation instructions, and hardware and anchor recommendations.
- C. Shop Drawings: Show layout and profiles; include assembly methods.
 - 1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
 - 2. Indicate wall conditions, door and frame elevations, sections, materials, gages, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on Drawings to identify details and openings.
- D. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer; include detailed terms of warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in installing products of the type specified in this section with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
 - 1. Store at temperature and humidity conditions recommended by manufacturer.
 - 2. Do not use non-vented plastic or canvas shelters.
 - 3. Immediately remove wet wrappers.
- C. Store in position recommended by manufacturer, elevated minimum 4 inches (102 mm) above grade, with minimum 1/4 inches (6 mm) space between doors.

1.08 FIELD CONDITIONS

- A. Do not install doors until structure is enclosed.
- B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty covering materials and workmanship, including degradation or failure due to chemical contact.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Molded Fiberglass Doors:
 - 1. ; MWG4 - Wood Grain Texture Mold: www.chem-pruf.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOOR AND FRAME ASSEMBLIES

- A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.

1. Door and frame pre-assembled, complete with hinges and hardware; shipped with braces, spreaders, and packaging as required to prevent damage.
 - a. Sliding doors do not require frames.
2. Mechanical Durability: Tested to ANSI A250.4 Level A (1,000,000 cycles), minimum; tested with hardware and fasteners intended for use on project.
3. Screw-Holding Capacity: Tested to 900 psi (6200 kPa), minimum.
4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less; when tested in accordance with ASTM E84.
5. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
6. Clearance Between Door and Frame: 1/8 inch (3 mm), maximum.
7. Clearance Between Bottom of Door and Finished Floor: 3/4 inch (19 mm), maximum; not less than 1/4 inch (6 mm) clearance to threshold.
8. Color: to be selected from manufacturer's samples.

2.03 ACCESSORIES

- A. Glazing: Laminated safety glass, 1/4 inch (6 mm) thick, with minimum 0.030 inch (0.76 mm) thick interlayer, clear.
- B. Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Clean and prepare substrate in accordance with manufacturer's directions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.
- B. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.
- C. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

3.04 ADJUSTING

- A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.
- B. Adjust hardware for smooth and quiet operation.
- C. Adjust doors to fit snugly and close without sticking or binding.

3.05 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.06 PROTECTION

- A. Protect installed products from damage during subsequent work.

END OF SECTION

SECTION 08 3323 - WOODEN ROLL-UP DOORS Wooden Flat Slats

1.01 SUMMARY

A. Roll-Up Wooden doors

1. These doors are commercial grade, fully openable and lockable, heavy duty 8'-0" wide X 6'-0" high, crank operated, mounted to interior face of storage closet wall.

B. Related Sections: Related to this section,

1. Section 06 1000 – Rough Carpentry.
2. Section 08 3100 – Access Doors and Panels.
3. Section 08 7100 – Door Hardware.
4. Section 09 9000 – Paints and Coatings.

1.02 SUBMITTALS

A. Submit under provisions of Section 01 3000.

B. Product Data: Provide standard details and catalog data. Provide installation instructions.

C. Shop Drawings:

Furnish shop drawings for architect's approval. Include elevation, sections, and details indicating dimensions, materials, finishes, conditions for anchorage and support of each door.

D. Submit manufacturer's recommended operation, troubleshooting, and maintenance instructions.

1.03 QUALITY ASSURANCE

A. Manufacturer: Rolling doors shall be manufactured by a firm with a minimum of five years' experience.

B. Single-Source Responsibility: Manufacturer shall provide doors, tracks, and accessories for each door.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packaging supplied by manufacturer with intact labels. Store materials away from harmful environmental conditions and construction.

1.05 WARRANTY

- A. Door Warranty: Provide a two-year written warranty from date of installation against deficiencies due to defects in materials or workmanship. Installer agrees to repair or replace any defects in materials or workmanship.

PART 2 –MANUFACTURERS AND PRODUCTS

1.01 Manufacturers:

Acceptable manufacturers include Overhead Door Corporation, Wooden Counter Shutter, Woodfold Corporation, and approved equivalents.

2.02 MATERIALS

A. Door Curtain:

1. Slats: Constructed of interlocking, 1-3/4" x3/4" thick wooden slats held together by cables that run through vertical holes drilled in each slat at 22" or 24" intervals.
2. Bottom Bar: Bottom Bar of curtain assembly is constructed of solid wood 5-5/8" x 1-5/8" thick with a deadbolt lock installed at both jambs with Cylinder locks compatible with project hardware specifications.
3. Cable: Plastic coated aviation cable. Diameter 3/32" with a tensile strength of 480 pounds. The cable is anchored to the bottom bar with a compression spring that applies tension to the cable. The other end of the cable is securely fastened to the top slat of the curtain.

B. Guides:

1. Guides: Constructed of anodized aluminum. Extruded 1/8" material thickness and measure 1-1/4" x 1-1/2" for between jamb and 2" x 3" thick for mounting to face of wall.

C. Door Support Brackets and Mounting Plates:

1. Bracket plates: Material fabricated from 1/8" or [3/16"] thick steel.

D. Counterbalance Assembly: Torsion

1. Counterbalance assembly: Spring is housed in either a 2" or [4"] diameter pipe. Springs are helical torsion and are designed to withstand a 25% overload.

E. Hood:

1. Hood: The coil enclosure hood is constructed of brake-bent anodized aluminum sheets.

2. Shape: Square

F. Locking:

1. Thumb turn locks: Placed on both sides, located at coil side.
2. Best Core Key Cylinders: Compatible with project Hardware specs.

2.03 OPERATION:

- A. Opening/Closing: Manual hand crank operator.
- B. Manual hand crank:

1. Provide crank hoist operator including crank gear box, steel crank drive shaft and geared reduction unit. Fabricate gear box to completely enclose operating mechanism and be completely oil-tight.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that dimensions are correct and project conditions are in accordance with manufacturer's installation instructions; do not proceed with fabrication until unacceptable conditions have been corrected.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Ensure that units are installed plumb and true, free of warp or twist, and within tolerances specified by manufacturer for smooth operation.

3.05 ADJUST AND CLEAN

- A. Clean units in accordance with manufacturer's instructions.
- B. Restore slight blemishes in finishes in accordance with manufacturer's instructions to match original finish. Remove and provide new units where repairs are not acceptable to the Architect.

END OF SECTION 08 3223

SECTION 08 6000 - ALUMINUM FRAMED SKYLIGHTS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Furnish all labor, material, plant and services required to complete fabrication and shipment of skylights as specified herein.
- B. Work is limited to skylight system only and includes the following.
 - 1. Thermal aluminum vinyl frame system.
 - 2. Glazing and glazing gaskets.
 - 3. installation by factory approved contractor with site supervision as required.

1.2 RELATED SECTIONS

- A. Section 07 5000 – Metal Roofing.
- B. Section 07 6000 - Flashing and Sheet Metal.
- C. Section 07 9126 - Joint Fillers.

1.3 REFERENCES

- A. Aluminum Association (AA) M12C22A41 - Anodized Plus Finish.
- B. Aluminum Association (AA) M12C22A32/A34 - Color anodized: Class II, Color Anodic Finish.
- C. American Architectural Manufacturer's Association (AAMA) 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- D. American Architectural Manufacturer's Association (AAMA) 605.2 - Voluntary Specification for High Performance Organic Coatings.
- E. Architectural Aluminum Manufacturers Association (AAMA) 612 - Voluntary Specifications and Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Coatings on Architectural Aluminum, for Finishes such as Anodized Plus.
- F. American Society for Testing and Materials (ASTM) B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- G. American Society for Testing and Materials (ASTM) E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- H. American Society for Testing and Materials (ASTM) E774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.
- I. AWS Structural Welding Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. [Product Data]: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Indicate materials, finishes and installation procedures recommended by manufacturer.
 - 4. Indicate compliance with specified design criteria.
 - 5. Indicate compliance with performance requirements.
 - 6. Include product specific glazing details.
- C. Shop Drawings:
 - 1. Indicate material types, gauges and finishes, fabrication details and installation details.
 - 2. Show glazing types, methods of attachment and thermal movement provisions.
- D. Indicate compliance with specified structural design criteria.
 - 1. Submitted design calculations shall bear seal of a professional engineer licensed in the State in which the skylight is to be installed.
 - 2. Certify that engineer has reviewed shop drawings.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Skylight manufacturer shall have a minimum of five years experience in skylight manufacturing, qualified by having performed similar work and having experienced workmen to perform work of type required by contract documents and licensed where appropriate.
- B. Installer Qualifications:
 - 1. Installer shall be trained and approved by manufacturer.
 - 2. Installer shall have five years experience with skylight type, size and complexity.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-

based materials, in accordance with requirements of local authorities having jurisdiction.

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.

1.8 WARRANTY

- A. Skylights are guaranteed for a period of 5 years from date of purchase against defects in materials or workmanship.
- B. Custom skylight systems are guaranteed for a period of 2 years from date of installation against leakage and defects in materials or workmanship.
- C. The guarantee is limited to repair or replacement, at manufacturer's discretion, and does not cover freight, installation, or consequential damages.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - Artistic Skylight Domes Ltd.,
 - Velux USA
 - Or approved equivalent
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 SKYLIGHT PERFORMANCE

- A. Load:
 - 1. Deflection of framing members shall not exceed $L/180$ or 1 inch (25 mm) whichever is less.
 - 2. Acrylic unit skylights shall meet the requirements of uniform load test ASTM E330 that requires glazing to withstand a positive and negative test pressure of 60 psf.
- B. Air Infiltration:
 - 1. Acrylic unit skylights shall meet the requirements of ASTM E283 that allows a maximum air infiltration of 0.06 cfm (.0017 cu. m/m) of the total glazed surface area.
- C. Water Infiltration:
 - 1. Acrylic unit skylights shall meet the requirements of ASTM E547/E331 that allows for no water infiltration at a test pressure of 12 psf (571 Pa).

2.3 CURB MOUNT SKYLIGHTS

- A. Product: Aluminum Curb Frame.
 - 1. The skylight shall consist of corrosion resistant extruded aluminum curb frame, 6063-T5 alloy, with heliarc welded corners. The skylight curb frame shall have an extruded rigid vinyl thermal break to prevent thermal transfer to interior of building which incorporates a high capacity 8 degree sloped condensation gutter with drainage to exterior, and co-extruded rubber draft seal. Retaining cap frame shall be extruded, mill finish or baked enamel finish, 6063-T5 aluminum alloy with heliarc welded corners.
 - 2. Glazing shall consist of sealed double acrylic domes.

2.4 MODEL SIZE

- A. Model Size: 2'-0" x 4'-0" nominal or :
 - 1. Size 2852, 22.25 inches by 46.25 inches (565 by 1175 mm).

2.5 MATERIAL

- A. Non-operable Framing systems shall be extruded aluminum, 6063-T5 alloy, with extruded rigid vinyl thermal break.
- B. Exposed aluminum surfaces shall be bright brushed clear anodized finish to match color of standing seam roofing.
- C. Sealants, as designated on drawings, shall be neutral cure architectural grade silicone.
- D. Fasteners shall be stainless steel or cadmium plated steel. Exposed fasteners to match specified color of adjacent aluminum.
- E. Gaskets to be continuous co-extruded vinyl, neoprene, EPDM, or rubber held with constant pressure.
- F. Glazing shall be:
 - 1. Plastic glazed units to be double glazed acrylic of thickness and colors as required by design criteria.
 - a. Clear.

2.6 FABRICATION

- A. Skylights shall be factory assembled and shipped as such. Work which cannot be permanently assembled will be shipped in pre-assembled sections to minimize field assembly.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Installer shall inspect area to receive skylights to determine that the conditions are in accordance with shop drawings and specifications. Any variance shall be recorded in writing and corrections made before beginning installation.
- B. Installation shall be in strict accordance with these specifications and the manufacturers shop drawings and installation instructions.
- C. All materials provided by installer shall be in accordance with those shown on the shop drawings.

3.4 PROTECTION

- A. Installer shall remove all labels and protective packaging from components and shall leave the installation free of all heavy construction dirt and sealant smears.
- B. Final cleaning and physical protection of all installed materials shall be performed by the general contractor.
- C. Protect installed products until completion of project.
- D. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 086300 - METAL-FRAMED SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes skylights with metal framing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Submit data and text for sustainable qualities of adhesives and sealants.
- C. Shop Drawings: For metal-framed skylights. Include plans, elevations, sections, and attachment details.
- D. Samples: For each type of exposed finish required, in manufacturer's standard sizes.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Field quality-control reports.
- C. Sample warranties.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of metal-framed skylights that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: two years from date of Substantial Completion..
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 - 1. Warranty Period: five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Loads: As per RI Building Code
- B. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Glazing Plane: Limited to **[edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite]** **[1/175 of clear span for spans up to 13 feet 6 inches (4.1 m)]** or an amount that restricts edge deflection of individual glazing lites to **3/4 inch (19.1 mm)**, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to **[L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller]** Usually retain "Lateral Bracing of Framing Members"
- C. Lateral Bracing of Framing Members: Compression flanges of flexural members are laterally braced by cross members with minimum depth equal to 50 percent of flexural member that is braced. Glazing does not provide lateral support.
- D. Structural-Test Performance: Metal-framed skylights tested in accordance with ASTM E330, as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified deflection limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding **[0.2]** percent of span.
 3. Test Durations: As required by design wind velocity, but not less than **10** seconds.
- E. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for local Wind Zone basic protection.
1. Large-Missile Test: For glazing located within **[30 feet (9.1 m)]** of grade.
 2. Small-Missile Test: For glazing located between **30 feet (9.1 m)** and **60 feet (18.3 m)** above grade.
- F. Air Leakage: Metal-framed skylights with maximum air leakage through fixed glazing and framing areas of **[0.06 cfm/sq. ft. (0.03 L/s per sq. m)]** of when tested in accordance with ASTM E283 at a minimum static-air-pressure difference of **[1.57 lbf/sq. ft. (75 Pa)]** Usually retain "Water Penetration under Static Pressure" Paragraph below. For water-penetration under static pressure tests, air-pressure difference of 20 percent of wind-load design pressure provides satisfactory performance in most parts of the U.S. Locations where high winds and heavy rains frequently occur simultaneously require higher test-pressure differences. Lower test-pressure differences are acceptable for some locations. Revise paragraph to suit Project.
- G. Water Penetration under Static Pressure: Metal-framed skylights that do not evidence water penetration through fixed glazing and framing areas when tested in accordance with ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than **[6.24 lbf/sq. ft. (300 Pa)]**

- H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: [120 deg F), ambient; 180 deg F material surfaces
- I. Condensation Resistance: Metal-framed skylights with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than [45] when tested in accordance with AAMA 1503.
 - 1. Haze Factor: Greater than 90 percent when tested in accordance with ASTM D1003.
- J. Energy Performance: Provide metal-framed skylights with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below.
 - 1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas have U-factor of not more than [**0.80 Btu/sq. ft. x h x deg F (4.54 W/sq. m x K)**] as determined in accordance with NFRC 100.
 - 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas have a solar heat gain coefficient of no greater than [**0.6**] [**0.7**] as determined in accordance with NFRC 200.

2.2 METAL-FRAMED SKYLIGHTS

- A. Metal-Framed Non-Operable Skylights: Acrylic glazed skylight assemblies supported by aluminum framing.
- B. Aluminum Framing Systems: Manufacturer's standard extruded-anodized aluminum members of thickness required and reinforced as required to support imposed loads.
- C. Aluminum: Alloy and temper as recommended in writing by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: **ASTM B209 (ASTM B209M)**.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: **ASTM B221**
 - 3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
 - 4. Structural Profiles: ASTM B308/B308M.
- D. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
- E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning skylight components.
- F. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.
- G. Concealed Flashing: Manufacturer's standard, corrosion-resistant, non-staining, nonbleeding flashing compatible with adjacent materials.
- H. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than [**0.030 inch**] thick.

- I. Corrosion-Resistant Coating: Cold-applied asphalt mastic.

2.3 GLAZING

- A. Glazing: Acrylic sheet As specified in Section 08 8400 "Plastic Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.
- D. Glazing Sealants: As recommended in writing by manufacturer.
- E. Fabricate aluminum components that, when assembled, have the following characteristics:
 1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
- F. Fabricate aluminum sill closures with weep holes and for installation as continuous component.
- G. Reinforce aluminum components as required to receive fastener threads.
- H. Factory-Glazed, Metal-Framed Skylights: Acrylic glazing sized for design loads as per code and to Comply with requirements in **Section 088400 "Plastic Glazing."**
- I. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.4 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm] to match color of metal roofing.
 1. **gloss**.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written instructions.
 1. Do not install damaged components.
 2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
 3. Rigidly secure nonmovement joints.

4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 5. Seal joints watertight unless otherwise indicated.
- B. Metal Protection: Where aluminum will contact dissimilar materials, protect against galvanic action by painting contact surfaces with protective coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
- D. Install components to drain water passing joints, and moisture migrating within skylight to exterior.
- E. Install components plumb and true in alignment with established lines and elevations.
- F. Glazing: Install glazing as specified in [Section 088400 "Plastic Glazing."]
- G. Erection Tolerances: Install metal-framed skylights to comply with the following maximum tolerances:
1. Alignment: Limit offset from true alignment to **1/32 inch (0.8 mm)** where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than **3 inches (76 mm)**; otherwise, limit offset to **1/8 inch (3.2 mm)**.
 2. Location and Plane: Limit variation from true location and plane to **1/8 inch in 12 feet (3.2 mm in 3.7 m)** but no greater than **1/2 inch (13 mm)** over total length.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Roofing Contractor to **Engage** a qualified testing agency to perform tests and inspections..
1. Water-Spray Test: Before installation of interior finishes has begun, skylights are tested in accordance with AAMA 501.2 and do not evidence water penetration.
- B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

END OF SECTION 086300

SECTION 08 7100 - DOOR HARDWARE**PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes
 - 1. Furnishing and installation of all mechanical finish hardware necessary for all doors, and hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware.
 - 2. The hardware required for the fiberglass shower doors shall be purchased and installed by the shower stall manufacturer and coordinated with the door manufacturer for templating and preliminary preparation.
- B. Related Sections
 - 1. Division 6 Section - Finish Carpentry
 - 2. Division 8 Section - Hollow Metal Doors and Frames
 - 3. Division 8 Section – Fiberglass Doors
 - 4. Division 083313 -Wood overhead coiling doors
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere :
 - 1. Windows
 - 2. Complete shower stall hardware and toilet stall hardware is included with the work of those sections as are bathroom accessories including coat hooks and curtain rods unless note otherwise.

1.03 REFERENCES

- A. Applicable state and local building codes and standards.
- B. FIRE/LIFE SAFETY

1. NFPA - National Fire Protection Association
 - a. NFPA 80 - Standard for Fire Doors
 - b. NFPA 101 - Life Safety Code
 - c. NFPA 105 - Smoke and Draft Control Door Assemblies
- C. UL - Underwriters Laboratories
 1. UL 1784 - Air Leakage Tests of Door Assemblies
 2. UL 305 - Panic Hardware
- D. Accessibility
 1. ADA - Americans with Disabilities Act
 2. Rhode Island Accessibility Code – SBC-14, 15, 16
- E. DHI - Door and Hardware Institute
 1. Sequence and Format for the Hardware Schedule
 2. Recommended Locations for Builders Hardware
- F. ANSI - American National Standards Institute
 1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 requirements. Advise architect within the submittal package of incompatibility or issues.
- B. Catalog Cuts: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Final Hardware Schedule Content: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, Include the following information:
 1. Door Index; include door number, heading number, and Architects hardware set number.
 2. Opening Lock Function Spreadsheet; list locking device and function for each opening.

3. Type, style, function, size, and finish of each hardware item.
 4. Name and manufacturer of each item.
 5. Fastenings and other pertinent information.
 6. Location of each hardware set cross-referenced to indications on Drawings.
 7. Explanation of all abbreviations, symbols, and codes contained in schedule.
 8. Mounting locations for hardware.
 9. Door and frame sizes and materials.
 10. Name and phone number for the local manufacturer's representative for each product.
- D. Key Schedule: After a keying meeting between representatives of the Owner, Architect, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled.
- E. Utilize ANSI A156.28 "Recommended Practices for Keying Systems" as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system.
- F. Samples: If requested by the Architect, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.
1. Samples will be returned to the supplier. Units that are acceptable to the Architect may, after check of operations, be incorporated into the Work, within limitations of key coordination requirements.
- G. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware..
- H. Operations and Maintenance Data: Provide in accordance with Division 1 and include the following:
1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 2. Catalog pages for each product.

3. Name, address, and phone number of local representative for each manufacturer.
 4. Parts list for each product.
 5. Copy of final approved hardware schedule, edited to reflect "As installed."
 6. Copy of final keying schedule.
 7. As installed "Wiring Diagrams" for each opening connected to power, both low voltage and 110 volts.
 8. One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
 9. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.
- I. Certificates of Compliance: Upon request of Architect or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.

1.05 QUALITY ASSURANCE

- A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Division 1 requirements. If proposing a substitute product, submit product data for the proposed item with product data for the specified item and indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability.
1. Items specified as "no substitute" shall be provided exactly as listed.
 2. Items listed with no substitute manufacturers listed have been requested by the Owner or Architect to match existing for continuity and/or future performance and maintenance standards or because there is no known equal product.
 3. If no other products are listed in a category, then "no substitute" is implied.
- B. Supplier Qualifications: A recognized architectural hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.
- C. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, exit devices, closers, etc.) from a single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Tag each item or package separately with identification related to the final hardware schedule, and include installation instructions with each item or package.
- B. Each article of hardware shall be individually packaged in manufacturer's original packaging.
- C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.
- E. Hardware shall be handled in a manner to avoid damage, marring, or scratching. Irregularities that occur to the hardware after it has been delivered to the Project shall be corrected, replaced, or repaired by the Contractor. Hardware shall be protected against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. No direct shipments will be allowed unless approved by the Contractor.

1.07 WARRANTY

- A. Provide manufacturer's warranties as specified in Division 1 and as follows:
 - 1. Closers: 10 years.
 - 2. Exit Devices: 3 years,.
 - 3. Locksets: 3 years,
 - 4. All Other hardware: 3 years.
- B. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

2.01 MANUFACTURERS

- A. The Awarding Authority has determined that certain products should be selected for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute" (NO OTHER PRODUCTS WILL BE CONSIDERED FOR THOSE LISTED IN PROJECTS DOCUMENTS.)

- B. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.05.A.
 - 1. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.
 - 2. All hardware to be finish : US32d satin stainless steel unless otherwise indicated. .

C.

Item	Scheduled Manufacturer	Acceptable Substitute
Hinges	Ives (IVE)	Hager, Stanley
Flush Bolts	Ives (IVE)	Burns, Rockwood
Locksets	Falcon (FAL)	Best, Sargent
Exit Devices	Falcon (FAL)	Precision, Sargent
Roller Latches	Ives (IVE)	Burns, Rockwood
Door Closers	FAL (FAL)	Norton, Sargent
Door Trim	Ives (IVE)	Burns, Rockwood
Protection Plates	Ives (IVE)	Burns, Rockwood
Overhead Stops	Glynn-Johnson (GLY)	Rixson, Sargent
Stops & Holders	Ives (IVE)	Burns, Rockwood
Silencers	Ives (IVE)	Burns, Rockwood
Cylinders & Keying	Falcon (FAL)	Best, Sargent
Sliding Barn Door	HME stainless steel	Pemko/Henderson (HEN)Or Equal
Thresholds	Assa Abloy	

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

2.02 MATERIALS

A. Fasteners

- 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
- 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
- 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners.
- 4. Hardware shall be installed with the fasteners provided by the hardware manufacturer of US32d satin stainless steel unless otherwise indicated. .

B. Hinges

- 1. Provide five-knuckle, ball bearing hinges of type, material, and height as outlined

in the following guide for this specification:

- a. 1-3/4 inch thick doors, up to and including 48 inches wide: Exterior or interior: heavy weight, bronze/stainless steel, 4-1/2 inches high
- b. 2 inches or thicker doors:
Exterior or Interior : heavy weight, bronze/stainless steel, 5 inches high
2. Provide three hinges per door leaf for doors 96 inches or less in height.
3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Stainless Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
4. . Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.
5. Acceptable manufacturers and/or products: Ives 5BB series, Hager BB series, Stanley FBB Series.

C. Cylindrical Locks - Grade 1

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1. Cylinders: Refer to 2.04 KEYING.
2. Provide locks with a standard 2-3/4 inches backset, unless noted otherwise, with a 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
3. Provide locksets with a separate anti-rotation through-bolts and shall have no exposed screws. Levers shall operate independently and shall have two external return spring cassettes mounted under roses to prevent lever sag.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Lever trim shall be solid cast levers without plastic inserts, and 4" square wrought roses on both sides. Locksets shall be thru-bolted to assure proper alignment.
 - a. Lever design shall be Falcon QUA-Quantum.
6. Acceptable manufacturers and/or products: Falcon T series, Best 93K series, Sargent 10-Line.

D. Doors D09 and D11 (access and egress)

1. Exiting swing doors to bathhouses/vestibules
 - 4" x 12" Stainless steel push plates on egress sides of doors,
 - Automatic heavy-duty surface mounted door closure at head of door
 - Automatic door opener for barrier free access, push-plate activated, mounted on exterior wall face at doorway
 - 4" x12" Pull handles and plates on access sides
 - Provide Stainless steel hold-open device at base of door leaf and door stop
 - Provide Assa Abloy's "Adams Rite" Heavy Duty Deadbolt #2331, with 1 5/32" diameter mortise cylinder or approved equivalent supplied to match other cylinders and keying on the project.

 2. 3 pairs of hinges each leaf, kickplates both sides of doors, surface mounted automatic door closers.
 - Provide barrier free stainless steel ADA thresholds and automatic lighting control switch for bathhouse lights.
 - Provide clearly visible signage to indicate direction of traffic, "IN" on access sides, "OUT" on egress sides. (See signage specifications.)
 - All vision panels to be clear laminated safety glazing.

 - E. Doors D08 and D09 (Exiting doors for egress)
 1. Exit Doors from public part of bathhouse - Bar Type push bars with concealed vertical stainless steel throw bars within hollow metal door- Required for Exiting doors for egress only . Exterior side of door to have lockable access lockset allowing free public exit when locked. Metal kickplates to be mounted on both sides of door, surface mounted automatic door closers., 3 pair of hinges, door stops and barrier free ADA threshold.
 2. Automatic door opener for barrier free egress, push-plate activated, mounted on interior wall face at doorway.

 - F. Door D07
 1. Access door to Mechanical Room to have one hour fire rated exterior lockable service access lever lockset and interior egress push-bar with concealed throw bar within hollow metal door, metal kickplates both sides of door, 3 pair of hinges, automatic surface mounted door closure, door stops and bottom sweeps and ADA threshold
 2. Vision panel to be clear laminated safety glazing.

 - G. Door D17 and D18
 1. Supply Closets - Cedar slat Rollup doors with heavy duty st.stl.track and nylon guide bearings as per . Deadbolt, door pulls, astragal, bifold hinges and 3 pair per leaf concealed hinges, kickplates. Door stops, bottom sweeps and automatic operating switch for overhead light fixture.
- General :
1. All visible door hardware finish will be smooth-polished stainless steel.
 2. Concealed Vertical Rod devices shall have 5/8 inch thrown latch bolts.
 3. Mechanism case shall sit flush on the inside face of all flush doors
 4. Provide manufacturer's standard strikes.
 5. Provide exit devices cut to door width and height. Locate ADA automatic exit devices at a height recommended by the exit device manufacturer and ADA requirements, allowable by governing building codes.

6. Exit devices meeting this specification: Falcon XX series, Precision Reliant series, and Sargent 90 Series with guarded latch.

H. Door Closers

1. Provide surface mounted door closers as indicated, certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
2. Door closers shall have fully hydraulic, full rack and pinion action with an aluminum cylinder.
3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to 10 degrees F.
4. Spring power shall be continuously adjustable and allow for reduced opening force as required by ADA accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
5. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
6. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.
7. Door closers meeting this specification: Falcon, Norton, Sargent.

I. Protection Plates

1. Provide kick plates minimum of 0.050 inch thick on all hollow metal doors, both sides of doors. Install with permanent bond epoxy adhesive to unpainted door surface.
2.
 - a. Kick Plates – 8 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs
3. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

J. Overhead Stops and Overhead Stop/holders

1. Provide heavy duty concealed mounted overhead stop or overhead stop/holder as specified for exterior and interior vestibule doors.
2. Where overhead holders are specified provide positive type at doors with a closer.
3. Acceptable manufacturers and/or products: Glynn-Johnson, Rixson, Sargent.

K. Door Stops and Holders and Thresholds

1. Provide door stops for all doors in accordance with the following requirements:

- a. Provide wall stops wherever possible.
 - b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
 - c. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.
 - d. Provide low-profile ADA compliant Saddle style aluminum thresholds at all
 - e. exterior doorways and at vestibule to bathroom doors, full width of the adjacent walls (10") . The thresholds are not to exceed a maximum height of 1/4" above finished grade or ADA maximum and are to have a vertical edge to act as a pour stop for the 3/16" poured resinous flooring.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood ASSA-Abloy.

L. Silencers

1. Provide "Push-in" type silencers for each hollow metal frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

2.03 FINISHES

- A. Finish of all hardware shall be smooth polished stainless steel.

2.04 KEYING

- A. Provide a new key system from the same manufacturer as the locks conforming to the

Following requirements:

1. Provide removable core cylinders at all keyed devices, locksets, exit device trim. Provide construction cores with construction master keying for use during construction. The hardware supplier, accompanied by the Owner or Owner's agent, shall install permanent keyed cores upon completion of the project. The temporary construction cores are to be returned to the hardware supplier.
2. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor as directed by the Owner. Provide owner with a copy of the bitting list, return receipt requested.
3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Architect to review keying requirements and lock functions prior to ordering finish hardware. Submit a keying schedule to Architect for approval.
4. Allow for two-hundred changes under the master key. All cylinders shall be keyed in alike or different sets as noted by their respective key set number. Do not use the letter "I" or "O" in the master key set.
5. Provide keys as follows

- a. Ten master keys for each set.
 - b. Three keys per core and/or cylinder.
 - c. Two construction core control keys
 - d. Two permanent core control keys
6. Visual key control:
- a. Keys shall be stamped with their respective key set number and stamped "DO NOT DUPLICATE".
 - b. Master keys shall be stamped with their respective key set letters.
 - c. Do not stamp any keys with the factory key change number.
 - d. Do not stamp any cores with key set on face (front) of Core. Stamp on back or side of cores so not to be visible when core is in cylinder.
7. Deliver master keys, change keys, and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.
8. Approved products: Falcon, Best, Schlage, Sargent.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

3.02 INSTALLATION

- A. Coordination:
 1. Prior to installation of hardware, schedule and hold a meeting for the purpose of instructing installers on proper installation and adjustment of finish hardware. Representatives of locks, exit devices, closers, automatic operators, and electrified hardware shall conduct training; provide at least 10 days notice to representatives. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.
- B. Hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware.
- C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- D. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
- E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
- F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

- G. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

3.03 ADJUSTING and CLEANING

- A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
- B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

3.04 FIELD QUALITY CONTROL

- A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of locks, exit devices, closer, and any electrified hardware, shall perform the following work:
 1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
 2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
 3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
 4. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.
 5. At completion of project, a qualified factory representative for the manufacturers of locksets, closer, exit devices, and access control products shall arrange and hold a training session to instruct the Owner's personnel on the proper maintenance, adjustment, and/or operation of their respective products. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

3.05 PROTECTION

- A. Provide for the proper protection of complete items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.06 HARDWARE SCHEDULE

- A. The door supplier is to provide the complete hardware schedule based on this specification guidelines and building plans, and to include in his bid price the specified hardware for each door to comply with requirements of Section "Finish Hardware," as indicated in door schedule and drawing A-10, and in the specified schedule of hardware sets.

- B. It is intended that the following schedule includes complete items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the schedule is to be rectified and the missing item included in the work with the approval of the project manager.

END OF Section 08 7100

SECTION 09 20 00 - WALL ACCESS PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Access Panels.

1.2 RELATED SECTIONS

- a. 102113 – Plastic toilet compartments
- b. 102116-Plastic Shower Compartments
- c. 220000 – plumbing
- d. 23000- HVAC
- e. 062000 -Finish Carpentry

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Indicate locations, type, overall dimensions, profile and joint treatment.
- D. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
 - 1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
 - 2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer regularly engaged in the design and fabrication of access panel products or plastic shower /toilet compartments
- B. Installer Qualifications: Installer regularly engaged and experienced in the installation of access panel fabrications.

- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover on a level surface protected from weather, moisture and damage. Product shall be appropriately stored until installation
- C. Handling: Handle products to prevent damage to finished surfaces.

1.6 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.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Bauco Corporation or approved equal
- B. Manufacturer or supplier of plastic shower/toilet compartments.
- C. Substitutions: approved equals to be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

Application

- Designed to provide access in HDPE (high density polyethylene) walls, while maintaining an invisible, architecturally pleasing appearance with concealed or dissimulated frames.

Specifications

- Frameless Door panel is to be one layer 1/2" HDPE
- Concealed stainless steel hinge
- Stainless steel access device with keyed lockable cylinder mechanism.

Internal Frame Material: concealed anodized Aluminum extrusion .064 thickness, color to match surrounding panels

Frameless Door: 1/2" HDPE panel to match surrounding partition drywall inserted into door panel . 1/4" tolerance gap.

Hinge: concealed non corroding two point pin hinge

Sizes : 12" x12" or 18" x 18" as required.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify field dimensions before beginning installation.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install temporary and permanent supplementary supports as required for proper installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install plumb and true to line. Use shims where necessary.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTOPM 09 5426 - WOOD PLANK CEILINGS**PART 1 – GENERAL****1.1 SUMMARY**

- A. Section includes:
 - 1. Concealed suspension system for Wood Plank ceilingS.
 - 2. Wood plank linear ceiling panels for concealed suspension system.
 - 3. Trim and accessories.
 - 4. Seismic restraints for suspended ceiling system.

1.2 RELATED WORK IN OTHER SECTIONS:

- A. Division 1 – “General Conditions” for substitution requests, submittals, etc.
- C. Division 13 – “Integrated Assemblies.”
- D. Division 15 – “Mechanical” for work to be coordinated with ceiling.
- E. Division 16 – “Electrical” for light fixture coordination.

1.3 REFERENCES

- A. ASTM A 641: Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire; 1992.
- B. ASTM C 635: Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- D. ASTM C 636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1992.
- E. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials; 1991.
- F. ASTM E 580: Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 1991.
- G. AWI (QSI): Architectural Woodwork Quality Standards Illustrated; 2003.
- H. CISCA: Ceiling Systems Handbook.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturers other than those listed in Paragraph 2.1 are required to submit for approval prior to bidding per Section One.
- B. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed open joint wood plank ceilings similar in species, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- C. Inspection: All work must pass inspection and approval of architect and project manager, as well as the local codes and regulations or authorities having jurisdiction.
- D. Single-Source Responsibility for Wood Ceiling System: Obtain each type of Wood Plank ceiling panels from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.

- E. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying project.
- F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.5 SUBMITTALS

- A. General: Submit each item in this Section according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For each type of product specified.
- C. Samples: For verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the range of variations expected.
 - 1. 12" x 12" samples of each plank type, pattern, and color with suspension clips and spacing as specified.

1.6 SHOP DRAWINGS & COORDINATION WITH OTHER TRADES

- A. Shop Drawings: Provide Shop Drawings/Coordination Drawings for all ceilings, which should include RCP and product details. Coordinate Wood Plank ceiling panels layout and installation of wood panels and suspension system components with other construction elements that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, partition assemblies and all perimeter conditions.

1.7 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install wood panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery & Unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.
- B. Acclimatization: Before installing wood planks or panels, permit them to reach room temperature and a stabilized moisture content not to exceed 15% (at least 72 hours) per AWI standards.
- C. Handling: Handle Wood Plank ceiling panels carefully to avoid chipping edges or damaging units in any way.
- D. Protection:
 - 1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary

precautions and wear appropriate protective equipment as needed. Read related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner, and manufacturer will rely on contractor's performance in such regard.

2. Existing completed work: Protect completed work above suspension system from damage during installation of suspension system components.

1.9 EXTRA MATERIALS/WARRANTIES

- A. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 1. Wood Plank ceiling panels: Furnish quantity of full-size units equal to 1.0 percent of amount installed.
 2. Suspension System Components: Furnish quantity of each component equal to 1.0 percent of amount installed.
- B. Warranties: Provide owner with a (1) year warranty for material and workmanship on all installed products.
 1. Manufacturers: All materials, wood ceiling and grid, shall be warranted for (1) one year for material and workmanship.
 2. Installer: All work shall be warranted for (1) year from final acceptance of completed work.

PART 2 – PRODUCTS

2.1 WOOD PLANK CEILINGS AND SUSPENSION SYSTEM

- A. General: The following manufacturers are acceptable :
 1. Ceiling Systems Inc. (www.csi-wood.com)
 2. Hunter Douglas (USA)
 3. Certainteed Ceilings
 5. Norton Wood Panelized Ceiling Systems.
- B. Or equal, as prior approved by architect.

2.2 WOOD PLANK CEILINGS

- A. Basis of Design: Removable wood planks installed by individual clip system or in panels to aluminum carrier channels in a suspended ceiling system. Ceiling plans call for $\frac{3}{4}$ " x 4" (nominal) planks with $\frac{1}{2}$ " open joint spacing however these dimensions may vary depending on which manufacturer is retained for the work. The plank size may be $\frac{3}{4}$ " x 3 $\frac{1}{4}$ " with $\frac{1}{2}$ " spacing or similar. The product species may vary depending on the availability of species from the generic term "cedar" to Douglas Fir, Poplar or Pine.
 1. Product Number:
 - 1) Species: generic cedar, Douglas Fir or Poplar
 - 2) Member Size: 3 $\frac{1}{4}$ " x $\frac{3}{4}$ "
 - 3) Members/LF: 3 units per lin.ft.

- 4) Assembly Style: Cross Piece Backer
- 5) Panel Sizes: dependent on manufacturer
- 7) Finish: Natural with Clear Finish, prefinished all faces
- 8) Spacing of planks: !/2" open joint

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal T-Grid Suspension System: Provide standard interior Heavy Duty 15/16" Suspension system using Main Runners, Cross-tees, Wall Angle or Shadow Moldings of types, structural classifications, and black finishes indicated and that comply with applicable ASTM C 635 requirements. Comply with all applicable seismic codes and ordinances.
- B. Attachment Devices or clips: Size for 3 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. General: Examine substrates and structural framing to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Layout: Measure each ceiling area and establish the layout of Wood Plank Panel to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans in accordance with Shop Drawings approved or provided by Ceiling System Inc.

3.3 INSTALLATION

- A. General: Install CSI Wood Grille Panels to comply with manufacturer's guidelines.
- B. Attachments: Suspend ceiling hangers from building's structural members per manufacturer's instructions and in compliance with all local codes and regulations.
- C. Installation of Metal Suspension Grid: Install, align, brace, tie-off, mount, handle interferences, and space suspension T-Grid in accordance with suspension manufacturer's instructions and in compliance with all local codes and regulations.
- D. Install CSI Wood Plank Panels in accordance with manufacturer's installation instructions and in compliance with all local codes and regulations. Install with undamaged edges and fitted accurately to suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit, as required.

- E. Suspension Runners: Install suspension system runners so they are square and securely interlocked with one another. Install number and use on-center spacing per wood ceiling manufacturer's instructions, as indicated on approved Shop Drawings and in compliance with all local codes.

3.4 CLEANING

- A. General: Clean exposed wood surfaces of CSI Wood Plank Panels. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage.

END OF SECTION 095426

SECTION 09 6700 - FLUID-APPLIED FLOORING**PART 1 GENERAL****SECTION INCLUDES**

Fluid-applied two part epoxy resinous flooring and cove base.

SUBMITTALS

See Section 01 3000 - Administrative Requirements, for submittal procedures.

Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

Provide 12" x 12" x 3/16" sample of proposed manufacturer's product and color charts .

Provide 3 year warranty on labor and materials against all defects including air bubbles, cracks, and uneven installation thicknesses.

QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

Applicator Qualifications: Company specializing in performing work of this section with minimum 3 years experience.

DELIVERY, STORAGE, AND HANDLING

Store resin materials in a dry, secure area.

Store materials for three days prior to installation in area of installation to achieve temperature stability.

FIELD CONDITIONS

Maintain minimum temperature in storage area between 60 and 85 degrees F.

Store materials in area of installation for minimum period of 24 hours prior to installation.

Test humidity and moisture content of subsurface and submit test results for manufacturer's/installer's acceptance prior to application.

Provide manufacturer's or installers written approval and acceptance of condition of substrate and jobsite work area prior to application.

PART 2 PRODUCTS**MANUFACTURERS**

Fluid-Applied Flooring acceptable manufacturers:

Stonhard: www.stonhard.com; Product Stonshield QBT.

Key Resin Co., Product Key Pool Deck

TrueBond – Product Surefoot Non-Skid

Tremco Flowcrete or Florock

Substitutions: See Section 01 6000 - Product Requirements.

MATERIALS

Fluid-Applied Flooring Type A: Epoxy base coat(s) with embedded anti-slip quartz aggregate and anti-slip additives in top coat specifically formulated for sloped surfaces-to-drains installations.

Thickness: constant 3/16 inch (5 mm), nominal, when dry.

Texture: Medium, slip resistant.

Color: Flagstone.

Material to include aluminum oxide or silica aggregate anti-slip and shark grip in final coating. Add additional anti-slip aggregate to finish coat in sloped flooring of indoor showers.

All surfacing to be compatible with bare feet on wet shower floors. Submit 12"x 12" sample for architects review.

Base Coat: QBT epoxy resin or manufacturers recommended primer coat.

Aggregate: colored quartz broadcast aggregate

Finish : non-slip finish when wet, installed as per manufacturer's instructions specifically at drains and cove bases.

Sealer: two-component, high performance, UV resistant anti-slip epoxy sealer.

Wall Base: Provide 6" high cove base with right angle metal or plastic top joint at head of cove bead.

PART 3 EXECUTION

EXAMINATION

Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring. Follow manufacturers instructions to maintain constant 3/16" thickness over sloped surfaces.

Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resin cove bases..

Verify that concrete sub-floor surfaces are ready for flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:

Moisture emission rate: Not greater than 3 lb per 1000 sq ft (7.1 kg per 100 sq m) per 24 hours when tested using calcium chloride moisture test kit for 72 hours.

Alkalinity: pH range of 5-9.

Verify that required floor-mounted utilities are in correct location.

PREPARATION

Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level.

Prohibit traffic until filler is cured.

Vacuum clean substrate.

Apply primer to surfaces required by flooring manufacturer.

INSTALLATION - FLOORING

Apply in accordance with manufacturer's instructions.

Apply each coat to minimum 3/16" thickness indicated allowing curing and setting times as per manufacturer's instructions. Carefully maintain minimal thickness of 3/16" over sloped surfaces and at edge of floor drains.

Finish to smooth non-slip level surface.

Cove base of 6" height at all vertical surfaces.

PROTECTION

Prohibit traffic on floor finish for 54 hours after installation.

Barricade area to protect flooring until cured.

END OF SECTION

SECTION 09900 – PAINTING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Primers & sealers
2. block filler and high performance coating on exposed CMU
3. Water-based latex finish coatings.
4. Floor sealers.
5. Painting of hollow core steel doors and frames
6. Exposed back-side of fiber cement panels only where visible.
7. Mechanical equipment and piping.
8. Wood preservative treatment for wood shingles.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.**B. Sustainable Design Submittals:**

1. Summit sustainable design text for paints and coatings.>
2. Samples: For each type of topcoat product.

C. Product Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.**1.3 QUALITY ASSURANCE****A. Mockups:** Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.**PART 2 - PRODUCTS MANUFACTURERS**

- A. Sherwin Williams high performance epoxy
- B. Benjamin Moore
- C. PPG Architectural coatings

- D. Osmose-Pentox Wood Preservative
- E. Or approved equivalent substitutions

2.2 PAINT PRODUCTS, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B.

- C. Colors: As selected by Architect from manufacturer's full range.

2.3 PRIMERS

- A. Epoxy Block Filler: Solvent-based, two-component, epoxy, high-solids coating; formulated to bridge and fill porous surfaces of CMUs in preparation for specified intermediate and topcoat coatings:
- B. Interior Latex Primer for Wood: Waterborne-emulsion primer formulated for resistance to extractive bleeding, mold, and microbials; for hiding stains; and for use on interior wood subject to extractive bleeding.
- C. Anti-Corrosive Epoxy Primer: Corrosion-resistant, solvent-based, two-component epoxy primer formulated for use on prepared, interior ferrous- and galvanized-metal surfaces.

2.4 WATER-BASED FINISH COATS

- A. Interior, Latex, Institutional Low Odor/VOC, Eggshell: White or colored latex paint with low-odor characteristics and a VOC of less than 10 grams per liter, for use in areas, such as hospitals and other occupied buildings, where the odor and VOC levels of conventional latex products would preclude their use

2.5 FLOOR SEALERS

1. Solvent-Based Concrete Floor Sealer: Clear, acrylic, solvent-based sealer formulated for oil, gasoline, alkali, and water resistance and for use on concrete traffic surfaces.
2. Slip-Resistant Aggregate: Manufacturer's standard additive

2.6 EPOXY COATINGS – Exposed CMU walls

- A. High-Build Epoxy, Low or semi-gloss finish: Two-component epoxy, high-solids, low-gloss coating for use on interior or exterior concrete, masonry, and primed metal surfaces. Two coats over block filler primed. (See Sect. 3.4 – Painting)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
- C. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions.
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- C. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.

- d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

- A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING

- A. Concrete Substrates,
- B. Concrete Substrates, Traffic Surfaces:
 1. Solvent Based Concrete Floor Sealer System
 - a. First Coat: Matching topcoat.
 - b. Topcoat: Solvent -based concrete floor sealer with non-slip additive..
 2. INTERIOR CMU WALLS (S-W Basis of design or approved equivalent)
 - 1) 1st Coat: S-W Pro Industrial Heavy Duty Block Filler, B42W150 (75-125 sq ft/gal).
 - 2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Water based Epoxy, K46- Series.
 - 3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Water based Epoxy, K46- Series (4 mils wet, 1.5 mils dry per coat). Semi-gloss finish.
- C. Steel Substrates:
 1. Latex System, Alkyd Primer
 - a. Prime Coat: Alkyd anticorrosive primer
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low odor/VOC, satin finish

D. Galvanized-Metal Substrates:

1. Latex System
2. Institutional Low-Odor/VOC Latex System
 - a. Prime Coat: Water-based galvanized primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low odor/VOC, **satin**

E. Exposed White Cedar shingles

Exterior wood shingles are to be treated with 3 coats of Osmose-Pentox™ Conservator™ clear preservative for Exterior Wood: Solvent-based, penetrating anti-fungal treatment for exterior wood containing zinc or copper naphthenate and treats the wood by osmosis from within the material .

Interior wood shingles are to be treated with one coat of Osmose Pentox clear Conservator . Ventilate area well during and after application.

Osmose-Pentox is a patented Canadian product in use for over fifty years and available directly from the manufacturer (no known US equivalent product exists to our knowledge that protects and preserves the wood without surface coating or changing the texture and appearance of the shingles).

F. Wood Framing:

1. Institutional Low-Odor/VOC Latex System
 - a. Prime Coat: Interior latex primer for wood.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low odor/VOC, **satin**

G. Cotton or Canvas ASJ Insulation-Covering Substrates: Including **pipe and duct coverings**

1. Institutional Low-Odor/VOC Latex System
 - a. Prime Coat: Interior latex primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low odor/VOC, **satin**

END OF SECTION 09 9123

SECTION 10 1400
SIGNAGE

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Building Dedication Plaque.

1.02 RELATED REQUIREMENTS

- A. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- B. Section 26 0553 - Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).
- B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room number to appear on signs differ from those on the drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Curved Sign Media Suction Cups: One for each 100 signs; for removing media.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.07 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Flat Signs:
 - 1. Best Sign Systems, Inc; HC 300 System: www.bestsigns.com.
 - 1. Gemini Incorporated; www.geminiplaques.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Plaques:
 - 1. Gemini Incorporated; Cast Bronze: www.geminiplaques.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FLAT SIGNS

- A. Tactile characters/symbols shall be raised 1/32 inch from sign plate face. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.
- B. Text shall be accompanied by Grade 2 braille.
- C. 3/8" wide, 1/32" raised perimeter border with 1/8" inside radius typical.
- D. All letters, numbers and/or symbols shall contrast with their background – either light characters on a dark background or dark characters on a light background. Characters and background shall have matte finish.

2.03 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: All signs are required to comply with ADA Standards for Accessible Design and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including vestibules, storage closets, mechanical rooms and similar open areas.
 - 1. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.
 - 2. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", do not include room numbers, provide braille. All restroom signs will include the graphic symbol of a wheelchair. The single-user restroom in the front of each building shall bear a pictogram sign with no gender identification showing equal sized pictograms for men, women, families and wheelchairs, plus braille identification of each.
 - 3. Exterior entrance door signs are to bear the individual; pictogram symbols on the automatic door opener-pads on each door in addition to a separate sign on the adjacent wall surface
- C. Interior Directional and Informational Signs:
 - 1. Sign Type: Same as room and door signs.
- D. Building Identification Signs:
 - 1. Use individual metal letters.
 - 2. Mount on outside wall in location to be determined on site.
- E. Plaque: Provide one 16"x20" building dedication plaque in the Main Building. Copy to be determined by Owner including the date of construction, and the names of the Architect and Consultant Engineers as well as DEM and RI State officials responsible for the park rebuild program.

2.04 SIGN SIZE

- A. Restroom signs shall be 6" x 8".

- B. Directional signs shall be 6" x 6".
- C. Room identification signs shall be 6" x 6", 8" x 6", 8" x 8" or 10" x 3".

2.05 CAST PLAQUES

- A. Material: Bronze.
- B. Plaque depth based on shape and size.
- C. Border: 3/8" Single Line
- D. Bevel: None
- E. Finish: Brushed.
- F. Background Color: Dark Oxide.
- G. Background textures: Sand.
- H. Clear Coat: Matte.
- I. Text: Raised Copy.
- J. Mounting: Blind Mount.
- K. Optional Rosettes per catalog. Sizes per catalog.
- L. Squares, rectangles or custom shapes and logos are available.
- M. Available with inserts: Etched, Cast, Ceramic, or Laser Engraved. .

2.06 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs where indicated:
 - 1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches (1525 mm) above finished floor.
 - 2. If no location is indicated obtain Architect's instructions.
- D. Protect from damage until Substantial Completion; repair or replace damage items.

END OF SECTION

SECTION 10 2113.19

PLASTIC TOILET COMPARTMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for **blocking** in adjacent masonry walls required for attachment or support.
2. Section 092216 "Non-Structural Metal Framing" for blocking.
3. Section 102800 "Toilet and Bath Accessories" for accessories mounted on toilet compartments.
4. Section 102116 – Plastic Shower Stalls
5. Section Access panels

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings: Plans, elevations, sections, details, and attachment details.

C. Samples: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

D. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.
- B. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:
 - 1. Panels are able to withstand a concentrated load on grab bar of at least **250 lbf (1112 N)** applied at any direction and at any point, without deformation of panel.
- C. Regulatory Requirements: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design for toilet compartments designated as accessible

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Note : The same installer, supplier and manufacturer must be selected for this Section and Section 102116 to simplify maintenance and repair purposes.
- B. Acceptable Manufacturers :
 - 1. Scranton Products
 - 2. Bobrick – Traditional Partitions
 - 3. US Partitions
 - 4. Ironwood Partitions
 - 5. Or Approved equivalent section 01600
- C. Toilet-Enclosure Style: Overhead braced
- D. Urinal-Screen Style: Wall hung
- E. Pipe-chase wall panels : integral braced and floor supported including solid laminate top
- F. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) material, not less than **1 inch (25 mm)** thick, seamless, with eased edges, and with homogenous color throughout thickness of material. Provide with no-sightline system consisting of door and pilaster lapped edges on strike side of door and door continuous hinge system .
 - 1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 - 2. Heat-Sink Strip: Manufacturer's continuous, stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 - 3. Color: One color in men's room and alternate color in women's rooms as selected by Architect from manufacturer's full range.
- G. Urinal-Screen Construction: Matching panel construction.
- H. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- I. Pilaster Sleeves (Caps): Manufacturer's standard design; **stainless steel**.

- J. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters
- K. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; **stainless steel**.

2.3 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories. All to be Mounted with through bolts.
 - 1. Hinges:
 - a. Manufacturer's integral hinge for solid-plastic doors, allowing emergency access by disassembly of door.
 - 1) Material, Integral Hinge: Nylon gravity cam unit with stainless steel pins/screws.
 - 2. Latch and Keeper: Manufacturer's surface-mounted latch unit, designed for emergency access, and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.
- B. All bathroom door hardware for wheelchair accessible toilet or indoor of outdoor shower stalls or handicapped designated stalls will be equipped with lever style heavy-duty stainless steel door handles.
 - a. Material: **Stainless steel**.
 - 2. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.
 - a. Material: **Stainless steel**
 - 3. Door Bumper: Manufacturer's rubber-tipped bumper at outswinging doors.
 - a. Material: **Stainless steel**.
 - 4. Door Pull: Manufacturer's unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at all toilet enclosures
 - a. Material: **Stainless steel**..
- C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's clear anodized finish.
- D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide

hex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: **ASTM B221** (**ASTM B221M**).
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.

Note : No Zamac products or commercial zinc-alloy die castings.

2.5 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-and-Ceiling-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- D. Urinal-Screen Posts: Manufacturer's standard corrosion-resistant anchoring assemblies at posts and walls, with leveling adjustment nuts at bottoms of posts. Provide shoes **and sleeves (caps)** at posts to conceal anchorage.
- E. Door Size and Swings: Unless otherwise indicated, provide **30-inch-** wide, in-swinging doors for standard toilet enclosures and **36-inch- (914-mm-)** wide, out-swinging doors with a minimum **32-inch- (813-mm-)** wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:

- a. Pilasters and Panels or Screens: **1/2 inch (13 mm)**.
 - b. Panels or Screens and Walls: **1 inch (25 mm)**.
2. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height stainless steel brackets.
- a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with full height anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.19

SECTION 10 2116.19 - PLASTIC SHOWER COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic shower compartments complete with shower rods curtains, all accessories and louvered fiberglass doors

Note 1.: Floor surface of indoor shower stalls is 3/16" thick fluid applied resin flooring sloped to linear shower stall drains.

Note 2: Accessories for shower stalls including grab bars, mobile device holders , robe hooks and folding shower seats , curtain rods etc. are specified in this section. These may be pre-mounted to partitions in the factory or site installed.

2. Pipe-chase walls (cavity wall construction) as per dwg. A-2 or Ab-2 : 16" wide pipe-chase cavity of Matching 1" thick HDPE panel construction and including solid composite top 5/8"thick x 17"w (Corian or equivalent see Solid Surfacing Fabrications Section 066116.) Concealed Support for these walls to be stainless steel light gauge framing.
3. These pipe-chase walls are to be floor-mounted and are to receive 6" high site-applied resinous cove base on one side . Check for material compatibility. (for cove base see details dwg A-11)

B. Related Sections :

1. Fiberglass louvered doors supplied as part of Section 081613 and installed as part of this Section.
2. Co-ordinate the installation of coin operated timing mechanisms for each shower unit supplied as part of mechanical equipment for each shower and to be mounted on the front wall of each shower stall.
3. Co-ordinate installation of all shower controls, floor mounted urinals and access panels to be located in or against pipe-chase walls
4. Solid Surfacing Fabrications -Section 066116

1.2 ACTION SUBMITTALS

A.

B. Product Data: For each type of product.

C. Sustainable Design Submittals:

1. Submit data and text for recycled materials content

- D. Shop Drawings: For shower compartments.
 - 1. Include plans, elevations, sections, and all hardware and attachment details.
- E. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

PART 3 - Acceptable manufacturers

Please Note : The same manufacturer, supplier and installer are to be selected for the work of this section and for Section 102113 Plastic Toilet Compartments

- A. Scranton Products : Hiny Hiders
- B. Bobrick : Traditional Partitions
- C. US Partitions
- D. Or Approved Equivalents

3.2 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.
- B. Regulatory Requirements: Comply with applicable provisions in USDOJ's "2010 ADA Standards for Accessible Design for shower compartments designated as accessible.

3.3 SOLID-PLASTIC COMPARTMENTS

- A. Configuration: Single or Multiple Indoor Shower compartments as indicated on Drawings.
- B. Enclosure Style: Overhead braced

- C. Panel and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges and with homogenous color and pattern throughout thickness of material.
1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 2. Heat-Sink Strip: Manufacturer's standard, continuous, anodized aluminum or stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 3. Color and Pattern: One color and pattern as selected by Architect from manufacturer's full range to match toilet compartments specified in Section 102113.19 "Plastic Toilet Compartments".
- D. Door Construction: The hanging of the louvered fiberglass doors (Section 081613) for all shower stalls and installation complete with all hardware and accessories is part of the work of this section.
- E. These louvered fiberglass doors are specified in Section 081613 of this specification .
- F. Pilaster Shoes and Sleeves Caps: Manufacturer's standard design; stainless steel.
1. Plastic Color and Pattern: Match toilet compartments specified in Section 102113.19 "Plastic Toilet Compartments"
- G. Brackets (Fittings):
1. Shower Compartment Brackets: Match toilet-compartment brackets specified in Section 102113.19 "Plastic Toilet Compartments."
- Note : Each shower stall unit will be set on a sloped floor surface of fluid applied resinous flooring for accessible compartments. Adjust height of pilasters and supports accordingly and for thickness of resin flooring (3/16") .
- H. Finish: Manufacturer's standard finish on exposed surfaces, to match Section 102113 Plastic Toilet Compartments.

3.4 ACCESSORIES- see Bathroom Accessories -see Section 102800 for product standards

- A. Door Hardware and Accessories: Manufacturer's standard design, heavy-duty, operating hardware and accessories. Mount to panels with through-bolts.
1. Material: Stainless steel.
 2. One per shower stall 1 1/2 diam.“ X 36” stainless steel grab-bar 0,40 wall thickness securely mounted on side wall at ADA recommended height for all indoor and outdoor shower stalls with escutcheon plate and concealed fasteners. Also, one 1 1/2” diam 18” knurled finish stainless steel grab -bar installed vertically per shower stall (indoor and outdoor.)
 3. Hinges: Manufacturer's standard, continuous, cam type that swings to a closed or partially open position allowing emergency access by lifting door.
 4. Latch and Keeper: Manufacturer's standard, surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide

- units that comply with regulatory requirements for accessibility. The entrance door hardware will include a lever style heavy-duty stainless steel door handle with suitable latching and privacy mechanism .
5. Clothing Hooks and mobile device holder : Supply and install a wall mounted two robe clothes hook type Bobrick-B7672 stainless steel and one wall mounted mobile device holder type Bobrick # B-635 with supporting stainless steel brackets in each shower compartment (including one in each of the 8 outdoor shower stalls) and rubber-tipped bumper at in-swinging doors, sized to prevent door from hitting wall panel or compartment-mounted accessories.
 6. Door Bumper: Manufacturer's standard, rubber-tipped bumper at out -swinging doors.
 7. Door Pull: Manufacturer's standard stainlesssteel unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide lever style heavy duty door handle privacy function units on both sides of doors at all shower compartments.
- B. Overhead Bracing: Manufacturer's standard, continuous, extruded-aluminum headrail or cap with anti-grip profile; in manufacturer's standard finish.
- C. Curtain Rod : Curved solid stainless steel rod **1-inch- (25-mm-)** diameter rod 0.040 wall thickness(see detail 4 drawing A-15) with Stainless steel supports and fittings at each extremity.
- D. Curtain: Flame-resistant, polyester-reinforced vinyl fabric that is stain resistant, self-sanitizing, antistatic, antimicrobial, and launderable to a temperature of not less than [**90 deg F (32 deg C)**] hemmed at top and bottom and fitted with stainless steel grommets sized for 1" curtain rod. (see detail 4 dwg A-15) and dyneema-cord hold-back straps with plastic snaps and fasteners at one side of curtain.
1. Flame Resistance: Passes NFPA 701 tests when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Labeling: Identify fabrics with appropriate markings of applicable testing and inspecting agency.
 3. Length: Where curtain extends to a floor surface, size so that bottom hem clears finished floor by not more than **4" inch** and not less than **2 inch** above floor surface.
 4. Color and Pattern: As selected by Architect from manufacturer's full range
- E. Soap Holder: wall-mounted HDPE soap dish with perforated bottom for drainage .
- F. Folding Seats: ADA seats at comfort height for each indoor shower stall. Wall mounted welded tubular stainless steel frame, perforated seat bottom only, with stainless steel hinge. Bobrick #B5181 by Bobrick Equipment or ASI- 8203 by American Specialties.
1. Material: Solid 12" x 12" x1" HDPE seat perforated for drainage at ADA comfort seating height.
 2. Finish: Match enclosure panels.
- G. Anchorages and Fasteners: Manufacturer's standard, exposed fasteners of stainless steel, finished to match the items they are securing; with theft-resistant-type heads. Provide hex-type bolts for through-bolt applications.
- H. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist **250 lbf** concentrated load applied in any direction and at any point.
2. Shower Seats: Installed units are able to resist **300 lbf** applied in any direction and at any point.

3.5 FABRICATION

- A. Overhead-Braced Compartments: Manufacturer's standard, corrosion-resistant supports, leveling method, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling method.
- B. Floor-and-Ceiling-Anchored Compartments: Manufacturer's standard, corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- C. Door Sizes and Swings: all shower doors to be 36" wide with swings as per ADA requirements and architectural drawings. (see Section 081613 for specification of louvered fiberglass doors)

PART 4 - EXECUTION

4.1 INSTALLATION

- A. Curtains: Install curtains to specified length and verify that they hang vertically without stress points or diagonal folds.

4.2 ADJUSTING

- A. Curtain Adjustment: After hanging curtains, test and adjust each track or rod to produce unencumbered, smooth operation. Steam and dress down curtains as required to produce crease- and wrinkle-free installation. Remove and replace curtains that are stained or soiled or that have stress points or diagonal folds.
- B. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 2116.19

SECTION 10 2123 - CUBICLE CURTAINS AND TRACK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Cubicle-curtain tracks and carriers.
 2. Cubicle curtains.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

Manufacturers and products listed in this Section are neither recommended nor endorsed by the AIA or Deltek. Before selecting manufacturers and products, verify availability, suitability for intended applications, and compliance with minimum performance requirements. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

Product options commonly available from manufacturers are included in square brackets throughout the Section Text. Not every manufacturer listed can provide every option offered; verify availability with manufacturers. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

2.1 PERFORMANCE REQUIREMENTS

- A. Cubicle Curtains: Provide curtain fabrics with the following characteristics:

Retain option in "Laundering" Subparagraph below for heavy-duty polyester fabrics made with "Avara FR" by INVISTA, "Trevira CS" by Trevira, or similar proprietary fibers.

1. Laundering: Launderable to a water temperature of not less than [160 deg F (71 deg C)] <Insert temperature>.

Coordinate "Flame Resistance" Subparagraph below with requirements of authorities having jurisdiction.

2. Flame Resistance: Provide fabrics identical to those that have passed NFPA 701 when tested by a qualified testing agency acceptable to authorities having jurisdiction.

- a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CUBICLE-CURTAIN SUPPORT SYSTEMS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

Retain "Extruded-Aluminum Curtain Track" or "PVC Curtain Track" Paragraph below. If necessary, insert requirements for hinged curtain tracks that allow one end of a track to be detached from the ceiling and lowered to within reach or other proprietary systems.

Retain first option in "Extruded-Aluminum Curtain Track" Paragraph below for standard tracks; retain second option for economy track.

- B. Extruded-Aluminum Curtain Track: Not less than [**1-1/4 inches wide by 3/4 inch high (32 mm wide by 19 mm high)**] [**5/8 inch wide by 1/2 inch high (16 mm wide by 13 mm high)**].

Radius in "Curved Track" Subparagraph below is standard with manufacturers. Verify availability and insert other radii if required.

1. Curved Track: Factory-fabricated, [**12-inch- (305-mm-)**] <Insert radius> radius bends.
 2. Finish: [**Clear anodized**] [**Satin anodized**] [**Baked enamel, acrylic, or epoxy**] <Insert finish>.
- C. PVC Curtain Track: Not less than **1-1/4 inches wide by 15/16 inch high (32 mm wide by 24 mm high)**.
 1. Curved Track: Factory-fabricated, **12-inch- (305-mm-)** radius bends.
 - D. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
 1. End Stop: [**Nonremovable**] [**Removable with carrier hook**].

Retain "Curtain Roller Carriers" or "Curtain Glide Carriers" Paragraph below. Coordinate type of curtain carrier with size of track and with products of manufacturers; 5/8-inch- (16-mm-) wide tracks typically use glides instead of rollers.

- E. Curtain Roller Carriers: Two nylon rollers and nylon axle with [**chrome-plated steel**] [**nylon**] [**aluminum**] hook.
- F. Curtain Glide Carriers: One-piece nylon glide with [**chrome-plated steel**] [**nylon**] hook.

Breakaway carriers in "Breakaway Curtain Carriers" Paragraph below are for psychiatric or detention applications. Not all manufacturers offer breakaway carriers; verify availability.

- G. Breakaway Curtain Carriers: [**One-piece nylon**] [**Velcro**] breakaway curtain carriers designed to allow curtains to detach from tracks with a pulling force of no more than **5 lbf (22.2 N)**.
- H. Exposed Fasteners: Stainless steel.

Retain second option in "Concealed Fasteners" Paragraph below for high-humidity installations.

- I. Concealed Fasteners: [**Hot-dip galvanized**] [**Stainless steel**].

2.3 CURTAINS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Fabric: Curtain manufacturer's standard, 100 percent polyester; inherently and permanently flame resistant, stain resistant, and antimicrobial.
 1. Proprietary Fiber:
 - a. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Pattern: **<Insert manufacturer's style name>**.
 3. Width: **<Insert dimension>**.
 4. Color: [**As selected by Architect from manufacturer's full range**] **<Insert requirements>**.
- C. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than **6 inches (152 mm)** o.c.; machined into top hem.

Retain "Mesh Top," "Beaded-Chain Curtain Drop," or "PVC-Strip Curtain Drop" Paragraph below if required to ensure curtains do not block water flow from sprinklers. Authorities having jurisdiction may have specific requirements about curtain drop height or mesh opening size. Verify requirements with authorities having jurisdiction.

Height of mesh top in "Mesh Top" Paragraph below is typically 20 inches (508 mm) to provide 22-inch (559-mm) total clearance from the ceiling as required by NFPA 13; however, some jurisdictions may interpret NFPA 13 to mean that 22 inches (559 mm) of mesh is needed. Verify requirements with authorities having jurisdiction.

- D. Mesh Top: Not less than [**20-inch- (508-mm-)**] [**22-inch- (559-mm-)**] **<Insert dimension>** high mesh top.

Retain one of three mesh opening sizes in "Mesh" Subparagraph below. The most commonly used, No. 50 mesh, is an open weave with openings of about 1/2 inch (13 mm) to comply with NFPA 13; No. 40 mesh is an open weave with openings of about 1/4 inch (6 mm); No. 42 mesh is closely woven with small openings. Verify acceptability with authorities having jurisdiction.

1. Mesh: No. [**50**] [**40**] [**42**] nylon mesh.
- E. Beaded-Chain Curtain Drop: [**6 inches (152 mm)**] [**9 inches (229 mm)**] [**12 inches (305 mm)**] [**15 inches (381 mm)**] [**18 inches (457 mm)**] long; nickel-plated steel with aluminum hook.
- F. PVC-Strip Curtain Drop: [**16 inches (406 mm)**] [**18 inches (457 mm)**] long with chrome-plated steel hook.

Retain "Snap Attachment" Paragraph below with "Modular Curtain Panels" Paragraph in "Curtain Fabrication" Article if required.

- G. Snap Attachments: Provide manufacturer's standard nickel-plated brass snap attachments for modular panels.
- H. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

2.4 CURTAIN FABRICATION

A. Continuous Curtain Panels:

- 1. Width: Equal to track length from which curtain is hung plus 10 percent of added fullness, but not less than **12 inches (305 mm)** of added fullness.
- 2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor of [**12 inches (305 mm)**] [**15 inches (381 mm)**] [**As indicated on Drawings**] **<Insert requirements>**.

B. Modular Curtain Panels:

- 1. Fabric Panels: [**48 inches (1219 mm)**] [**66 inches (1676 mm)**] **<Insert dimension>** wide. Fabricate panels in quantity required to provide assembled curtains equal to track lengths plus 10 percent added fullness, but not less than **12 inches (305 mm)** added fullness.
- 2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor of [**12 inches (305 mm)**] [**15 inches (381 mm)**] [**As indicated on Drawings**] **<Insert requirements>**.
- 3. Mesh Top: [**Continuous for each track length, matching overall width of assembled curtains**] [**Modular, matching width of modular fabric panels with snap attachments at side hems of mesh-top panels**].

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install tracks level and plumb, according to manufacturer's written instructions.
- B. For tracks of up to **20 feet (6.0 m)** in length, provide track fabricated from single, continuous length.

Retain one of three options in "Curtain-Track Mounting" Subparagraph below. Surface mounting is typically recommended by manufacturers for ceiling heights of up to 108 inches (2743 mm); suspended mounting is recommended for higher ceilings.

- 1. Curtain-Track Mounting: [**Surface**] [**Suspended**] [**As indicated on Drawings**].
- C. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

Retain both subparagraphs below if required. Coordinate with accessories. If beds shown on Drawings do not define locations of accessories, revise to suit Project.

- 1. Provide one hinged loading unit for each bed.

- D. Curtain Carriers: Provide curtain carriers adequate for 6-inch (152-mm) spacing along full length of curtain plus an additional carrier.
- E. Cubicle Curtains: Hang curtains on each curtain track.[**Secure with curtain tieback.**]

END OF SECTION 10 2123

SECTION 10 2800 – TOILET AND BATHROOM ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Healthcare accessories.
3. Hand dryers.
4. Childcare accessories.

B. Please note : other accessories including ADA grab-bars and seats for the shower stalls are specified in Section 102116 – Plastic Shower Compartments

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each finish specified, full size.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Delegated Design Submittal:

1. Include structural design calculations indicating compliance with specified structural-performance requirements and ADA requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **10** years from date of Substantial Completion.

1.6 MANUFACTURERS

- A. Bobrick Bathroom Accessories
- B. A&J washroom Accessories
- C. American Specialties
- D. Kimberley Clark
- E. Substitutions : Section 0 1600 product requirements

Electric Hand dryers

American Dryer Inc – model Extreme Air EXT

Excel Dryer-model Elerator Eco

World Dryer Corp. – model Smart DRi

- F. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FINISHES : Stainless Steel - #4 brushed satin unless otherwise stated

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Electric Hair dryers : 1 per cloakroom men's & women's –wall mounted at 6'-0" high with adjustable nozzle and start button , concealed fasteners.
 - 1. Mediclinics style #sc0088HCS or World Dryer model Airstyle by Gen we
- B. Electric hand Dryers – 2 per each bathhouse , wall mounted at 38" height
 - 1. Automatic Sensor operated , surface mounted , provide ADA mounting accessory.
 - 2. Cover stainless steel
 - 3. Total wattage 500 watts

- C. Toilet Tissue (Roll) Dispenser – one per toilet compartment mounted not more than 7'-9" from front of toilet
1. Concealed anchorage double roll surface mounted stainless steel jumbo roll dispenser
 2. Model Bobrick B-2892 equipped with tumbler lock or approved equivalent
- D. Grab Bar – one wall mounted per shower stall –(included in Section 10 2116)
- E. Grab-Bars – two per handicapped accessible toilet stall – Bobrick # B-6806 36" long x 1 ½" diam, stainless steel 0.40 tube with concealed fasteners and snap on escutcheon plate. Include Bobrick backing plate for grab bars. Provide one 18" long matching grab-bar in each toilet stall mounted in the vertical position. Ambulatory stalls are to include two full length (48" long x 1 ½" diam) grab bars each stall, one mounted on each wall to assist persons using crutches.
- F. Sanitary-Napkin Disposal Unit
1. Mounting: Surface mounted.
 2. Door or Cover: Self-closing cover locking bottom panel, full length piano hinge stainless steel with hinged face panel with tumbler lockset.
 3. Receptacle: Removable plastic .
 4. Container Material and Finish: Stainless steel,
 5. Model : RM 6140 manufactured by Rubbermaid or Bobrick B-254
- G. Mirror Unit – one per sink unit
1. Wall mounted 24" x 36" Bobrick Frameless stainless-steel mirror # B- 1556-2436 or equivalent
- H. Robe Hooks – one per toilet compartment door mounted.
1. Bobrick Stainless steel type B-7672 two pronged stainless steel with concealed fasten
- I. Baby Changing Station – two for each man's and women's bathhouse or as shown on floor plans A-2 and Ab-2 mounted in men's and women's cloakrooms of each building and one in each single user bathroom.
1. Description: Wall mounted folding commercial use diaper station that opens by folding down from stored position and with adjustable strap meeting or exceeding ASTM F2285
- Mounting: Surface mounted, with unit projecting not more than 4 inches (102 mm) from wall when closed, fully horizontal surface when open.
2. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin), with replaceable insulated polystyrene tray liner and rounded plastic corners.
- J. ADA sinks (see mechanical specifications) – are to be mounted with lower edge not more than 27" from floor height and top surface not more than 32" from floor.
- K. ADA urinals –(see mechanical specifications) – one ADA compliant urinal is required per men's bathroom .
- L. ADA toilets (see mechanical specifications) – ADA toilets are to have flush mechanisms no higher than 36" from floor.

- M. Garbage disposal: Provide wall mounted garbage disposal with sanitary liners in each cloakroom.

Manufacturers:

1. American Specialties
2. Foundations worldwide
3. Koala Kare products

2.4 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. The shower stall accessories for indoor and outdoor showers are specified in Section 102116

2.5 CUSTODIAL ACCESSORIES

- A. Waste Receptacle -free standing type- 3 per bathhouse vestibule
65 gallon Brute rollout waste containers
- B. Custodial Utility Shelf and Mop and Broom Holder

wall mounted Bobrick #223 stainless steel broom and mop holders- 2 units per
mechanicalroom.

2.6 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of **[six]** <Insert number> keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

END OF SECTION 102800

SECTION 12 4816 – ENTRANCE FLOOR GRILLES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Recessed floor grilles and frames.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Divisions between grille sections.
 - 2. Perimeter floor moldings.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Construction Specialties – Stainless Steel Gridline with anti-slip Rubber inserts
- B. Matsinc – Grate Grid – Aluminum grid with rubber inserts
- C. Approved equivalent.

2.2 ENTRANCE FLOOR GRILLES, GENERAL

- A. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design

2.3 FLOOR GRILLES

- A. Aluminum or Stainless Steel Floor Grilles: Provide manufacturer's standard floor grilles with extruded members, top-surfaced tread rails, and as follows:

1. Aluminum Color: Clear anodized
 2. Tread Rail Spacing: [**1-1/2 inches (38 mm)** o.c. with **1/8- to 3/16-inch-** wide openings between treads.
 3. Top Surface: Fusion-bonded, recycled rubber insert; **1/4 inch (6.4 mm)** high,
 - a. Top Surface Color: clear anodized
 4. Grille Size: see Floor Plan dwg. A-2 or Ab-2 (Vestibules)
- B. Stainless Steel Floor Grille: Type 304.
1. Surface Treads: **0.071-by-0.177-inch (1.8-by-4.49-mm) wire with 0.125-inch-(3.17-mm)-**wide openings between wires.
 2. Recycled rubber inserts treads
 3. Support Rods: Spaced **1 inch (25.4 mm)** o.c., welded to each wire.
 4. Pit Grating: **1-1/8 inches (28.5 mm)** deep.
 5. Stainless Steel Finish: **Mill**
 6. Grille Size: see Dwg. A-2 or Ab-2
- C. Lockdown:

2.4 FRAMES

- A. Provide manufacturer's standard frames of size and style for grille type. Provide manufacturers installation template for grill and drain pan.

2.5 SUPPORT SYSTEM

- A. Drainage Pit Applications: Provide manufacturer's special deep-pit frame and support extrusion system with intermediate support beams, sized and spaced as recommended by manufacturer for indicated spans and equipped with vinyl support cushions.

2.6 DRAIN PANS

- A. Provide manufacturer's standard aluminum or stainless steel sheet drain pan with **NPS 2 (DN 50)** drain outlet for each floor-grille unit and dirt strainer/filter. Coat bottom of pan with protective coating recommended by manufacturer.

2.7 MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- B. Stainless Steel Plate Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.
- C. Stainless Steel Flat Bars: ASTM A666, Type 304.
- D. Stainless Steel Angles: ASTM A276 or ASTM A479/A479M, Type 304.

- E. Aluminum Sheet: **ASTM B209** (ASTM B209M).
- F. Extruded Aluminum: **ASTM B221** (ASTM B221M).

2.8 FABRICATION

- A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated.
- B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install recessed floor grilles and frames and drain pans to comply with manufacturer's templates and written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining poured resinous flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

3.2 PROTECTION

- A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124816

DIVISION 23 – MECHANICAL**SECTION 23 00 00 - MECHANICAL GENERAL REQUIREMENTS****PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings, provisions of the Contract, and Division 01 Specification Sections, apply fully to work in this section.
- B. All requirements of this Section shall govern the work under all of the Sections of Division 23 - Mechanical including:

Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS

Section 23 01 50 MECHANICAL: VIBRATION ISOLATION

Section 23 02 50 MECHANICAL: PIPE HANGERS AND SUPPORTS

Section 23 03 00 MECHANICAL: FIRE SAFING / FIRESTOPPING

Section 23 04 00 MECHANICAL: INSULATION

Section 23 04 40 MECHANICAL: PIPE CLEANING TESTING

Section 23 10 00 PLUMBING

Section 23 15 00 PLUMBING: FIXTURES

Section 23 80 00 HVAC: AIR HANDLING SYSTEMS

Section 23 85 00 HVAC: EQUIPMENT

Section 23 90 00 HVAC: CONTROL SYSTEM / ANALOG

Section 23 94 00 HVAC: CONTROL SEQUENCE OF OPERATIONS

Section 23 95 00 HVAC: TESTING ADJUSTING BALANCING

1.02 DEFINITIONS:

- A. The term "Mechanical" applies and refers to all work specified within Division 23 and as indicated on the Contract Drawings.
- B. The term "Mechanical Contractor(s)" applies and refers to all those furnishing labor and materials for the completion of the work specified within Division 23 and as indicated on the Contract Drawings. All subcontractors and sub-subcontractors, as defined within the General Conditions, are collectively termed "Mechanical Contractor(s)". The requirements of Section 23 00 00 apply to all Mechanical Contractor(s).
- C. The term "this Section" shall mean "this Section of the Specifications". The term "this Division" shall refer to "Division 23 - Mechanical" and all of its Sections.

- D. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".
- E. "Concealed" shall mean hidden from sight in trenches, chases, furred spaces, shafts, above hung ceilings, embedded in construction, in attic spaces or in crawl spaces.
- F. "Work by others" shall mean "not by Mechanical Contractor but provided or installed by the General Contractor or any other sub-contractor performing their respective work within this contract".

1.03 INTENT:

- A. The intention of these Specifications and Drawings is to call for finished work, tested and ready for operation.
- B. The drawings are diagrammatic and not intended to show every pipe, offset, associated equipment or other minor detail. Provide such parts, materials, and appliances as required to complete the systems for operation.
- C. Equipment and/or materials specified in the singular shall be provided in quantities as required for complete systems.

1.04 PROJECT MEETINGS:

- A. Provide knowledgeable personnel to attend meetings scheduled (Include all trades) as required.

1.05 COORDINATION / COOPERATION:

- A. Cooperate with all other tradesmen, Contractors and Subcontractors to facilitate the completion of the work as a whole, as indicated on the drawings and specifications.
- B. Wherever work interconnects with the work of other Contractors, coordinate the work with these Contractors to insure that all information is available such that all equipment and material may be installed properly with all necessary connections and appurtenances.
- C. Coordinate the location of all openings required for apparatus and transmit this information sufficiently in advance, so that all openings in walls, slabs, roofs, piping supports, inserts and equipment including sleeves and access doors may be properly installed.
- D. Where work will be installed in close proximity to, or interfere with the work of other trades, assist in coordinating space conditions to a satisfactory adjustment. If directed by the Architect, provide composite working drawings indicating the proposed adjustment.
- E. All distribution systems which require pitch or slope such as plumbing drains, sprinkler piping, and condensate drain piping shall have the right of way over those systems which do not require pitch. Where the work to be installed is located by detail and or elevation, that work shall have the right of way over items indicated as schematic or without indicated location (electrical conduits, control conduits etc). Confer, coordinate and cooperate with other trades as to the location of pipes, lights, and apparatus and install all work to avoid conflict and interference.
- F. Work that is installed to interfere with the work of others prior to proper coordination and cooperation, shall be adjusted to correct the situation without extra compensation.

1.06 DELAYS:

- A. Become fully informed as to availability dates of materials and equipment to be provided. Where availability dates interfere with the progress of the work or the Sequence of Operations, notify the Architect and transmit all recommendations, including any changes in costs, to remedy the situation.
- B. Final decisions as to the procedure in cases of delays, strikes, and acts of God shall be in writing by the Architect. DO NOT alter work, materials or equipment without written authority by the Architect.
- C. Order equipment and materials in advance of the time of installation to avoid project delays.

1.07 WORKMANSHIP:

- A. Workmanship shall be of the highest quality, in the best practice of the trade, and none but competent mechanics skilled in their respective trades shall be employed. Materials and apparatus shall be provided, delivered, erected, connected, and finished in every detail; and shall be so selected and arranged as to fit properly into building spaces.

1.08 DRAWINGS:

- A. Refer to all Contract Drawings for a full comprehension of the extent and detail of the work. Drawings are supplementary to the specification and work indicated, mentioned or implied in either is considered as specified by both.
- B. Work indicated on the drawings is intended to be approximately correct to scale, but dimensions and details are to assume precedence.
- C. Typical details apply to every like item. They are not repeated in full on all of the drawings, which are diagrammatic only, but with the intention that such typical details are fully applicable.

1.09 INTERPRETATION OF PLANS AND SPECIFICATIONS:

- A. The Architect, whose interpretation shall be final, conclusive and binding on all parties, shall decide questions or disagreements as to the true intent of this specification and drawings.

1.10 CODES, ORDINANCES, AGENCIES:

- A. The State Building Code, Fire Code and local ordinances, with all amendments to date, are hereby made a part of these specifications. Work shall conform to State Codes and Regulations.
- B. The codes and ordinances shall be considered as a minimum requirement, and work specified or indicated on the drawings in excess of code requirements shall be provided.
- C. Notify authorities and agencies; obtain all permits; obtain all official licenses and certificates; obtain all necessary approvals of authorities having jurisdiction; file all necessary plans; perform all necessary testing; and transmit to the Architect all certificates of inspection.

- D. Materials provided and work installed shall comply with the National Fire Codes of the NFPA; with the requirements of local utility companies; and with the requirements of agencies having jurisdiction.
- E. Electrical materials and equipment shall be U.L. approved or listed. All electrical equipment shall be in compliance with the Energy Conservation Code and shall meet or exceed all operating energy efficiency requirements.

1.11 FEES, PERMITS:

- A. Include the following costs within the bid amount;

The payment of all fees in connection with obtaining necessary permits, licenses, and inspections.

Note: All contractors and subcontractors must file for permits

The costs of all utility connections and extensions, to include the purchasing of meter(s) and appurtenances.

The payment of applicable taxes.

PART 2 - SUBMITTAL GENERAL REQUIREMENTS

2.01 SUBSTITUTIONS, CONTRACTOR'S OPTIONS:

- A. See Supplementary Conditions of the Contract for Construction.
- B. Where only one product is specified, and the intention is to match existing equipment or materials within the mechanical system, the contractor shall submit his base bid on the product specified.
- C. Where only one product is specified, but is followed by the phrase "or approved equal" the Mechanical Contractor(s) must submit his base bid on the product specified. Proposed substitutions for equivalent products shall be submitted for review under SUBSTITUTION PROPOSALS.
- D. Where two or more products are specified for one use, the Mechanical Contractor(s) shall select from those products mentioned. Where specific model of one manufacturer is specified and other manufacturers are listed, the products of listed manufacturers must be equal in all major respect.
- E. It remains the responsibility of the Mechanical Contractor to review the dimensions, weights, required clearances, required supporting structure, etc. of the equipment of "other" manufacturer's relative to the proposed use. The Mechanical Contractor is responsible for any changes to the design and to the building fabric (i.e. supporting structure, mechanical spaces, piping or ductwork connections and routing, etc.) resulting from the use of equipment of the "other" manufacturers.
- F. No proposal for extra charges resulting from the use of equipment of the "other" manufacturers will be entertained for approval.
- G. Where products are specified by reference standard, select any product that meets the standards by any reputable manufacturer.

2.02 SUBSTITUTION PROPOSALS:

- A. Refer to the Schedule of Submissions for the time period allowed for submission of substitution proposals. The proposal shall state the exact products proposed for substitution and include a cost difference in total savings to the Owner for each proposal.
- B. Include in the proposal complete engineering data, shop drawings, samples and state whether related changes in the project are involved if the proposal is accepted.
- C. No substitutions of products, materials or methods are permitted without written authority by the Architect.
- D. Where no substitution proposal is made within the specified time period, products, materials and equipment shall be submitted and installed as specified.
- E. See Division 01 Specification Sections: Review additional requirements for substitutions.

2.03 SUBMISSIONS:

- A. Refer to the Schedule of Submissions below. Also refer to SUBMITTALS within other Sections of Division 23 in which some of the shop drawings to be submitted are listed. The listing is a minimum listing only. Submit lists of products and subcontractors; detailed drawings, catalog data of all products, equipment and materials required to complete the project and no item shall be ordered, delivered or installed until the reviewed shop drawing submittal is in the possession of the installing contractor.

2.04 SCHEDULE OF SUBMISSIONS:

ITEM	TIME PERIOD	COPIES
LIST OF SUBCONTRACTORS	10 days	7
LIST OF MANUFACTURERS/PRODUCTS	15 days	7
SUBSTITUTION PROPOSALS	20 days	7
SHOP DRAWINGS	25 days	7

Note: The time period above is based on the number of working days after the signing of the contract.

2.05 LIST OF SUBCONTRACTORS:

- A. Submit a complete LIST OF SUBCONTRACTORS proposed for use; including complete firm names, address, and phone numbers.

2.06 LIST OF MANUFACTURERS / PRODUCTS:

- A. Submit a complete LIST OF MANUFACTURERS of materials and equipment specified within this section proposed for use; including materials and equipment proposed by all subcontractors. Partial lists will not be accepted.

2.07 COORDINATION DRAWINGS:

- A. Coordination Drawings are required to be completed by all trades for the project.
- B. The coordination drawings shall be based upon information contained in the design drawings. It shall be recognized that the work indicated on the design drawings is intended to be approximately correct to scale, but dimensions and details are to assume precedence. It shall also be recognized that the design drawings are schematic in nature and are not intended to indicate all offsets that may be required.
- C. Coordination Drawing Submittals shall contain sufficient plans, elevations, sections, details and schematics to describe work clearly. Drawings shall be 1/4" = 1'-0" scale and shall indicate work of other Sections where physical clearances are critical and where interferences are possible. Provide larger scale details as necessary. Fire Protection Drawings shall show elements of Architect's reflected ceiling plan, HVAC ductwork, walls, partitions, diffusers, registers, lights, grilles, fire dampers, sleeves and other aspects of construction as necessary for coordination.
- D. These Coordination Drawings shall be prepared electronically on AutoCad and shall be updated as required to reflect as installed conditions.
- E. Coordination Drawings at 1/4" = 1'-0" scale shall be prepared by the Plumbing Contractor in concert with the HVAC, Fire Protection, and Electrical Contractors and these drawings shall be used to work out the coordination of all work of all Trades as specified in each applicable Section. Plumbing, Fire Protection, HVAC, Automatic Control and Electrical systems shall be shown and coordinated on these drawings in the order listed by the respective Contractors.

2.08 SHOP DRAWINGS:

- A. Provide shop drawings (drawings, catalog cuts, spec sheets) for ALL equipment and products to be installed on the project.
- B. Label all shop drawing submittals as follows:
 - Project Name
 - Contractor's Name
 - Specification paragraph
- C. Mark in ink all catalog cuts, pamphlets to indicate options, accessories and model numbers.
- D. Data submitted which is general and not labeled and marked as required above will not be accepted.

2.09 SHOP DRAWING REVIEW:

- A. Review will be based on manufacturer's published data, and ratings. Any product, material or equipment submitted not in accordance with these specifications will be rejected.
- B. Where substitute products are proposed and no exception is taken, the Mechanical Contractor shall assume the entire responsibility for any changes in the work required or occasioned by the use of the substitute.

- C. Review of shop drawings is not a guarantee of suitable measurements, quantities required, or that other changes in the work are not required to permit proper installation. Review does not mean the submittal has been checked for every detail, or that the Contractor is relieved from responsibility of providing complete systems as required by the Contract Documents.

2.10 RECORD DRAWINGS:

- A. During the period of on site construction, keep at the site, separate from construction documents, accurate construction drawings marked to indicate actual installation of all work of all of the trades specified within Division 23. Drawings shall reflect addenda, change orders, VE items or substitutions accepted for the project. Drawings shall be “red lined” with all modifications on a weekly basis.
- B. All under-slab, concealed or underground piping shall be located by dimension sufficient for exact location determination in the future.
- C. All concealed work shall be accurately located and all points of adjustment (dampers etc) shall be shown in actual locations.
- D. Final Record Drawings shall be prepared by the Mechanical Contractor on a set of reproducible drawings which accurately indicate all of the work as installed.
- E. All adjustable setpoints shall be indicated on the drawings at the device sensor or point of adjustment.
- F. Transmit originals and two sets of prints for review at project closeout.
- G. At project closeout transmit final Record Drawings in electronic format indicated below
 - AutoCad dwg files
 - PDF files

2.11 OPERATING AND MAINTENANCE MANUALS:

- A. Compile complete manuals including manufacturer’s data, bulletins, maintenance instructions, approved shop drawings, parts lists, warranties etc for all equipment and materials provided.
- B. Equipment data shall include:
 - Manufacturer / Models
 - Input and output capacities
 - Service and maintenance recommended actions
 - Manufacturers published instructions
- C. Operations written narrative:
 - Assemble and index three copies of each manual within suitable binders (8 ½” x 11”). Provide cover clearly indicating project title and “OPERATION AND MAINTENANCE MANUAL”.

Transmit manuals to the Architect for review in advance of scheduled instruction periods.

2.12 GUARANTEE:

- A. Transmit to the Architect a written guarantee from each of the Mechanical Contractors stating that the work provided under these specifications is guaranteed against defects in material and workmanship which shall become apparent during the period of one (1) year two (2) years from acceptance of the systems.
- B. The written guarantee shall list all contractors with contact names and phone numbers, and shall indicate the dates of acceptance of systems and any extended warranties.
- C. The written guarantee shall be posted as directed by the Architect
- D. Extended guarantee or warranty of certain equipment may be required. See specification of individual items.

PART 3 - PRODUCT HANDLING

3.01 PROTECTION AND STORAGE OF MATERIALS:

- A. Equipment and materials furnished shall, at all times, be protected from weather, vandalism, and other construction phase exposures to include paint, plaster and dust.
- B. Outdoor storage of equipment not intended for outdoor use will NOT be permitted.
- C. Properly protect all pipe openings with temporary caps to prevent obstruction and damage. Post notices and prohibit use of fixtures, equipment and apparatus prior to the completion of the project.

3.02 RIGGING, HOISTING, STAGING:

- A. Furnish rigging, hoisting equipment, staging and other services necessary for delivery and installation of any product provided. Remove rigging, staging from the site when no longer required.

PART 4 - PROJECT CONDITIONS

4.01 FIELD MEASUREMENTS AND DISCREPANCIES:

- A. Base all measurements, both horizontal and vertical, from referenced points established by the General Contractor.
- B. Prior to the start of work, check drawings and specifications for discrepancies.
- C. Field verify spaces, dimensions and clearances where materials and equipment will be installed.
- D. Where discrepancies arise which prevent or alter installation, notify the Architect.

- E. Where discrepancies between drawings and specifications; between different drawings; or where the work of others is affecting work under this Division notify the Architect.
- F. Where the work herein required is not clearly understood apply to the Architect for further clarification.
- G. In each instance above, the Architect shall clarify the discrepancy and the Mechanical Contractor(s) shall complete the work at no additional cost to the Owner.

4.02 ACCESSIBILITY:

- A. Install work so that parts requiring access are readily accessible for inspection, operation, maintenance, repair and removal. Minor deviations from the drawings may be made to accomplish this, but changes of magnitude shall not be made without written approval of the Architect.

4.03 TEMPORARY OPENINGS:

- A. Examine contract documents and ascertain whether special, temporary openings will be required for the installation of apparatus and notify the Architect.

4.04 SOLDERING, BRAZING, WELDING:

- A. Soldering, brazing, welding or other open flame operation shall be conducted only when a person, with approved firefighting equipment, trained in its use is on duty at the location of the operation.

4.05 INTERRUPTIONS TO SERVICES:

- A. Where a temporary shutdown of an existing operating system is required, schedule the work at times designated by the Architect. Work requiring an interruption shall be completed by continuous performance, including overtime, to minimize the shutdown interruption.

4.06 USE OF INSTALLATION BY OWNER:

- A. The Owner may use parts of the installation, including mechanical systems when complete, but such use shall not be considered as acceptance of the work in lieu of written certificate from the Architect.
- B. Schedule obnoxious, noisy, or otherwise objectionable portions of the work at times approved by the Architect. Overtime work must be approved in writing.

PART 5 - PRODUCTS AND INSTALLATION

5.01 MATERIALS:

- A. Provide new, first-class quality materials and apparatus, unless specifically directed otherwise by this specification or contract drawings.

5.02 ON-SITE INSPECTIONS

- A. Arrange for and coordinate all on-site inspections with the authorities having jurisdiction.
- B. Review project schedules and insure that such inspections as are necessary are completed in a timely manner.

5.03 MANUFACTURER'S RECOMMENDATIONS, IDENTIFICATION:

- A. Obtain necessary data on equipment and materials to insure proper installation and testing in accordance with manufacturers' recommendations. Install all equipment and material per the recommendations and instructions of the manufacturer; this requirement shall take precedence over other requirements of this specification unless specifically noted.
- B. Equipment and materials furnished for this work shall bear the manufacturers' nameplate, trademark or suitable identification permanently affixed. The nameplate of a contractor or distributor is not acceptable.

5.04 COLOR SELECTION; MATERIALS / EQUIPMENT:

- A. Exterior: Provide metal louvers, grilles, fans, intake units, etc of equal coloration as indicated for exterior metal trim for the project. All exterior metal trim shall match.
- B. Interior: Product color shall be selected by the Architect. Provide complete color selection charts, chips with product submittals. Equipment to be painted shall have prime coat, anti-rust as necessary, factory applied.

5.05 QUIET OPERATION:

- A. Equipment and apparatus provided shall operate under all conditions of load without sound or vibration which are considered objectionable by the Architect. Eliminate same in a manner approved by the Architect.

5.06 ELIMINATION OF TRANSMISSION OF VIBRATION:

- A. Eliminate objectionable transmission of vibration from mechanical systems to building structure. Select and install equipment with proper vibration control equipment and provide isolators on piping, equipment, ductwork and apparatus where necessary to prevent transmission of sound and vibration. Isolate all rotating equipment from the building structure.

5.07 BASES AND SUPPORTS:

- A. Provide all bases and supports for mechanical equipment not part of the building structure of required size, type and strength, as approved by the Architect.
- B. Equipment, bases, and supports shall be anchored to the building structure to prevent shifting of position under all conditions. Attachments shall be strong and of a durable nature and any attachments, anchors, piers, bases, or other supports that are, in the opinion of the Architect, not strong enough or durable shall be replaced as directed.

- C. Equipment bases required for roof mounted equipment shall be as recommended by the roof manufacturer and the Architect.

5.08 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS:

- A. Provide steel members, channels as required for the proper installation, mounting and support of equipment provided. Pipe shall not be allowed for use as miscellaneous steel supports. All steel used for support shall be firmly attached to the building construction.
- B. Size and type of supporting steel shall be determined by the installer and shall be of sufficient strength and size to allow only a minimum deflection under all conditions of load.
- C. All steel provided for support shall be free from rust and shall be primed with antirust paint or shall be galvanized. All exterior steel shall be galvanized.

5.09 SLEEVES, PLATES:

- A. Provide and locate sleeves, plates, anchors, and inserts required; mark openings before floors and walls are constructed or core bored.
- B. Provide sleeves for piping passing through floors, walls, roofs, partitions and masonry. Sleeves for concrete or masonry shall be Schedule 40 steel pipe of size to allow for pipe expansion and passage of vapor barrier insulation. Other sleeves shall be 20 gauge galvanized sheet steel with lock-seam joint.
 - Terminate sleeves flush with walls, partitions, and ceiling.
 - Terminate sleeves 1/2" above finished floor where piping is exposed.
- C. Provide support systems such that access to equipment or appurtenances requiring access are not impeded in any way.

5.10 PIPE ESCUTCHEONS:

- A. Provide escutcheons for pipe penetrations of building construction exposed to view.
- B. Escutcheons shall closely fit bare or insulated pipe and shall conceal pipe sleeves.
- C. Escutcheons in unfinished areas shall be of solid or split pattern steel, cast iron or malleable iron.
- D. Escutcheons in finished areas shall be of chrome plated, solid pattern brass.

5.11 FIRE SAFING: PIPING, DUCTWORK AND EQUIPMENT OPENINGS:

- A. Fire Stop: Pack all piping, ductwork and equipment openings and sleeves full depth with approved fire safing material to fully seal all openings.
- B. Seal all sleeves, core holes, etc. through floors, walls and ceilings with approved fire safing material or fire safing system. Fire safing materials and systems shall be as manufactured by Nelson "Flame-seal", 3-M Systems, Hilti Systems, Metacaulk Firestopping or Dow Corning. Install in accordance with manufacturer's printed instructions.

- C. Firestopping is to meet UL ratings for each penetration type and material for floors, walls and ceilings. Coordinate with Architectural Drawings for exact requirements and ratings at various conditions.
- D. Refer to Section 23 03 00 Mechanical Fire Safing for Specific fire safing requirements.

5.12 MACHINERY DRIVES:

- A. V-belt drives shall be designed to transmit safely equal to or greater than 150% of motor horsepower rating, but not less than manufacturer's recommendation for type of service intended.

5.13 PROTECTIVE GUARDS:

- A. Provide protective guards at all belt drives, rotating shafts and rotating equipment. If not a part of equipment, guards shall be of galvanized angle frame with galvanized wire mesh, readily removable for service.

5.14 PORTABLE OR DETACHABLE PARTS:

- A. Retain and be responsible for all portable or detachable parts provided as a part of the work. Install these parts just prior to project closeout when the site is secure. Replace all lost, stolen or damaged items prior to project acceptance.

5.15 LABELING: LABELS, VALVE TAGS, PIPE, DUCTWORK, AND EQUIPMENT IDENTIFICATION:

- A. General:

All new systems provided as a part of the contract are to be labeled in a manner that conforms to the following specification. All existing systems, at points of new connection or reconfiguration, shall also be labeled in accordance with the following standards.

All labels, unless otherwise directed, shall be made of hard black plastic. Lettering shall be affected by engraving or incising, and shall be white. All labels shall be securely mechanically attached with screws or equal. Letters and numbers shall be at least 1/4" high, or larger, if required to read clearly from a normal viewing distance. All labels must be made to withstand the temperatures and atmosphere in the area they are to be mounted. Any labels which are to be mounted outdoors must be treated to prevent degradation from sunlight, and must be mounted with stainless steel screws.

Where air or hydronic systems have been balanced, the Contractor shall permanently mark, ON THE DEVICE, the correct balancing setting of each valve, damper, or similar device. This will allow our skilled tradesmen to restore proper operation if the device is tampered with.

All Mechanical Systems to be labeled in accordance with these requirements include, but are not specifically limited to, the following: Additional, specific items may require to be labeled as directed separately in other sections of this specification package.

- B. Pipe Labeling:

Labels for piping shall be Seton Setmark or equal. Labels to identify zone number may be self-stick type, but must wrap completely around pipe, and be adhered to itself. All self-stick labels must be plasticized to withstand washing with commercially available cleaning products.

C. Label must show:

Fluid contained and service

Flow direction

D. Pipe Marker Lettering:

Outside Diameter of Pipe Covering	Required Size of Lettering	Tag Length
3/4" to 1-1/4"	1/2"	8"
1-1/2" to 2"	3/4"	8"
2-1/2" to 6"	1-1/4"	12"
8" to 10"	1-1/2"	24"
Over 10"	3-1/2"	32"

E. Pipe Marker Color Standards:

Pipe Line Type	Description	Background Color	Lettering Color
Gas	Natural Gas	Yellow	Black
Water	Hot Potable Water	Yellow	Black
	Cold Potable Water	Green	White
Waste	Sanitary Waste	Green	White
	Sanitary Vent	Green	White

F. Valve Tagging:

Labels for valves shall be hard plastic and shall be no smaller than 2" in diameter.

Tags shall have the valve number incised or recessed into the plastic. The tag background and tag lettering shall conform to the color scheme as defined by this standard.

All valve labels shall be permanently attached with steel or brass jack chain, tags shall be color coded to correspond to the following color chart, if product is not listed, consult the Architect/Engineer.

Balancing Valves shall also be provided with tags, permanently marked, with the correct balancing setting. This will allow our skilled tradesmen to restore proper operation if the device is tampered with.

All valve labels must show a number that corresponds to a clearly posted valve legend.

G. Valve Tag Color Standards:

Pipe Line Type	Description	Background Color	Lettering Color
Gas	Natural Gas	Yellow	Black

Water	Hot Potable Water Cold Potable Water	Yellow Green	Black White
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H. Equipment:

All pieces of equipment shall be labeled with hard plastic, black plate labels. Lettering shall be white and must be made by engraving or incising the plate.

Any unit which is designed to move volume air shall be appropriately labeled. The hard plastic plate shall show brand; model; system number and function; areas served; design CEM; type of sheave; voltage and phase of service; HP and frame of motor; number and size of belts.

EXAMPLE:

UNIT NUMBER: HVAC 1-1
 TRANE BU-15
 ZONE AC-1 / AIR COND / 21,000 CFM
 ADJ Shv - 5 HP - 208/3
 FRM - (3) 4L190 BELTS
 THIRD FLOOR NORTH

Show unit number as stated on the Drawings.

HVAC unit tags shall also state unit service or function.

I. Air Filter Racks and Media:

Filter racks shall be labeled adjacent to the nearest access plate or door, through which the filters may be changed. The hard plastic plate shall show the number of filters required for a complete change-out, and the size of the filters carried on the rack.

EXAMPLE:

24 FILTERS 30x30x4

J. Ductwork: Main Trunks, Main Branches Only:

Labels on ductwork shall be Seton Ventmark or equal. Each label shall show the required information as shown above. Labels shall be mounted over covering on the duct. The label must be mechanically attached. Adhesive backing alone is not acceptable.

Ducts shall be labeled every 30 linear feet of duct. Each duct branch shall be labeled with rooms and areas served.

Show number of system and identify what is carried within. Exhaust Air, Conditioned Air, etc.

Ductwork tags shall also state branch's service or function.

K. Ductwork Accessories:

Show, AT THE DEVICE OR ACCESSORY LOCATION, tags indicating the type of device or accessory located within the ductwork. (i.e. dampers; eliminators; access panels; filter racks; water coils; etc.)

Where systems have been balanced, the Contractor shall permanently mark ON THE DEVICE the correct balancing setting of each damper, or similar device. This will allow our skilled tradesmen to restore proper operation if the device is tampered with.

L. Electric Motor Starters/Variable Frequency Drives:

Show equipment controlled; Primary and control voltage and phase located within.

M. Automatic Control / Temperature Control Devices:

Show, AT THE LOCATION OF THE DEVICE, tags indicating the type of device or accessory,

i.e. temperature, humidity, pressure and current sensors; freezestats; etc. Identify device function.

N. Automatic Control Systems Electrical Conduits:

Labeling for conduit shall be factory-made. Painting or stenciling is not acceptable. Lettering shall include the highest voltage carried within, and shall identify phase. Labeling shall repeat every 30 linear feet. Adhesive backed labels are acceptable here provided the label wraps around the entire circumference of the conduit, and adheres to itself. Otherwise, mechanical fastening with strap is required.

O. Automatic Temperature Control Cabinets:

Each device in each control cabinet shall be affixed with a clear number that shall correspond to a clearly posted control legend. This legend shall identify each device by zone and function. The outer door of the cabinet itself must be labeled with its contents.

In a place within the Mechanical Room selected by the Owner, the Contractor shall mount a clear, reduced set of building prints, showing the systems installed by the Contractor, as-built. These prints shall show zoning by color coding, including all ducts and hydronic piping. Major pieces of equipment shall be highlighted. These prints shall be mounted under a sheet of clear Lexan or Plexiglass.

P. Contractor's Warranty Plate:

Must show the name, address, and telephone number of the contractor who completes the installation, and the date of final acceptance of the installation. THIS DATE WILL BE PROVIDED BY THE OWNER.

Q. Equipment and Systems Concealed above Suspended Ceilings:

Where valves, equipment, electric motor starters or other items subject to routine service are mounted in a concealed area above an opaque ceiling, the ceiling must be marked with an engraved plastic disc directly under the serviced device. The disc shall carry appropriate nomenclature that corresponds to a clearly posted legend. The legend shall be counted in the mechanical room. Use Seton or equal with push-in tack backing.

R. Access Panels:

On each access panel or door, clearly label the door with a legend description of what is behind the door.

PART 6 - PROJECT CLOSEOUT

6.01 TESTING AND ADJUSTING:

- A. Where testing leaks develop or the installation fails to function properly, make all necessary corrections and repeat tests until all defects have been remedied. Corrections made shall be to the satisfaction of the Architect prior to the acceptance of the work.
- B. Furnish labor, material, and instruments necessary for those tests required. See respective Sections for test requirements.
- C. In addition to required tests specified, provide qualified personnel to adjust all parts of systems such that proper, economical operation is achieved.
- D. Conduct and be responsible for all testing and adjusting of all complete systems to include providing all labor and equipment required and the submission of all reports. Systems shall be operated, tested and adjusted in all modes of operation.
- E. All defects and deficiencies or failing to operate properly shall be corrected by the Contractor and the systems shall be re-tested or readjusted prior to final acceptance.
- F. Any and all damage caused by tests shall be the responsibility of the Contractor.
- G. The balancing of the air conditioning systems shall be performed by an independent balancing contractor.
- H. SEE SECTION 23 95 00 TESTING AND BALANCING.

6.02 OPERATION, MAINTENANCE INSTRUCTIONS:

- A. Schedule and conduct, after the mechanical -- electrical systems are complete and operational, instruction periods for Owner's personnel. Operation and Maintenance Manuals shall be distributed to the Owner in advance of scheduled instruction periods.
- B. Instruction periods shall include:
 - Normal and emergency start up and shut down of all systems
 - Normal maintenance requirements for all systems and equipment
 - Maintenance tasks and schedules for proper operation.
 - Review of Operations and Maintenance Manuals
 - Review of AS BUILT drawings
- C. All instruction periods shall be video taped with two copies provided to the Owner.
- D. In addition to instruction periods; a thorough project walk through shall be conducted and the location and access to all points of operation, control and maintenance shall be indicated and noted.
- E. At the completion of instruction periods forward a letter (5 copies) stating the names of those giving and receiving instructions.

6.03 LUBRICATION:

- A. Lubricate, as required, all motors, bearings, fans, etc. before operation of any equipment. Provide a final lubrication when system is accepted by Owner.

6.04 CLEANING:

- A. At completion, thoroughly clean all parts of the installation. Equipment, materials and apparatus shall be free of grease, paint, plaster and debris. Any damage to the building due to leakage or by other means shall be properly and immediately cleaned and repaired to the satisfaction of the Architect.
- B. At completion, replace, clean, such parts of systems as filters, strainers, and traps. This work shall be done after site is substantially free of dust.

6.05 SCRATCHES, SCRAPES, DENTS:

- A. Repair and correct, to the satisfaction of the Architect, all minor equipment deficiencies such as scratches, scrapes, dents; where corrective methods are not satisfactory, replace the item.

6.06 PROJECT CLOSEOUT SUBMITTALS:

- A. Review all project closeout submittal requirements of this specification and transmit in a timely manner.
- B. Provide all required items including (but not limited to):

Record As Built Drawings

Written Guarantee including any extended warranties

Operating / Maintenance Instructions Memorandum

Testing / Adjusting Logs

6.07 SERVICE:

- A. At completion, provide the Architect with a complete listing of all service contractors including 24-hour phone numbers.
- B. Provide service on equipment furnished for a period of one year from the date of final acceptance. Render service promptly at the request of the Owner. This shall not be construed to include routine maintenance.

END OF SECTION 23 00 00

SECTION 23 00 50 - MECHANICAL ELECTRICAL COMPONENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings, provisions of the Contract, and Division 01 Specification Sections, apply fully to work in this section.
- B. Refer to all construction documents including all of the Sections of Division 23 for a complete understanding of the electrical components required. Coordinate with all trades.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 01 50	MECHANICAL: VIBRATION ISOLATION
Section 23 03 00	MECHANICAL: FIRE SAFING / FIRESTOPPING
Section 23 10 00	PLUMBING
Section 23 15 00	PLUMBING: FIXTURES
Section 23 85 00	HVAC: EQUIPMENT
Section 23 90 00	HVAC: CONTROL SYSTEM / ANALOG
Section 23 95 00	HVAC: TESTING ADJUSTING BALANCING

1.02 SCOPE:

- A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

1.03 RELATED WORK:

- A. conjunction with this section shall be as designated below:

General Contractor:

- Cutting, Patching, and Painting
- Openings in roofs / Flashing
- Openings in walls
- Equipment foundations and bases
- All temporary heating

Electrical Contractor:

Power wiring for electrical equipment provided within this section.

1.04 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following submittals shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

- Motor Contactors
- Motors
- Electrical connection diagrams
- Electric Motor Starters

1.06 PROJECT CLOSEOUT:

- A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements, including:
 - Testing and Adjusting
 - Record Drawings
 - Operating, Maintenance Instructions
 - Written Guarantee
 - Lubrication, Filters
 - Operating, Maintenance Manuals
 - Cleaning
 - Test Log
 - Letters of compliance.

PART 2 - ELECTRICAL PRODUCTS / DATA

2.01 GENERAL:

- A. Provide new, standard products, materials and equipment which comply with the specification; are undamaged and unused at the time of installation; are complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use.

2.02 COMPONENT INSTALLATION:

- A. Provide the electrical components to the electrical equipment installer for mounting and installation.

- B. Combination Electric Motor Starters and Variable Frequency Drives shall not be mounted directly on any mechanical piece of equipment unless specifically indicated on the mechanical drawings.

2.03 ELECTRICAL CURRENT CHARACTERISTICS:

- A. Refer to the Electrical Drawings and field coordinate the electrical components of the mechanical systems specified in this Division.

- B. Mills Camp:

Building Electrical Service: 120 / 208V, 3 phase, 4 wire

Motors: 1/2 HP and larger: 208V, 3 phase
Smaller than 1/2 HP 120V, 1 phase

- C. All Other Camps:

Building Electrical Service: 120 / 240V, single phase, 3 wire

Motors: 1/2 HP and larger: 240V, 1 phase
Smaller than 1/2 HP 120V, 1 phase

2.04 ELECTRICAL CONNECTIONS AND WIRING:

- A. The Electrical Contractor shall provide power wiring complete from power source to motor or equipment junction, including power wiring through starters and line voltage control apparatus. The Mechanical Contractor(s) shall furnish and the Electrical Contractor shall install all electric motor starters.
- B. The mechanical/temperature controls contractor(s) shall provide all wiring, relays, transformers, devices, etc. necessary (regardless of voltage) for automatic controls.
- C. Wiring provided by Mechanical Contractor(s) shall be in accordance with the National Electric Code, local and state codes and Division 016. Wiring shall be in conduit, regardless of voltage, unless noted otherwise.

2.05 ELECTRICAL DEVICE COORDINATION:

- A. Coordinate electrical devices, motors with the Electrical Contractor and electrical drawings as to voltage, starter location and control required. Provide electrical data and wiring diagrams to the Electrical Contractor.
- B. Power and / or signaling requirements for each mechanical device shall be coordinated with the Electrical Contractor prior to the start of the electrical systems installation
- C. Do NOT allow installation of starters and drives mounted directly to mechanical equipment without prior approval. All devices are to be mounted with separate supports as required.
- D. Do NOT operate electrical devices until:

Voltage available on all phases is in accordance with nameplate.

Direction of rotation is checked.
Full load voltage reading is not less than nameplate.
Full load amperage reading is not greater than nameplate.

- E. The Mechanical Contractor(s) shall furnish the Electrical Contractor with copies of the Mechanical System floor Plans, (Plumbing, Fire Protection and HVAC). These drawings shall have all equipment and systems requiring electrical connection clearly marked in red. Copies of these "Electrical Coordination Drawings" shall also be submitted for record.
- F. Power and / or signaling requirements for each mechanical device shall be coordinated with the Electrical Contractor prior to the start of the electrical systems installation.

2.06 ELECTRIC MOTOR STARTERS:

- A. Manufacturer: Cutler-Hammer
Square D
Allen Bradley
General Electric
- B. Types Required:
 - Start/Stop Automatic control at Equipment:
 - Start/Stop Automatic control at Remote Location:
- C. Provide proper heater in all motor starters furnished.
- D. Check proper rating of thermal overloads. Replace any overloads found to be of an incorrect rating. Provide a spare set of thermal overloads for each starter and leave inside starter enclosure.
- E. Provide a minimum of two (2) sets of auxiliary contacts of convertible type N.O. to N.C. for each starter. Motor starters shall have NEMA I enclosures. Those in wet locations shall be NEMA 3R.

END OF SECTION 23 00 50

SECTION 23 01 50 - MECHANICAL: VIBRATION ISOLATION**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.
- B. Refer to all construction documents including all of the Sections of Division 23 for a complete understanding of the electrical components required. Coordinate with all trades.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 02 50 MECHANICAL: PIPE HANGERS AND SUPPORTS

Section 23 03 00 MECHANICAL: FIRE SAFING / FIRESTOPPING

Section 23 10 00 PLUMBING

Section 23 80 00 HVAC: AIR HANDLING SYSTEMS

Section 23 85 00 HVAC: EQUIPMENT

1.02 GENERAL REQUIREMENTS:

- A. Provide vibration isolation supports for all air systems, equipment and piping as outlined below.
- B. Devices shall be selected, installed, and adjusted in a manner to prevent objectionable vibration transmission to the structure.
- C. Seismic restraints are not included in this section of the specification. See Division 23, Section 23 02 00 MECHANICAL SEISMIC RESTRAINT for seismic restraint requirements. All restraints to be separate and not interfere with vibration isolation devices or must be fully consolidated to perform both tasks.

1.03 APPROVED MANUFACTURERS:

- A. Provide all vibration isolation devices, including auxiliary steel bases and pouring forms, as designed by a single manufacturer.
- B. Approved manufacturers: Mason Industries
Kenetics
Amber-Booth
Vibration Mountings and Controls

- C. Engage manufacturer to provide technical supervision of installation of vibration control products.

1.04 SUBMITTALS:

- A. The following submittals shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all inclusive. Provide submittals for all materials and equipment proposed for use on this project.)
- B. Vibration Isolators: Provide catalog cuts, show drawings and other documents as necessary to indicate equipment unit number, isolator type, scheduled deflection, proposed deflection under operating load, spring free height, spring operating height, spring solid height (at coil bind), and spring coil diameter for each isolator. Indicate the weight and lowest rotational speed of equipment supported by each isolator.

Submittal Format:	Example:
Supported Equipment	AHU-1
Isolator Type	Mason SLF
Equipment Weight	4900 lbs.
Lowest Speed	800 RPM
Schedule Deflection	2.5 inches
Operating Deflection	2.6 inches
Spring Free height	9.6 inches
Operating Height	7.0 inches
Solid Height	5.6 inches
Spring Height	6.2 inches
Remarks:	

- C. Shop Drawings: submit shop drawings and manufacturer’s installation instructions for thrust restraints wherever they are required.

1.05 DRAWINGS:

- A. Detailed drawings are schematic only. The size and number of mounts and hangers shall be chosen to meet these specifications.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS:

- A. Steel springs and neoprene elements shall have static deflections under operating load equal or greater than deflections shown on the schedules. Isolators submitted on the basis of rated loads will be disapproved.
- B. All steel springs as installed shall have minimum additional travel to solid (coil bind) equal to 50% of the deflection under operating load.
- C. Spring diameter shall be no less than 0.8 of the compressed height of the spring at operating load.

- D. All neoprene components shall be selected for maximum hardness of 40 durometer, show A rating where possible. In no case shall hardness exceed 50 durometer. Bridge bearing quality neoprene meeting AASHTO Highway Bridge Specifications shall be used in all elastomeric components where installed in irretrievable locations and as noted elsewhere in the documents.
- E. All isolators supporting a given piece of equipment shall be selected for approximately equal spring deflection.
- F. Steel springs shall not take a permanent set when compressed to coil bind.
- G. Steel springs shall be color-coded to allow positive identification after installation.

2.02 CORROSION PROTECTION:

- A. All vibration isolators and associated hardware shall be designed or treated for resistance to corrosion.

2.03 BRATION ISOLATOR TYPES:

- A. Type A: Elastomeric pads shall be waffled or ribbed neoprene pads Mason model Super W., Amber-Booth model NR, Kinetics model NP or approved equal; or ribbed or waffled neoprene pads with steel shim plate Mason model WSW, Amber-Booth model SP-NR style E. or approved equal. Size pads for deflection equal to 10-20% of unloaded height; bridge bearing quality pads shall be loaded 10-15%.
- B. Type B: Neoprene-In-Shear floor mount isolators shall have steel bottom plates with bolt holes for bolting to foundations, a threaded steel insert at top of the mounting for attaching equipment, and friction surfaces both top and bottom. All metal surfaces shall be neoprene covered to resist corrosion. Mounts shall be double deflection and designed for 0.25 – 0.35 inches deflection at rated load. Isolators shall be Mason model ND, Amber-Booth model RVD, Kenetics model RD or approved equal.
- C. Type D: Open spring floor mount isolators shall be free standing and laterally-stable with no housing, and shall have leveling adjustment bolts which shall be rigidly bolted to the equipment. Provide with ¼ inch minimum elastomeric friction pad Type A between the baseplate and the support. Vibration isolator vendor shall size elastomeric pads and associated load distributing shim plates to achieve deflection equal to 10-20% of the vertical thickness of the pads. If the mounting base plate is to be bolted to the structure, elastomeric grommets shall be used between the bolts and the isolators to prevent mechanical short-circuit. Bolt holes shall be properly sized to allow for bushings. The hold-down bolt shall use steel washers to distribute load evenly over neoprene washers. Isolators shall be Mason model SLF, Amber-Booth model SW, Kinetics model FDS or approved equal.
- D. Type E. Restrained open spring floor mount isolators for windy rooftop locations and/or for equipment with operating weight greater than installed weight shall have built-in adjustable limit stops to prevent equipment from rising when weight is removed. Isolators shall be as Type D above plus height-limiting studs and adjustable nuts, with ½ inch minimum clearance around the studs. Isolators shall be Mason model SLR, Amber-Booth model CT, Kinetics model FLS or approved equal.
- E. Type F. Elastomeric hanger shall be a neoprene-in-shear element mounted in a hanger box. The neoprene element shall be molded with a rod isolation bushing that prevents the rod from contacting

the hanger box. Design for 0.25 – 0.35 inch minimum static deflection at rated load. Isolators shall be Mason model HD, WHD, Amber-Booth model BRD, Kinetics model RH or approved equal.

- F. Type G: Spring-and-neoprene-in-series hangers shall contain a steel spring and 0.3 inch deflection elastomeric element in series. Neoprene elements shall be molded with a rod isolation bushing that passes through the hanger box. The diameters of the spring and the hole in the mounting box shall allow for 15 degree misalignment from vertical before mechanical short circuit occurs. Isolators shall be Mason model 30N, Amber-Booth model BSRA, Kinetics model SRH or approved equal.
- G. Type H: Precompressed spring-and-neoprene-in-series hangers shall be equal to Type G including 15 degrees misalignment capability. Isolator shall be precompressed to the rated deflection to allow installation at a fixed elevation. Hangers shall have a release mechanism to free the spring after installation and the hanger is subject to its full load. Deflection shall be indicated by means of a scale. Isolators shall be Mason model PC30N, Amber-Booth model PBSRA or approved equal.
- H. Reference electrical specification for flexible conduit specification.

PART 3 - EXECUTION

3.01 MANUFACTURER'S RESPONSIBILITY:

- A. The vibration isolation manufacturer or his authorized representative shall alert the Engineer to any isolator selections which may experience resonance with the approved equipment and upgrade any isolators that are found to resonate with the supported equipment. He shall provide supervision as may be necessary to assure correct installation and adjustment. He shall submit a written report to the Architect at completion of the Work, certifying correctness of the installation and compliance with Contract Documents.

3.02 GENERAL:

- A. All equipment and piping shall be resiliently mounted on or suspended from approved foundations and supports, with isolation pads, mounts and hangers as specified herein and as shown on drawings. Contractor shall cooperate with the Architect to replace any isolators that need to be upgraded from what is shown on the drawings if equipment operating results in resonance with building natural frequencies.

3.03 MOUNTS AND HANGERS:

- A. Location of all vibration isolation equipment shall be selected for ease of inspection and adjustment as well as proper operation.
- B. Installation of vibration isolation equipment shall be in accordance with the manufacturer's instruction.
- C. All vibration isolators shall be aligned squarely above or below mounting points of the supported equipment.
- D. Isolators for equipment with bases shall be located on the sides of the bases that are parallel to the equipment shaft unless this is not possible because of physical constraints.

- E. Hanger rods for vibration isolated support shall be connected to structural beams or joists, not from the floor slab between beams and joists. Provide intermediate support members as necessary.
- F. Vibration isolation hanger elements shall be positioned as high as possible in the hanger rod assembly, but not in contact with the building structure so that the hanger housing may rotate a full 360 degrees about the rod axis without contacting object.
- G. Adjust all leveling bolts and hanger rod so that the isolated equipment is level and in proper alignment with connecting ducts or pipes.
- H. Limit stops shall be out of contact during normal operation.

3.04 CORROSION RESISTANCE:

- A. Treat isolation systems for corrosion resistance. Coatings damaged during installation shall be repaired.

3.05 INDEPENDENT SUPPORTS:

- A. Isolated systems shall be independent. Piping, ductwork, conduit or mechanical equipment shall not be hung from or supported on other equipment, pipes or ductwork installed on vibration isolators. Maintain 2" clearance between isolated equipment and walls, ceilings and other equipment. Drain piping connected to vibration isolated equipment shall not contact the building structure or other non-isolated systems.

3.06 MOUNT SUSPENDED HORIZONTAL FANS AS FOLLOWS:

- A. Units shall be hung by spring and neoprene in Type G series hangers.
- B. If equipment to be mounted is not furnished with integral structural frames and external mounting lugs of suitable strength and rigidity, approved structural sub-base shall be installed in the field which shall support equipment and to which hangers shall be attached.

3.07 SUPPORT DUCTWORK AS FOLLOWS:

- A. Flexible duct connections as described elsewhere in this specification shall be provided at all fan inlets and outlets between the fan and the first duct hanger or support.
- B. In slabs and walls, provide a ½" to 1" clearance for all penetrating ducts when not precluded by fire dampers. Pack the clear space full-depth with fiberglass insulation, and caulk penetration airtight on both sides of wall or slab.

3.08 SUPPORT PIPES AS FOLLOWS:

- A. For all pipes over 1" in diameter, provide metal sleeves sized for ¼" to ½" clearances at wall and slab penetrations, and seal tightly in place. Pack with fiberglass insulation, and caulk airtight at each end of the sleeve.

END OF SECTION 23 01 50

SECTION 23 02 50 - MECHANICAL: PIPE HANGERS AND SUPPORTS**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.
- B. Refer to all construction documents including all of the Sections of Division 23 for a complete understanding of the electrical components required. Coordinate with all trades.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS

Section 23 01 50 MECHANICAL: VIBRATION ISOLATION

Section 23 04 00 MECHANICAL: INSULATION

Section 23 10 00 PLUMBING

1.02 SCOPE:

- A. Section Includes: Pipe hangers and supports, pipe saddles and shields, and pipe guides and anchors for piping systems except for fire protection piping systems.

1.03 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.04 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The listing below is not intended to be all-inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

- C. Product data sheets: Provide product data sheets for all hangers and supports intended for use on the project.

Pipe Hangers
Hanger Rod
Structural Attachments
Insulation Shields

1.05 QUALITY ASSURANCE:

- A. Pipe hangers, pipe supports, hanger and support accessories, pipe saddles and pipe shields, where applicable, shall comply with provisions of latest edition of ASME Code for Pressure Piping ANSI/ASME B31.1 - Power Piping, Fed. Spec. No. WW-H171, Manufacturers' Standardization Society Standard Practice SP-58 and SP-69, and these Specifications. Where there is conflict, these Specifications shall govern.
- B. Hangers, supports, accessories, saddles and shields shall be load-rated. Load ratings shall be established by manufacturers based upon testing and analysis in conformance with above referenced codes. Manufacturers load tests shall be made on both supporting materials and configurations. Tests shall be performed by independent testing laboratory. Results of these tests shall be made available to the Owner upon request.
- C. Manufacturers shall select hangers, supports, accessories, saddles and shields based on load ratings for applications involved.

PART 2 - PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS:

- A. Manufacturer(s) Specified:

Grinnell Corp.
Carpenter & Paterson, Inc.
Michigan Hanger Co., Inc.
Penn Pipe Hangers Div. of Penn Construction Industries
Power Piping Co.
Basic Engineers, Inc.
National Pipe Hanger Corp.
B-Line Systems, Inc.

- B. General Requirements:

Pipe hangers, supports and accessories specified herein are from master specifications and include hangers, supports and accessories for various piping materials and applications. Refer to related Sections for actual piping materials required for the Project and select hangers, supports and accessories for applications involved.

Auxiliary structural steel, not part of building structure, required for support of piping shall be as required and necessary. Provide unistrut of strength required. Pipe used as supports is not acceptable. All metal surfaces shall be painted. Metal exposed to weather shall be galvanized.

Unless otherwise shown or specified, hangers, supports and accessories for insulated piping systems shall be sized to accommodate pipe insulation system, and shall fit around outside of pipe insulation without crushing and penetrating pipe insulation. Refer to specifications for piping insulation for detailed specifications of insulation and inserts at hangers and supports.

Hangers, supports and accessories exposed to weather or corrosive environments shall be protected with factory-applied corrosion-resistant finish. Provide galvanized or cadmium-plated finish except when it is specified that components and assemblies are to be constructed of stainless steel, or copper-plated steel.

Certain piping shall be resiliently supported. Refer to requirements for vibration isolation.

C. Upper Attachments:

Hanger rod shall be threaded steel, Grinnell Fig. 146 or 140.

Rod couplings shall be steel, Grinnell Fig. 135.

Extension pieces shall be malleable iron, Grinnell Fig. 157

Eye rods shall be threaded steel, Grinnell Fig. 248.

U-bolts shall be steel, Grinnell Fig. 137 with nuts.

D. Pipe Attachments:

Hangers for bare steel pipe 2" and smaller shall be Grinnell Fig. 65 light-duty steel clevis hangers. For 2-1/2" and larger use Grinnell Fig. 260 standard-duty steel clevis hangers.

Hangers for bare copper tubing 4" and smaller shall be Grinnell Fig. CT-69 adjustable, copper-plated steel, swivel ring hangers or Grinnell Fig. CT-65 lightweight, copper-plated steel, adjustable clevis hangers. For 5" and larger use Carpenter & Paterson Fig. 800 CT adjustable, swivel type, copper-plated steel ring hangers.

Hangers for bare cast iron soil pipe shall be Grinnell Fig. 260 standard-duty steel clevis hangers.

Hangers for insulated pipe and tubing of 4-1/2" OD combined and smaller shall be Grinnell Fig. 65 light-duty steel clevis hangers. Above 4-1/2" OD combined, use Grinnell Fig. 260 standard-duty steel clevis hangers.

E. Risers:

Riser clamps for bare steel pipe 20" and smaller shall be Grinnell Fig. 261 steel riser clamps. Weld support lugs on pipe 4" and larger.

Riser clamps for bare copper tubing 4" and smaller shall be Grinnell Fig. CT-121 copper-plated steel riser clamps. For 5" and larger use Grinnell Fig. 261 steel riser clamps with 4 psf lead sheet between pipe and clamp. Braze bronze support lugs on tubing 4" and larger.

Riser clamps for bare cast iron pipe shall be Grinnell Fig. 261 steel riser clamps. Locate under coupling or bell of pipe.

F. Supports:

Supports for bare steel and cast iron run vertically on walls shall be Grinnell Fig. 103 offset pipe clamp, unless shown or specified otherwise.

Supports for bare copper tubing 2" and smaller run vertically on walls in unfinished areas shall be Grinnell Fig: CT-122R copper-plated, rod-threaded, split tubing clamp, with Fig. CT-128R copper-plated, rod-threaded flange and Fig. CT-146 copper-plated threaded rod. In finished areas, provide copper tube to enclose threaded rod.

Supports for bare steel 1-1/2" and smaller, run vertically on walls in finished areas, shall be Carpenter & Paterson Fig. 68 adjustable stamped brass hanger with concealed threaded post and polished brass finish.

Supports for insulated pipe and tubing 12" OD (pipe and insulation combined) and smaller, run vertically on walls shall be Grinnell Fig. 103 offset pipe clamp, unless shown or specified otherwise.

Floor supports for bare and insulated pipe and tubing shall be as follows:

For supporting less than 2-7/8" OD, pipe attachment shall be Michigan Hanger Co. Model No. 723BJ split ring type support, similar to Model No. 455, with matching adjustable support extension.

For supporting from 2-7/8" up to 36" OD, pipe attachment shall be Michigan Hanger Co. pipe saddle support with U-bolt, Model No. 72 1 or No. 724 with fixed or adjustable support extension.

Include matching welded baseplate or screwed flange base for floor mounting.

2.02 PIPE SHIELDS:

- A. Provide the following at pipe hangers and supports:
- B. Insulation Shields:

Provide galvanized steel insulation shields at locations of pipe hangers for piping systems with ID less than 2". Insulation shields shall extend 6" on either side of hanger and shall be with rounded edges.

PART 3 - EXECUTION

3.01 PIPE HANGERS AND SUPPORTS:

- A. General:

Supports shall secure pipes in place, prevent swaying and vibration, maintain required grading by proper adjustments and provide for expansion, contraction, anchorage and piping insulation protection. Design supports of strength and rigidity to suit loading and service. Include weight of water and fluids wed for cleaning and testing. Supports shall not unduly stress building construction.

Installation of pipe hangers and supports shall conform to:

Manufacturers Standardization Society (MSS) Standard Practice:

SP-69 Pipe Hangers and Supports - Selection and Application

In case of conflict, more stringent requirements shall apply.

B. Hanger and Support Spacing:

Pipe hangers and supports shall be selected and spaced on basis of building structure, loading limitations, imposed loads, and pipe stress. Tables below are based on pipe stress only.

Maximum pipe hanger and support spacing dimensions specified or listed herein are for bare pipe without additional loads such as flanges, valves, piping specialties, accessories, insulation or other forces. Certain spacing dimensions are recommended by piping manufacturers or are accepted good practice. Reduce spacing from maximums shown or specified as required to accommodate actual imposed loads of piping systems in conjunction with load limitations of building structure and elements of pipe hanger and support systems including pipe saddles, pipe shields and inserts.

Maximum spacing of hangers and supports for standard weight steel pipe shall conform to requirements of ANSI/ASME B31.1 - Power Piping and Manufacturer's Standardization Society Standard Practice (MSS) SP-69. Pipe Hangers and Supports for reference as follows:

Pipe Size Inches	Maximum Spacing	Maximum Spacing
	Feet Water Service	Feet Vapor Service
½ and smaller	7	8
¾, 1, 1-1/4	7	9
1-1/2	9	12
2	10	13
2-1/2	11	14
3	12	15
4	14	17

Maximum horizontal spacing of hangers and supports for copper tubing shall conform to requirements of manufacturers Standardization Society (MSS) Stand Practice SP-69 listed for reference as follows:

Nominal Size Inches	Maximum Spacing	Maximum Spacing
	Feet Water Service	Feet Vapor Service
½ & 3/8	5	6
¾	5	7
1	6	8
1-1/4	7	9
1-1/2	8	10
2	8	11
2-1/2	9	13
3	10	14
3-1/2	11	15
4	12	16

For cast iron and Schedule 40 PVC ype piping systems (including ductile iron and high silicon), provide minimum of one (1) hanger per pipe section and locate close to joint on pipe bar Provide hangers at changes in direction and at branch connections. Maximum hanger spacing shall not exceed 10 feet.

Provide supports for riser (vertical) piping at each floor except where shown or specified otherwise.

C. Intermediate Attachments:

Attachments shall be selected on basis of building structure and loads to be supported. Maximum applied loads shall not exceed manufacturer's published load data. Install per manufacturer's instructions.

D. Pipe Attachments:

Do not hang one pipe from another nor from ductwork and conduits. Do not use perforated band iron, wire nor chain as hangers.

Unless otherwise specified or shown on the Drawings, piping shall be suspended by individual hangers.

Drainage piping shall be suspended by individual hangers only.

Where piping must be suspended closer to overhead than is possible with single rod clevis hangers, trapeze supports shall be used as specified further herein.

At pipe bends, place hanger no more than 1/2" from bend.

Apply double wraps of 3M Co. No. 51 Scotchwrap PVC tape with pressure-sensitive adhesive around bare piping where piping materials are dissimilar from pipe attachments. Scotchwrap is not required where pipe attachments are specified to have protective coating or match piping material being supported.

Select and install pipe attachments to permit expansion and contraction.

3.02 PIPE SHIELDS:

- A. Install pipe shields on insulation such that shield is centered under insulation inserts. Coat inserts with compatible wet adhesive and insert into snugly cut undersized holes in pipe insulation. Stabilize large and heavy pipes with additional inserts (hardwood dowels) at 4 and 8 o'clock positions. After installation, coat outer surface and vapor-seal with adhesive, then apply layer of pressure-sensitive adhesive vapor barrier tape.
- B. Coordinate the Work with insulation subcontractor.

END OF SECTION 23 02 50

SECTION 23 03 00 - MECHANICAL FIRE SAFING / FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.
- B. Refer to all construction documents including all of the Sections of Division 23 for a complete understanding of the electrical components required. Coordinate with all trades.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS

Section 23 04 00 MECHANICAL: INSULATION

Section 23 10 00 PLUMBING

Section 23 80 00 HVAC: AIR HANDLING SYSTEMS

Section 23 90 00 HVAC: CONTROL SYSTEM / ANALOG

1.02 SCOPE:

- A. Provide labor, equipment and materials to complete the Firesafing / Firestopping work as herein specified.

1.03 RELATED WORK:

- A. Work in conjunction with this section shall be as designated below:

General Contractor: Cutting, Patching, and Painting
 Flashing
 Openings in walls

1.04 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all-inclusive. Provide submittals for all materials and equipment proposed for use on this project.)
- C. Shop Drawings: For each different firestopping configuration, provide the following:
- Listing agency's detailed drawing showing opening, penetrating items, and firestopping materials, all of which are identified with listing agency's name and number or designation, fire rating achieved, and date of listing.
- Identify which rated assembly each system is to be used in.
- Any installation instructions that are not included on the detailed drawing.
- For proposed systems that do not conform strictly to the listing, submit listing agency's drawing marked to show modifications and stamped approved by firestop system manufacturer's fire protection engineer.
- D. Submit listing agency's test report showing compliance with requirements, based on testing of current products.
- E. Product Certificates: Submit certificates signed by firestop system manufacturer certifying that materials furnished comply with requirements.
- F. Product Data: Manufacturer's data sheets on each material to be used in firestop system systems, including:
- Product characteristics and Material Safety Data Sheets.
Listing numbers of systems in which each product is to be used.
Preparation instructions and recommendations.
Storage and handling requirements and recommendations.
Installation methods.
- Installer's Qualification Documentation.

1.06 REFERENCES:

ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2000a.

ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2000a.

ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2000.

ASTM E 1399 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems; 1997 (Reapproved 2000).

ASTM E 1529 - Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies; 2000.

ASTM E 1725 - Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components; 1995 (Reapproved 2001).

UL 1479 - Standard for Fire Tests of Through-Penetration Firestops; 1994.

UL 1709 - Rapid Rise Fire Tests of Protection Materials for Structural Steel; 1994.

ANSI/UL 2079 - Tests for Fire Resistance of Building Joint Systems; 1998.

1.07 DEFINITIONS:

- A. Construction Gap: An open joint between adjacent rated assemblies; may be a moving joint or static opening, without penetrating items.
- B. Firestop System: Specific firestop material or materials, which when installed in openings in a specific rated assembly, achieve the performance required.
- C. Firestopping: Result of installation of firestop system.
- D. Listing: The current, published listing of a system in a qualified listing agency's directory.
- E. Listing Agency: Independent testing agency that has conducted tests and classified firestop systems for particular applications, which conducts routine in-plant follow-up inspections, and which lists tested systems in a published directory.
- F. Penetrating Item: Any item (pipe, duct, conduit, cable, etc.) that passes completely through a rated assembly through an opening of any size.
- G. Rated Assembly: A wall, floor, roof/ceiling, or other construction that is required to have an hourly fire rating or a smoke resistance rating.
- H. Through Penetration: A hole through a rated assembly made to accommodate the passage of a penetrating item or an empty hole made for another purpose and not repairable using the original materials of construction.

1.08 QUALITY ASSURANCE:

- A. Installer Qualifications: Firm who is qualified by having experience, staff, and training to install the specified products, and who:
 - Is a Certified and Trained contractor in the field of fire stopping and fire safing.
 - Is acceptable to or licensed by manufacturer.
 - Is acceptable to or licensed by authority having jurisdiction.
 - Has completed the manufacturer's certified product installation training.
 - Can provide a list of completed projects as evidence of experience; include project name and address, Owner's name and address, and Architect's name and phone number.
- B. ting: Conduct a meeting at the project site to discuss installation conditions and requirements; require the attendance of all relevant installers.

1.09 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver and store products until ready for installation in manufacturer's original unopened packaging, legibly marked with manufacturer's name and product identification, date of manufacture, lot number, shelf life, listing agency's classification marking, curing time, and mixing instructions if applicable.
- B. Following manufacturer's instructions, store and handle in such a manner as to prevent deterioration or damage due to moisture, temperature changes, contaminants, and or other causes.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.10 PROJECT CONDITIONS:

- A. Coordinate construction and cutting of openings so that each particular firestop system may be installed in accordance with its listing, including sizing, sleeves, and penetrating items.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install firestopping under environmental conditions outside manufacturer's absolute limits.
- C. Provide ventilation as required by firestopping manufacturer, including mechanical ventilation if required.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Acceptable Manufacturer:
 - 3M Fire Protection Products, Inc
 - Hilti Fire Stop Products.
- B. Single Source: All instances of a specific firestop system shall be made using products of the same manufacturer; where multiple installers (e.g. different subcontractors) are responsible for installation of firestopping, all installers shall use the same system made by the same manufacturer.
- C. Where a proposed system is not listed by one of the listing agencies specified as acceptable, submit evidence prepared by a qualified independent testing agency that the system complies with the requirements.

2.02 MATERIALS:

- A. Rated Assemblies: Provide installed firestopping that limits the spread of fire, heat, smoke, and gasses through otherwise unprotected openings in rated assemblies, including walls, partitions, floors, roof/ceilings, etc.⁴⁵
- B. Provide firestopping that has fire resistance rating equal to or greater than the fire-resistance rating of the assembly in which it is to be installed.

- C. Provide firestopping that has movement capability appropriate to the potential movement of the gap.
- D. Requirements for All Types of Firestopping:

Listing Agency: Provide systems that are listed by at least one the following:

Underwriters Laboratories Inc. (UL), in "Fire Resistance Directory" category XHEZ or XHBN as appropriate.

ITS, in "Directory of Listed Products."

Omega Point Laboratories (OPL), in "Directory of Listed Products, Through Penetration Fire Resistance Directory."

Any other qualified independent testing and inspection agency that conducts periodic follow-up inspections and is acceptable to authorities having jurisdiction.

Furnish products identical to those tested for classification by listing agency.
Mark product packing with classification marking of listing agency.

Unlisted Systems: Where firestop systems not listed by any listing agency are required due to project conditions, submit a substitution proposal with evidence specified.

Firestopping Exposed To View: Provide products with flame spread index of less than 25 and smoke developed index of less than 450, when tested in accordance with ASTM E 84.

Firestopping Exposed to View, Traffic, Moisture, or Physical Damage: Provide products that after curing do not deteriorate when exposed to those conditions during and after construction.

Materials: Use only products specifically listed for use in listed systems.

Compatibility: Provide products that are compatible with each other, with the substrates forming openings, and with the items, if any, penetrating the firestopping, under the conditions represented by this project, based on testing and field performance demonstrated by manufacturer.

- E. Through Penetration Firestop Systems (All Types Except Electrical Penetrations): Provide firestop systems listed for the specific combination of fire rated construction, type of penetrating item, annular space requirements, and fire rating, and:

F-Rating: Provide firestopping that has F-rating equal to or greater than the fire-resistance rating of the assembly in which the firestopping will be installed.

T-Rating: In habitable rooms and areas, where penetrating items are exposed to potential contact with materials on fire side(s) of rated assembly, provide firestopping that has a T-rating equal to its F-rating.

Wall Penetrations: Provide systems that are symmetrical, with the same rating from both sides of the wall.

Cold Smoke Resistance: Provide firestopping that has L-rating of 1 cfm per linear foot (5.5 cu m/h/m), maximum.

Testing: Determine ratings in accordance with ASTM E 814 or UL 1479.

Provide asbestos-free products.

Schedule of Systems: Indicated on the drawings

- F. Through Penetration Firestop System For Electrical Penetrations: Provide firestopping complying with UL system No.5, R11044, tested in accordance with UL 1709, ASTM E 119, ASTM E 1529, and ASTM E 1725.

Smoke and Flame Sealant: 3M FireDam(tm) 150+ Caulk, 3M Fire Barrier CP 25WB+ Caulk, or 3M Fire Barrier IC 15WB Caulk.

Tape for Vapor Barrier, Heat Reflector, and Installation Aid: 3M Interam(tm) T-49 aluminum foil tape.

Tape for Installation: Scotch 898 Filament Tape.

Sheet to Cover Openings and as Collar: 3M Fire Barrier CS-195+ Composite Sheet.

- G. Cast In Place Devices: 3M Fire Barrier Cast In Place Devices.

PART 3 - PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Do not begin installation until substrates have been properly prepared.
- B. Conduct tests according to manufacturer's written recommendations to verify that substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt and other foreign substances capable of impairing bond of firestopping.
- C. Verify that items penetrating fire rated assemblies are securely attached, including sleeves, supports, hangers, and clips.
- D. Verify that openings and adjacent areas are not obstructed by construction that would interfere with installation of firestopping, including ducts, piping, equipment, and other suspended construction.
- E. Verify that environmental conditions are safe and suitable for installation of firestopping.
- F. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION:

- A. Prepare substrates in accordance with manufacturer's instructions and recommendations.
- B. Install masking and temporary coverings as required to prevent contamination or defacement of adjacent surfaces due to firestopping installation.

3.03 INSTALLATION:

- A. Install in strict accordance with manufacturer's detailed installation instructions and procedures.
- B. Install so that openings are completely filled and material is securely adhered.

- C. Where firestopping surface will be exposed to view, finish to a smooth, uniform surface flush with adjacent surfaces.
- D. After installation is complete, remove combustible forming materials and accessories that are not part of the listed system.
- E. Repair or replace defective installations to comply with requirements.
- F. At each through penetration, attach identification labels on both sides in location where label will be visible to anyone seeking to remove penetrating items or firestopping.
- G. Clean firestop materials off surfaces adjacent to openings as work progresses, using methods and cleaning materials approved in writing by firestop system manufacturer and which will not damage the surfaces being cleaned.
- H. Notify authority having jurisdiction when firestopping installation is ready for inspection; obtain advance approval of anticipated inspection dates and phasing, if any, required to allow subsequent construction to proceed.
- I. Do not cover firestopping with other construction until approval of authority having jurisdiction has been received.

3.04 PROTECTION:

- A. Protect installed systems and products until completion of project; where subject to traffic, provide adequate protection board.
- B. Touch-up, repair or replace damaged systems and products before Substantial Completion.

END OF SECTION 23 03 00

SECTION 23 04 40 - MECHANICAL: PIPE CLEANING AND TESTING**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.
- B. Refer to all construction documents including all of the Sections of Division 23 for a complete understanding of the electrical components required. Coordinate with all trades.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 10 00 PLUMBING

1.02 SCOPE:

- A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.
- B. This specification defines the requirements and procedures for field pressure testing of above ground and underground piping systems, connected equipment and integral components to assure mechanical strength and tightness. Also included are flushing and cleaning requirements for open and/or closed piping systems. Any deviation from this specification shall require written approval from the Engineer.
- C. Testing Exclusions: The following are excluded from the testing requirements of this specification:

Any package unit previously tested by the manufacturer in accordance with the applicable codes.

Lines and systems open to the atmosphere such as safety valve discharges, vents or drains downstream of the last shutoff valve. These lines shall be visually inspected to determine that all joints are properly made up.

1.03 RELATED WORK:

- A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs
Openings in walls
All temporary heating

1.04 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following submittals shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all-inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

Sources of All Cleaning and Testing Agents
Pressures and Temperatures for Final Testing
Date of Test for Each System
Name and Address of Testing and Cleaning Contractor / Contractors
Test pressures and holding time
Calibration record of pressure measuring devices and relief devices settings
Cleaning and Testing Materials to be used with Recommended Temperatures
Chemical Treatment Materials to be used with Recommended Temperatures

Summary report of testing and cleaning results, including testing log for all systems, chemical treatment solutions in place and chemical analysis of system water after testing and cleaning procedures are complete.

1.06 QUALIFICATIONS:

- A. Qualified Contractors shall be recognized as firms specializing in providing services related to the requirements of this specification. All Contractors providing Pipe Cleaning and Testing Services shall have a minimum of three years of documented experience.

1.07 PROJECT CLOSEOUT:

- A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements.

PART 2 - PRODUCTS

2.01 CLEANING PRODUCTS:

- A. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.
- B. Cleaning and rinsing solutions for Specialized Piping Systems applied as recommended by manufacturer.

- C. Combined Chelant solution system for passivation of Specialized Piping Systems. Application shall follow the recommendations of specialized Contractor.

2.02 PIPE CLASS TABLE:

PIPE CLASS	PIPE MATERIALS	NOTES:
	<u>Copper and brass</u>	
U2	Copper Tubing Type L	Soldered Joints
U3	Copper Tubing Type K	Soldered Joints
	1) <u>Plastic</u>	
P1	PVC drainage	Solvent joints
P2	PVC Sewer	Tyton fittings

2.03 CLEANING CLASS:

- A. Cleaning Class C1:

Covers water flushing and cleaning of piping systems after assembly and erection. Cleaning shall be accomplished by thoroughly flushing with clear water at sufficient velocity to remove all foreign matter.

- B. Cleaning Class C2:

Covers the blowing-out of piping systems after assembly and erection. Blow out agent shall be steam (S), oil free air (A), or nitrogen (N)

- C. Cleaning Class C3:

Covers water flushing and disinfecting of above and below ground potable water piping systems after assembly and erection. Cleaning of piping shall be accomplished by first thoroughly flushing with potable water at sufficient velocity (2.5 fps mm.) to remove all foreign matter and then sterilizing with chlorine solution (100 ppm of available chlorine for a minimum contact time of 2 hours).

2.04 TESTING CLASS:

- A. Testing Class T1:

Covers initial service leak testing per ASME B31 .3, Category D, at operating pressure and leak test inspection of piping systems after assembly and erection.

- B. Testing Class T2:

Covers hydrostatic leak and pressure testing and inspection of piping systems after assembly and erection.

- C. Testing Class T3:

Covers pneumatic leak and pressure testing and inspection of piping systems after assembly and erection. Pneumatic agent shall be oil free air, or nitrogen (N).

D. Testing Class T4:

Covers static head leak test and test inspection of piping systems after assembly and erection. Piping systems are to be tested and inspected for leak tightness while being subjected to the internal test pressure of a 10 foot static head. Water shall stand in the system without change in level for a period of not less than 5 hours.

2.05 REFERENCES:

- A. Piping tests shall comply with the provisions of the latest edition of ASME B31 .3 Process Piping, section 345, Testing. Any conflict between Code and Specification shall be referred to the Engineer for resolution.
- B. Piping cleaning/disinfecting of piping systems shall comply with the provisions of the current edition of the Uniform Plumbing Code, ANSI A40.8 Section 10.9 or AWWA C601. Any conflict between Code (5) and Specification shall be referred to the Engineer for resolution.
- C. The maximum test pressure for each line shall be as per ASME B31 .3 Process Piping, section 345, Testing.

2.06 PIPING SYSTEMS: CLEANING AND TESTING:

<u>Article II.</u> <u>SYSTEM</u>	<u>PIPE</u>	SYMBOL	PIPE CLASS	CLEANING CLASS	TESTING CLASS	TEST PRESSURE
PLUMBING:						
Cold Water - Domestic Potable	CW		U2	C3	T2	125 psig
Hot Water - Domestic Potable	HW		U2	C3	T2	125 psig
Hot Water Recirculating	HWR		U2	C3	T2	125 psig
Sanitary Waste - PVC	SAN		P1	C1	T4	10ft wc
Sanitary Vent - PVC	V		P1	C1	T4	10ft wc
Water Service	W		U4	C3	T2	1.5 x max

2.07 PRESSURE TESTING:

A. Pressure Test Blinds

Plain test blanks with 1/16 in flat non-asbestos gaskets shall be used for blanking fiat face, raised face, ring joint, male and female and tongue-and groove type flanges. Provide full face blanks and gaskets and 125#C1 connections. However, where permanent operational blinds are installed, they may be used for field pressure testing. A field procedure must be established and care taken to insure the installation and removal of material specified for testing. The following is one method for identifying test material.

Unless dictated otherwise by contract requirements, plate material, extra length bolts and gaskets for testing shall be furnished by field. The outer periphery (edge) of each test gasket shall be dabbed with a spot of fluorescent yellow paint in 4 spots (90 degree equidistant) prior to installation. End

points of studs and heads of bolts shall be dabbed with a spot of fluorescent yellow paint. Refer to Attachment 4 for maximum test pressure at various thicknesses for test blanks.

B. Cleaning Products

Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.

PART 3 - EXECUTION

3.01 PRESSURE TESTING: GENERAL REQUIREMENTS FOR TESTING

- A. Leak testing shall be done in accordance with ANSI B31.3 Process Piping, section 345, Testing.
- B. Upon completion of system(s) erection work and cleaning, but prior to adjusting and balancing, all installed piping and/or tubing shall be pressure tested except where otherwise qualified in this specification.
- C. Piping that is to be chemically cleaned after installation shall be tested and all repairs made before cleaning.
- D. Contractor shall provide competent personnel to conduct all tests. System(s) shall not be considered complete until all tests have been concluded to the satisfaction of the Engineer. In the event of leakage or defects, tests must be repeated until all faults are corrected.
- E. Contractor shall furnish all instruments, ladders, test equipment, test tees, accessories, and personnel required for the tests.
- F. All successful tests shall be documented and certified by the General Contractor with the resulting data transmitted to the Architect, to be retained as a permanent record.
- G. Tests shall be considered satisfactory if no leakage is detected on the piping and any of the joints. After this initial period, pressure shall be maintained until system is inspected for leaks and thereafter, for specified time periods according to system tested.
- H. Areas requiring repairs shall be retested as originally specified.
- I. Following the completion and approval of the test, Contractor shall restore all components of the system to normal operating condition. This includes removing the temporary provisions installed for the test.
- J. Piping shall be tested at metal temperatures between 60°F and 100°F.
- K. Hydrotest equipment shall include at least one NIST standard calibrated pressure measuring device (to be installed at the highest point in the tested system) and a calibrated pressure relieving device.
- L. The following shall be excluded from all pressure tests:
 - Pumps, compressors, and turbines.
 - Equipment and vendor furnished piping specifically recommended by the manufacturer not to be tested.

3.02 APPLICATION: TEST METHODS AND PRESSURES

A. Hydrostatic Testing of Piping Designed for Internal Pressure

The hydrostatic test pressure shall not be less than 1.5 times the design pressure.

If the design conditions of piping attached to a vessel are the same as those of the vessel, then the piping and vessel may be tested together at the test pressure of the vessel. However, if the piping should be subject to higher design conditions and requires a higher test than the connected equipment, or if the piping is designed for lesser operating conditions than the connected equipment and could be overstressed by a system test, then it shall be isolated and tested separately.

B. Pneumatic Testing

If the piping is tested pneumatically, the minimum test pressure shall be 110 percent of the design pressure.

C. Static Head Test

This test covers leak testing of all non-pressure plumbing and drainage systems, including sanitary sewer, storm drainage, etc. All piping in this test shall be subjected to an internal test pressure not less than 10-foot static head of water.

3.03 PRESSURE TESTING: PREPARATION FOR FIELD PRESSURE TEST

- A. Restrictions to flow, such as orifice plates and flow or mixing nozzles, shall not be installed or shall be removed. When necessary, items shall be replaced with temporary spool pieces.
- B. All valves (except vents, drains, and hydro boundary valves) within the system to be tested shall be in open position; control valves shall be specifically checked to assure that they are in an open position or they shall be bypassed or removed during testing.
- C. Shut-off valves at instruments on process lines or equipment shall be closed.
- D. Equipment that is not to be hydrostatically tested shall be isolated or removed from the system. If valves are used for isolation, Contractor shall verify that valves can withstand the test pressure in the closed position without any damaging effect.
- E. System relief and safety valves shall be blanked off at the inlet flange of the valves. Screwed relief and safety valves shall be removed and replaced with plugs, or capped.
- F. All flanges, threaded joints and welds shall be left bare of insulation and unpainted. All underground pipe joints shall be bare and exposed for a distance of two feet on each side of joints and shall not be backfilled or encased in concrete until final testing approval.
- G. All joints, including welds, shall be left uninsulated and exposed for examination during the test; however, joints previously tested in accordance with this specification may be insulated or covered. If a sensitive test is required, all joints mentioned above shall be left unprimed and unpainted.
- H. Underground portions of piping systems may be tested and covered before testing aboveground portions.
- I. Before testing:

Piping systems shall have been completely checked (Punched Out).

All lines, vessels, and equipment shall be checked to ensure that the entire system can be completely drained after testing.

Vents or other high point connections shall be opened to eliminate air from lines that receive a hydrostatic test.

System shall be purged of air before hydrostatic test pressure is applied.

System shall be thoroughly vented to remove all air pockets before the hydrostatic test pressure is applied.

Field personnel shall review all vessels and internals in order to determine best method to prevent air entrapment when filling and to prevent vacuum when draining.

Short pieces of piping that must be removed to permit installation of a blind or blank shall be tested separately.

Lines containing check valves shall have the source of pressure located in the piping upstream of the check valve so that the pressure is applied under the seat. If this is not possible, remove or jack up the check valve closure mechanism or remove check valve completely, and provide necessary filler piece or blinds.

When conducting tests at freezing temperatures, the test shall not take more than 4 hours, and special precautions (such as warming the line test water, or both) shall be observed to avoid freezing damage.

Systems that include expansion joints shall be investigated to see that any required temporary restraints, anchors, or guides are installed before test.

When a pressure test is required to be maintained for a period of time during which the testing medium in the system would be subject to thermal expansion, provision shall be made for relief of any pressure greater than the maximum test pressure.

3.04 FIELD PRESSURE TEST PROCEDURES

A. General:

Pressure Testing and Cleaning Procedure Index:

Pressure testing procedures shall be selected based on service and line class according to the table as included herein under the heading PIPING SYSTEMS: CLEANING AND TESTING.

The testing of piping and/or tubing, and equipment shall be performed on a system basis, in preference to the testing of individual lines or single components if at all possible. Breaking joints to insert blinds for hydrostatic testing shall be avoided wherever possible.

Special equipment shall be tested only as per instructions by the Engineer and/or Owner.

B. Hydrostatic Pressure Test:

In order to hydrostatic test as much piping as possible at one time, a systems test may be employed. This test shall include 1 or more lines and if possible connected vessels and equipment.

The minimum test pressure for a system test shall be such that each line in the system is subjected to a test pressure in accordance with the table as included herein under the heading PIPING SYSTEMS: CLEANING AND TESTING.

The maximum system test pressure shall not exceed the pressure test rating of any piping component or the shop test pressure of any vessels or equipment included in the test system. (Maximum test pressure for flanges and valves conforming to ASME B16.5 are given in the table as included herein under the heading PIPING SYSTEMS: CLEANING AND TESTING.

Systems or sections of systems to be tested may be isolated by closed valves, provided the valve body and seat are suitable for the test pressure. Do not use closed diaphragm valves for isolation.

Where a suitable valve is not available, vessels, equipment, or other piping not included in the system pressure test shall be either disconnected from the a system or isolated by blinds or other means during the test.

The normal locations for the pressure test gauge are at grade near the pressure test pump. Readings may be made at higher points providing the gauge pressure reading and the static head (0.433 psi/ft) between grade and the point of measurement do not exceed the maximum

test pressure. Pressure test gauges shall be calibrated once a month, using a dead weight tester. Gauges shall be tagged with the date last calibrated, and this activity shall be recorded.

Hydrostatic test pressure shall not be applied until the vessel or equipment and its contents are at approximately the same temperature. To minimize the risk of brittle fracture, pressure tests through vessels and equipment shall not be conducted when the test liquid or metal temperature is below 60°F.

Hydrostatic test pressure shall be maintained for a sufficient length of time to visually determine whether there are any leaks, but not less than 1 hour. Contractor shall not be required to maintain test pressure in excess of 2 hours after notification of the client's authorized inspector.

C. Pneumatic Test Procedure:

Minimum Metal Temperature

At time of testing the minimum pipe metal temperature shall be as follows:

All ferric piping: 60°F
All copper: 40°F

Minimum temperatures for materials not listed above, shall be determined by the Engineer of Record and the Owner when required by field construction.

Clear the test area of all nonessential personnel before bringing the line up to test pressure. It may be desirable to conduct pneumatic tests during weekends when fewer personnel are deemed necessary to protect workers during such tests.

A pressure relief device shall be provided, having a set pressure not higher than the test pressure plus the lesser of 50 psi or 10 percent of the test pressure.

When pneumatic testing at over 25 psig, a preliminary check at 25 psig shall be made to locate major leaks. The pressure shall be increased in gradual steps of 5 psig, or 10 percent of the test pressure, whichever is greater.

A double block and bleed valve arrangement shall be included in the pressurizing line to the system

being tested. A test pressure gauge shall be downstream of the double block. After each pressure step has been reached, close the block valve and open the bleeder to atmosphere. If after a 5-minute period the step pressure is held, proceed to the next step pressure. If not, examine the entire system for leakage.

Before soaping the joints, the entire line should be walked to determine whether there is any audible evidence of leakage. Any leaks found at the time shall be marked, and repaired after first de-pressuring the line.

When the system has been brought up to the test pressure shown on the line list, all joints and welds shall be covered with soap solution in order to detect any leakage.

Soap solutions are to be low chloride and designed specifically for use in pneumatic testing of stainless steel systems.

Bolting shall not be tightened while systems being tested are pressured above 30 psig.

Pneumatic test pressure shall be maintained for a sufficient length of time to permit thorough visual inspection of all joints and weld seams but not less than 2 hour. Pressure shall be reduced gradually when de-pressuring.

D. Static Head Test Procedure

Underground pipe joints shall be exposed for a distance of two feet on each side of joints and shall not be backfilled until piping has been tested and approved.

Piping which connects to or is continuous with lines installed by others shall be isolated from these lines by a valve or line blind.

All openings will be provided with temporary plugs except the highest (fill opening)

Piping system shall be filled with clean water to the top vent stack. Systems without a vent stack shall be provided a temporary vertical stack. Stack shall be at least 10 feet in length.

Water shall stand in the system without change in level for a time period of not less than 5 hours.

Joints having leaks shall be repaired and retested for a time period of 1 hour.

E. Test Completion

In the event that repairs or additions are made following the pressure test, the affected piping shall be retested at the pressures originally specified for the test

After completion of testing, all temporary blanks and blinds shall be removed, all operating blinds returned to proper position, and all lines and piping components shall be completely drained. Valves, orifice plates, expansion joints, and short pieces of piping that have been removed shall be reinstalled with as specified proper new gaskets in place. All valves that were closed during hydrotest shall be opened to ensure drainage of the bonnet cavity. Lines being drained after testing shall have all vents open. Piping systems downstream of check valves should be inspected to ensure complete drainage.

Care shall be exercised in controlling the rate of drainage from vessels with respect to the inflow of air through the vent to ensure that the vessel is not subjected to vacuum. After vessels have been completely drained, vents, cyclones, and other internal closures that were opened before testing shall be closed.

3.05 CLEANING; GENERAL PREPARATION

- A. General Contractor shall schedule testing so that sanitizing and passivation of tubing system(s) immediately follows testing of system.
- B. Schedule field cleaning as close to the commissioning of the equipment as possible.
- C. Protect threaded connections, flange faces, and valves to prevent damage by abrasion.
- D. Block off, disconnect or remove the following items from the piping system to be cleaned:
 - Exposed instruments, gauges
 - Relief valves, and plug cocks
 - Materials that may become damaged by cleaning solutions or procedures
- E. Do not allow aluminum, copper, galvanized steel, magnesium, or zinc surfaces to come in contact with solutions having a pH of less than 4.0 or a pH more than 10.
- F. Do not introduce chemical solution into equipment unless high point vents and low point drains (supplied by piping contractor) are available to ensure proper filing and complete removal of solutions.
- G. Do not apply heat directly to equipment containing acid solutions. Boilers may be fired for
- H. degreasing, but acid solutions must be diluted and heated externally to the equipment.

END OF SECTION 23 04 40

SECTION 23 10 00 - PLUMBING**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.
- B. Refer to all construction documents including all of the Sections of Division 23 for a complete understanding of the electrical components required. Coordinate with all trades.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS

Section 23 01 50 MECHANICAL: VIBRATION ISOLATION

Section 23 02 50 MECHANICAL: PIPE HANGERS AND SUPPORTS

Section 23 03 00 MECHANICAL: FIRE SAFING / FIRESTOPPING

Section 23 04 00 MECHANICAL: INSULATION

Section 23 04 40 MECHANICAL: PIPE CLEANING TESTING

Section 23 15 00 PLUMBING: FIXTURES

1.02 SCOPE:

- A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.
- B. Work specified within this Section is limited to 5'-0" beyond building limit.
- C. Work required beyond 5 ft from building limit is specified within Division 2.
- D. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs / Flashing
Openings in walls
Equipment foundations and bases
All temporary heating

Electrical Contractor:

- E. Power wiring for electrical equipment provided within this section.

1.03 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.04 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list is not intended to be all inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

- Pipe and fittings
- Hangers / Supports
- Valves
- Insulation
- Clean outs
- Floor drains
- Backflow preventers
- Fixtures and Fixture carriers (See Section 23 15 00)
- Automated Shower Systems
- Hot Water Heaters
- Potable Water Expansion Tanks
- Vacuum breakers
- Wall Hydrants

1.05 INSPECTION AND TESTING: BY AUTHORITIES / AGENCIES

- A. Inspections, examinations and tests required by authorities/agencies shall be coordinated and paid for as necessary by the Plumbing Contractor to obtain complete and final acceptance of the systems. Transmit certificates of inspection, acceptance to the Architect.

1.06 QUALITY ASSURANCE:

- A. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

1.07 FLUSHING, CLEANING AND TESTING: BY CONTRACTOR

- A. Provide all labor, equipment and expertise to flush, clean and test all piping systems installed. Isolate all sections and equipment as necessary to complete the flushing, cleaning and testing according to the requirements of SECTION 23 04 40 MECHANICAL: PIPE CLEANING - TESTING.

1.08 UTILITY CONNECTIONS / COORDINATION / METERS

- A. Review all contract documents with the proper utility companies prior to the start of any work to insure that meters, testing, inspections, acceptances will all be properly completed in a timely manner.
- B. Report any alterations required to insure utility company coordination.

1.09 ENERGY CONSERVATION:

- A. All work shall be in compliance with the energy conservation requirements of the IECC.
- B. Work indicated in excess of the minimum shall be provided as shown.
- C. Provide proper insulation, heat traps, controls and equipment such that systems are energy conserving and efficient.

1.10 PROJECT CLOSEOUT:

- A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements, including:
 - Testing and Adjusting
 - Operating, Maintenance Instructions
 - Lubrication
 - Cleaning
 - Sterilization
 - Record Drawings
 - Written Guarantee
 - Operating, Maintenance Manuals
 - Test Log
 - Letters of compliance

PART 2 - PIPING: PRODUCTS AND INSTALLATION

2.01 PIPING: INSTALLATION, GENERAL:

- A. Provide new, standard products, materials and equipment which comply with the specification; are undamaged and unused at the time of installation; are complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use.
- B. Arrange and install piping approximately as indicated, straight, plumb, and as direct as possible. Form right angles or parallel lines with building wall. Keep pipe close to walls, partitions and ceilings. Offset only where necessary to follow walls. Where so indicated and wherever possible, conceal piping in building construction before erection of closing construction. When furred spaces are indicated, keep pipes as close to structural members as possible. Piping shall not interfere with openings, doors and windows. Allow for proper clearance at windows, doors, equipment and other building parts such that pipes do not interfere with access and building use.
- C. Piping shall be cut accurately to measurements established at the site and shall be installed without springing, forcing and excessive cutting or weakening of building structure. Pipes shall be installed

in a manner permitting proper drainage, venting and free expansion and contraction. Changes in direction shall be made with factory-manufactured fittings.

- D. Install pipe to allow for expansion without excessive stress on pipe, hangers and building.
- E. Welding, brazing, soldering shall be with proper regard for fire prevention and safety. See Fire Watch requirements.
- F. Arrange piping passing through floors, walls and other partitions of building construction so that piping is centered in openings/sleeves and is rigidly supported on both sides of openings/sleeves.
- G. Clean pipe, pipe fittings, and valves before erection. Cap or plug open ends of piping and equipment during construction to keep dirt and foreign material out of system.
- H. As specified elsewhere, certain service piping and associated fittings. Valves and accessories will be furnished factory-cleaned and sealed.
- I. Provide concrete thrust blocks for certain underground piping as shown on the Drawings. Provide concrete support pads under valves as shown on the Drawings.
- J. Unions or flanges shall be used to facilitate piping installation, and shall be installed between shut-off valves and equipment to facilitate removal of equipment for repair.
- K. Provide dielectric unions where pipes of dissimilar metals are joined together.
- L. Isolate and drain existing systems as required to complete the Work. Fill, circulate and vent both new and existing systems as required for proper operation.
- M. Copper tube, of annealed or bending temper quality, where indicated to be installed without joints or fittings, shall be bent to accomplish changes of direction. Bending shall not collapse outside nor buckle inside of bend. Proper radius, method and tools required shall comply with Copper Tube Handbook.
- N. Do not route pipelines over switchboards, panels, motor control centers, individual motor starters and other electrical equipment.
- O. Avoid routing pipelines over electrical raceways and bus ducts. If these locations cannot be avoided, provide drip pans under pipelines. Also provide drip pans where indicated on the Drawings. Drip pans shall be constructed of minimum 22 gauge stainless sheet metal with waterproof mastic applied to interior seams and joints. Pan width shall be minimum 2 times pipe diameter and with sides turned up minimum of 4" high and fitted with hemmed edge. Do not hang drip pans from pipe. Pitch pans minimum 1/8" per foot and provide 3/4" drain connection at low points. Pipe drains to nearest floor drain or as shown on the Drawings.

2.02 CROSS AND INTER-CONNECTIONS:

- A. No piping for fixtures, equipment, devices or internal connections shall be installed which will provide a cross or interconnection, under any circumstance of operation, between a distributing supply for drinking or domestic purposes and a not-potable supply. A non potable supply would include a drainage system or a soil or sanitary waste pipe which would permit or make possible the backflow of sewage, polluted water or waste into the domestic water supply system.

2.03 PIPE: SANITARY SEWER PVC (Beyond Foundation)

PIPE CLASS: P2
PIPE SYMBOL SAN
CLEANING CLASS C1
TESTING CLASS T4

- A. Materials: Provide PVC Gravity Sewer Pipe with ring-tite joints complying with ASTM D 3034-SDR35.
- B. Appurtenances: Provide elbows, tees, wyes, couplings, caps of the same type and class of material as the pipe, or of a material having equal or superior physical and chemical properties.
- C. Installation:
- Install pipe in accordance with governing authorities having jurisdiction.
- Inspect pipe prior to installation to detect any apparent defects. Mark defective material with white paint and remove from site.
- Lay pipe beginning at the low point of the system, true to the grades, inverts and alignment indicated with unbroken continuity of invert.
- Install compression gaskets in accordance with manufacturer's instructions as to lubricants, cements, and other special requirements.
- D. Installer: A firm specializing and experienced in sanitary sewer system work for not less than two (2) years.
- E. Connections: Provide connection to manholes as indicated and in accordance with the sewer authority. Provide labor and materials to rework table as required.
- F. Changes in direction/elevation: Roll down or offset at no greater than 45 deg.
- G. Cleanouts: Provide cleanouts to grade at all changes of direction / elevation, at intervals as required by Code and as indicated on the drawings.
- H. Building Sewer Cleanout: Provide at the point sanitary piping exits the building a cleanout to floor level with specified cover/cap.
- I. Bedding: Provide sand/gravel bedding material. No stone, ledge to be within 6" of invert of pipe. Provide pipe cradles in fill or unsuitable material.
- J. Cover: Provide minimum of 3'-0" cover. Notify Architect if this requirement does not appear to be attainable.
- K. Test: Cap or plug piping at any manhole and fill system to grade, let stand for a period of 2 hours, no appreciable fall in level will be allowed.

2.04 PIPING: SANITARY WASTE and VENT, PVC (BELOW SLAB)

PIPE CLASS: P1
PIPE SYMBOL SAN
CLEANING CLASS C1
TESTING CLASS T4

- A. Material: Provide type PVC Schedule 40 sanitary drainage piping with drainage type fittings, free of defects, as manufactured by Celanese, Yardley or ITT Grinnell.
- B. Joints: Solvent fused socket type with chemical designed for use with the type PVC piping system.
- C. Cleanouts: Provide cleanouts at changes of direction and at intervals as required by Code and as indicated.
- D. Workmanship: Pitch piping at a rate of 1/4 " per foot unless noted otherwise and install parallel or perpendicular to building. Allow for continuous bearing of pipe on soil.
- E. Connections: Provide wye branches with 45 deg elbows at connections. Use long sweep bends at bottom of all stacks.
- F. Changes in direction/elevation: Roll down or offset at no greater than 45 deg.
- G. Cleanouts: Provide cleanouts to grade at all changes of direction / elevation, at intervals as required by Code, and as indicated on the drawings.
- H. Building Sewer Cleanout: Provide at the point sanitary piping exits the building a cleanout to floor level with specified cover/cap.
- I. Inspection/Testing: Provide labor and equipment to test the underground piping system as follows:
 - 10 feet water head applied to piping for a period of 2 hours.
- J. Inspect all joints to insure watertight connections, coordinate approval of local authority prior to backfill.

2.05 PIPING: SANITARY WASTE and VENT - PVC (ABOVE SLAB)

PIPE CLASS: P1
PIPE SYMBOL SAN – For VENT see legend
CLEANING CLASS C1
TESTING CLASS T4

- A. Material: Provide type PVC Schedule 40 sanitary drainage piping with drainage type fittings, free of defects, as manufactured by Celanese, Yardley or ITT Grinnell.
- B. Joints: Solvent fused socket type with chemical designed for use with the type PVC piping system.
- C. Cleanouts: Provide cleanouts at changes of direction and at intervals as required by Code and as indicated.
- D. Workmanship: Pitch piping at a rate of 1/4 " per foot unless noted otherwise and install parallel or perpendicular to building.

- E. Supports: See PIPE SUPPORTS.
- F. Vents through roof: Provide no-hub cast iron vents through roof. Provide rigid support to structure at and below roof to insure stable vertical vent.
- G. Fixture Waste Connections: Exposed piping to plumbing fixtures shall be chrome plated brass with chrome plated brass traps as specified. Fixtures shall be trapped separately with trap screws below water line.
- H. Inspection/Testing: Provide labor and equipment to test the piping system as follows:
 - Fill system to roof for a period of 2 hours.
- I. Inspect all joints to insure watertight connections, coordinate approval of local authority prior to closing in.

2.06 PIPING: DOMESTIC WATER, ABOVE GRADE:

PIPE CLASS: U2
 PIPE SYMBOL CW / HW / HWR See Legend
 CLEANING CLASS C3
 TESTING CLASS T2

- A. Material: Pipe shall be Type-L copper tubing with wrought copper fittings as manufactured by Revere, Anaconda, or Chase.
- B. Joints: Install with sweat joints with lead free solder; remove all excess flux and solder from piping.
- C. Water Hammer Arrestors: At all branches and risers, provide water hammer arrestor as specified under Part 5 -Equipment/Appurtenances.
- D. Workmanship: Ream pipe to full inside diameter to remove all burrs before joining. Install piping parallel or perpendicular to building or as indicated. Install in a manner to allow for expansion.
- E. Test: Perform a hydrostatic pressure test at 150 psi for a period of 30 minutes until system is proved tight. Test pressure drop shall not exceed 1 psi during test period. For piping that is to be concealed, perform all tests while accessible.

2.07 COPPER PRESS TYPE FITTINGS: (Contractor's Option)

- A. Manufacturers, Copper Press Fittings:
 - Viega, 17545 Daleview Dr., Lakewood, OH 44107, 877.620.0016 or Ridge Tool Co., 400 Clark Street, Elyria, OH 44035, 800.519.3456
- B. Material:
 - Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM.
- C. Installation, Fittings for Copper Tubing:

Press connections: Copper press fittings shall be made in accordance with the manufacturers installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

2.08 PIPE STERILIZATION, DOMESTIC WATER PIPING SYSTEMS:

- A. Pipe Sterilization: Sterilize the system with chlorine prior to acceptance for domestic use in accordance with requirements of AWWA C651, AWWA C652, or as described as follows:

The piping system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.

Once clean water has been found to be flowing at all points of outlet, the system, or part thereof, shall be filled with a water/ chlorine solution containing at least 50 parts per million (50mg/L) of chlorine, and the system, or part thereof, shall be valved off and allowed to stand for 24 hours. As an alternate, the system, or part thereof, shall be filled with a water/chlorine solution containing at least 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.

Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.

The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

2.09 PIPING: SYSTEM TESTS

- A. Provide labor, instruments, and equipment necessary to complete all tests.
- B. Maintain a log of tests with dates, times, and type of test. Leaks found during testing periods shall be noted, identified, and corrected.

2.10 SUPPORTS: PIPE HANGERS:

- A. General: Provide pipe supports, hangers, or other appurtenance to firmly support the piping systems. All pipes shall be independently supported from the building structure and not from other pipes, flues, conduits, ducts or pipe hangers, etc.
- B. Refer to Section 23 02 50 – MECHANICAL PIPE HANGERS AND SUPPORTS for pipe hanging requirements.

2.11 VALVES: DOMESTIC WATER

- A. General: Provide valves where indicated and as required for proper isolation and operation of the domestic water distribution system. Provide shut off valves on all piping serving system risers, equipment, fixtures or banks of fixtures, and at wall hydrants.

Valves shall be designated for 125 psi working pressure unless noted otherwise.

Valves 2-1/2" and smaller shall be bronze or brass.

Valves 3" and larger shall be iron body brass mounted flange ends.

- B. Valves shall have the name or trademark of the manufacturer and the guaranteed working pressure cast on the body of the valve. Valves shall be as manufactured by Milwaukee, Stockham, Crane or Nibco. Valves for the project shall be the product of one manufacturer.

- C. Ball Valves, Class 150: 1/4" to 2" cast bronze 600# W.O.G., full port, screwed ends.

All valves to be installed within insulated pipeline shall be provided complete with valve stem extensions. Stem extensions shall be 2" minimum.

Milwaukee	BA-300
Apollo	77-14
Nibco	T-585-70

- D. Drain Valves: 1/4" to 2" cast bronze 600# W.O.G., full port, screwed ends w/ capped hose end, chain and cap.

Milwaukee	BA-1001T
Apollo	78-100

2.12 TRAPS:

- A. Every plumbing fixture without a manufacturer's integral trap shall separately trapped by a water seal type trap. The vertical distance between the fixture outlet and the trap weir shall not exceed 14 inches. Plumbing fixtures shall not be double trapped.
- B. Each fixture trap shall have a liquid seal of not less than 2" and not more than 4". (Deeper trap seals may apply to special designs for accessible fixtures.)
- C. Where trap seals are subject to loss by evaporation, deep seal type traps shall be used.
- D. All floor drains shall be provided with deep seal type traps.

2.13 VALVES: SPECIAL TYPES

- A. Check Valves: 1/4" to 2" bronze 125#, Y-pattern, threaded ends, lead free.

Milwaukee	509T/1509T
Apollo	163T
Nibco	T-413-Y-LF

- B. Balancing Valves: 1/2" to 2"

Provide balancing valves as indicated on the Drawings and at all return water connections to heating and cooling equipment. Balancing valves shall be Model CBV-S soldered or CBV-T threaded type Circuit Balancing Valves, as manufactured by Armstrong or approved equal.

Each valve shall have metering ports incorporating Nordel check valves, on both sides of the seat.

All valves shall be "Y" pattern equal percentage globe style, designed either for presetting with a balance schedule or for proportional balancing. All metal parts are bronze copper alloy. Each valve shall provide four functions:

Precise flow measurement.
Precision flow balancing.
Positive shutoff with a no-drip soft seat.
Diagnostic point for system analysis.

Valves shall have four full 360 degree adjustment turns of the handwheel with a micrometer-type indicator and hidden memory feature to program the valve for a precise, tamper-proof balanced setting. Metering ports shall be interchangeable with drain ports to allow for read-out flexibility when installed in tight piping locations.

2.14 SLEEVES, PLATES:

- A. Provide and locate sleeves, plates, anchors, and inserts required; mark openings before floors and walls are constructed or core bored.
- B. Provide sleeves for piping passing through floors, walls, roofs, partitions and masonry. Sleeves for concrete or masonry shall be Schedule 40 steel pipe of size to allow for pipe expansion and passage of vapor barrier insulation. Other sleeves shall be 20 gauge galvanized sheet steel with lockseam joint.
 - 1. Terminate sleeves flush with walls, partitions, and ceiling.
 - 2. Terminate sleeves 1/2" above finished floor where piping is exposed.
- C. Where ceiling inserts are provided specifically for the use of the Owner, install all work, so as to not interfere, with a separate support system.

2.15 FIRE SAFING: PIPING AND EQUIPMENT OPENINGS:

- A. Refer to Section 23 03 00 – MECHANICAL: FIRE SAFING, for requirements.
- B. Fire Stop: Pack all piping and equipment openings full depth with approved fire safing material to fully seal all openings.
- C. Seal all sleeves, core holes, etc. through floors, walls and ceilings with Nelson “Flame-Seal” Fire Stop Putty, 3-M Systems, Hilti Systems, Metacaulk Firestopping or Dow Corning “Fire-Stop” Sealant. Install in accordance with manufacturer’s printed instructions.
- D. Firestopping is to meet UL ratings for each penetration type and material for floors, walls and ceiling. Coordinate with Architectural Drawings for exact requirements and ratings at various conditions.

2.16 UNIONS:

- A. Provide union connections at equipment and as indicated. Unions 2" and smaller shall be wrought copper sweat type; larger shall be wrought copper flange type.

2.17 SANITARY/STORM SYSTEM CLEANOUTS:

- A. Provide cleanouts at all changes in direction, at intervals as required by Code, and as indicated.

- B. Floor cleanouts: Provide with dura-coated iron body, inside caulk outlet, cadmium plated iron plug, lead seal, adjustable nickel bronze top; Zurn or approved equal.

For concrete floor: ZN-1400 Set flush with floor

- C. Wall Cleanout: Provide with cast iron supreme cleanout with cadmium plated plug, lead seal, and round stainless steel access cover with securing screw.

Model: ZN-1445 With Z-1462 8x8 access
 Model: ZN-1446 With round wall access

PART 3 - INSULATION: PRODUCTS AND INSTALLATION

3.01 INSULATION: GENERAL:

- A. Provide all insulation as specified in a neat and workmanlike manner observing the best practices of the trade. All longitudinal seams shall be flat and facing away from view. Insulation shall be smooth throughout. Vapor barriers, where required, shall be continuous. No raw ends of material shall be permitted; cover same with eight ounce canvas or approved equal.
- B. Piping and equipment shall be insulated as specified within Section 23 04 00 – MECHANICAL INSULATION.

PART 4 - EQUIPMENT / APPURTENANCES

4.01 ACCESS PANELS:

- A. Provide coordination to properly locate panels that are provided within other sections of this Specification.

4.02 VACUUM BREAKERS:

- A. Provide approved vacuum breakers at all service sinks and wherever required by governing codes.
- B. Provide Watts #288 or approved equal vacuum breaker at hot water heater.

4.03 FLOOR DRAINS:

- A. Provide floor drains as indicated as manufactured by MiFab, Josam or Smith. Zurn model numbers are used to set standards.
- B. Refer to the SCHEDULE on the Drawings for the types and models of floor drains to be provided.
- C. All floor drains shall be fit with "Sure Seal" trap sealing devices as manufactured by Rectorseal. Trap sealing devices shall be ASSE 1072 and IPC approved.

4.04 INSIDE SILL FAUCET:

- A. Provide inside sill faucet with vacuum breaker, threaded hose outlet, tee handle, chrome plated, as manufactured by Chicago Faucet Co or approved equal.

Model: Chicago Model #952

4.05 WATER HAMMER ARRESTORS:

- A. Provide water hammer arrestors, in domestic water piping systems, properly sized, with adapters, and with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Both casing and bellows constructed of Type 18-8 stainless steel.

Model: Z -1700 "Shoktrols" or equal models by J R Smith or Watts

- B. Provide complete submittal with models, sizes and locations for all arrestors.

- C. Locations: Provide arrestors at:

At all electric solenoid automatic valve locations.

At all banks of three or more fixtures.

- D. Coordinate the location of properly sized access panels with the arrestor location to assure proper access.

4.06 DOMESTIC WATER EXPANSION TANK

- A. Provide a potable, domestic water expansion tank on the supply line to the hot water heater. Unit shall be of steel construction, with rigid polypropylene reservoir liner, butyl diaphragm separating the air chamber from the domestic water, stainless steel lined inlet connector, FDA approved materials, field adjustable air pressure charge and with 3/4" male connection.

- B. Manufacturer: Taco, (refer to the water heater detail on the Drawings for Model and Capacity required).

4.07 HOT WATER RECIRCULATING PUMP:

- A. Provide cartridge type circulator with cast bronze body, suitable for 175 psig working pressure and 300 degree F water temperature as manufactured by Taco or Bell & Gossett.

See RECIRCULATING PUMP SCHEDULE for size and capacities.

4.08 WATER HEATERS: HEAT TRAPS

- A. Provide heat traps at the inlet and outlet of all water heater tanks. Water heaters with integral factory installed heat traps shall be provided if available.

4.09 HOT WATER TEMPERING VALVE, THERMOSTATIC MIXING VALVE; POINT OF USE:

A. General:

Provide point of use type thermostatic mixing valves where indicated on the Drawings. Thermostatic mixing valves shall be as manufactured by Symmons or Leonard.

Water temperature limiting valve including integral checks and dual stainless steel strainers for double protection against suspended particles in supply lines. Valve made from lead free* metal components.

B. Temperature control range:

60°F - 140°F (15.6°C - 60°C)

C. Minimum supply pressure:

20 psi (138 kPa)

D. Maximum supply pressure:

125 psi (862 kPa)

E. Inlet to outlet temperature differential:

10°F (5.55°C)

Model: 7-400-NI-T-425-400

F. Finish:

Standard rough bronze and copper finish.

G. Testing:

Factory assembled and tested.

H. Installation:

The thermostatic mixing valve must be piped in strict accordance with the manufacturer's recommendations.

4.10 COIN OPERATED SHOWER SYSTEM:

A. General:

The coin operated shower systems shall be as manufactured by Fluid Manufacturing, 804 Black Diamond Way, Lodi, California 95240. www.fluidmfg.com, and shall be configured as indicated on the drawings.

B. The coin operated shower systems shall include the following components:

Model FM136 24 Vold AC timers

Model KE610 Use Timers

Model FM107 Solenoid Valves

Model FM101L Large, Surface Mount Coin Boxes, (500 coin capacity)

Model FM118T – 9070T100D13 Transformer Control

System III Control Panel for Control of up to 6 Showers.

(Refer to the shower system schematic on the drawings for a full description of the system configuration and components required.)

4.11 GAS FIRED DOMESTIC WATER HEATERS:

- A. Provide condensing type, propane fired domestic water heaters as manufactured by AO Smith or approved equal. Units shall operate with minimum 95% thermal efficiency, Units shall be of Model and Capacity as indicated in the SCHEDULE on the Drawings.
- B. Water heaters shall have a maximum static working pressure of 160 psi.
- C. Water heater(s) shall be provided with modulating gas burner that automatically adjusts the input based on demand, powered anodes that are non sacrificial and maintenance free, and shall have seamless glass-lined steel tank construction, with glass lining applied to all water-side surfaces after the tank has been assembled and welded.
- D. Water heaters shall meet the thermal efficiency and/or standby loss requirements of the U. S. Department of Energy and current edition of ASHRAE/IES 90.1.
- E. Water heater shall be provided with foam insulation and a CSA Certified and ASME rated T&P relief valve and a down-fired power burner designed for precise mixing of air and gas for optimum efficiency, requiring no special calibration on start-up. Units shall be approved for 0" clearance to combustibles.
- F. The control shall be an integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display, and shall have digital temperature readout. No charge connectivity shall be provided allowing for remote viewing and fault notification via app.
- G. Units shall be design certified by Underwriters Laboratories (UL), Inc., according to ANSI Z21.10.3 - CSA 4.3 standards governing storage type water heaters and shall meet the thermal efficiency and standby loss requirements of the U. S. Department of Energy and current edition ASHRAE/IES 90.1. Complies with SCAQMD Rule 1146.2 and other air quality management districts with similar requirements for low NOx emissions.

END OF SECTION 23 10 00

SECTION 23 15 00 - PLUMBING FIXTURES**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.
- B. Refer to all construction documents including all of the Sections of Division 23 for a complete understanding of the electrical components required. Coordinate with all trades.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS

Section 23 01 50 MECHANICAL: VIBRATION ISOLATION

Section 23 02 50 MECHANICAL: PIPE HANGERS AND SUPPORTS

Section 23 03 00 MECHANICAL: FIRE SAFING / FIRESTOPPING

Section 23 04 00 MECHANICAL: INSULATION

Section 23 04 40 MECHANICAL: PIPE CLEANING TESTING

Section 23 10 00 PLUMBING

1.02 SCOPE:

- A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

1.03 RELATED WORK:

- A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs / Flashing
Openings in walls
Equipment foundations and bases
All temporary heating

- B. Electrical Contractor:

Power wiring for electrical equipment provided within this section.

1.04 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to all inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

- Plumbing Fixtures
 - Fixture Trim

1.06 PROJECT CLOSE-OUT:

- A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements, including:

- Testing and Adjusting
 - Operating, Maintenance Instructions
 - Written Guarantee
 - Lubrication
 - Operating, Maintenance Manuals
 - Cleaning

PART 2 - FIXTURES AND INSTALLATION

2.01 FIXTURES: GENERAL

- A. The arrangement and quantity of plumbing fixtures shall be as indicated on the Architectural Drawings.
- B. Provide fixtures, carriers, brass and appurtenances complete with trimmings ready for use.
- C. Securely support fixtures from the building structure in a rigid manner. Provide hangers, frames, and carriers for proper installation. Wall hung fixtures shall be set tight to wall.
- D. Protect all fixtures during construction and thoroughly clean at project closeout.
- E. Air Gap: Provide only fixtures with an air gap between the level of supply openings and the level at the point of unrestricted external overflow.
- F. Domestic water hot and cold water supplies shall be arranged with cold on the right and hot on the left. Faucets shall be indexed to indicate H and C.

2.02 WATER FLOW RATE:

A. General: Fixtures shall be limited to a flow rate of 1.6 gpm at 80 psig unless noted otherwise.

B. Public facilities:

Lavatories in restrooms of public facilities shall be equipped with faucet outlet devices that limit the flow to a maximum rate of .5 gpm.

Water closets shall use a maximum of 1.6 gallon per flushing cycle.

Urinals shall use a maximum of 1.0 gallon per flushing cycle.

2.03 FIXTURES: MANUFACTURERS

A. General: Plate numbers and manufacturer's names used in the Schedule establish type and quality required.

B. Manufacturers:

Vitreous China	American Standard Kohler Zurn Toto
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Brass	Chicago Zurn Symmons Moen Delta Kohler American Standard
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Toilet seats	Church American Standard Zurn
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Flush valves	Sloan Zurn Toto
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Shower Enclosure	Kohler Lasco Aquabath
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Stainless steel sinks	Elkay Just
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Electric Water Coolers	Elkay Halsey-Taylor Haws
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2.04 FIXTURE INSTALLATION:

- A. General: Review all drawings and determine the mounting locations and heights. All fixtures intended for handicapped use shall be mounted to suit requirements. Provide carriers and wall supports for the proper mounting height and type of construction indicated. For all exposed hot water piping and drains at fixtures provide insulation as specified and / or required.
- B. Review the installation of all fixtures to insure proper clearances. If necessary, request additional detail data prior to the installation of fixtures.
- C. Install plumbing fixtures level and plumb according to roughing-in drawings.
- D. Install floor-mounted water closets on closet flange attachments to drainage piping.
- E. Install counter-mounting fixtures in and attached to casework.
- F. Install supports, affixed to building substrate, for wall-mounted lavatories.
- G. Indicate on Drawing, those lavatories that are required to be accessible.
- H. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to Uniform Federal Accessibility Standards (UFAS).
- I. Install accessible, water closets at mounting height for handicapped/elderly, according to Uniform Federal Accessibility Standards (UFAS).
- J. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

Exception: Use ball or gate valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 23 10 00 "Plumbing."

- K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- L. Install toilet seats on water closets.
- M. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- N. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- O. Install traps on fixture outlets.

Exception: Omit trap on fixtures with integral traps.

Exception: Omit trap on indirect wastes unless otherwise indicated.

- P. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks.
- Q. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 23 00 00 "Mechanical General Requirements."

- R. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

2.05 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 23 10 00 "Plumbing."
- C. Comply with soil and waste piping requirements specified in Section 23 10 00 "Plumbing."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220000 "Plumbing."

2.06 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

2.07 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

2.08 CARRIER SYSTEMS:

- A. Provide fixture carrier systems as indicated at fixtures. Carriers shall be installed per manufacturer's recommendation and shall be secured to the building with adequate fastening systems.

Manufacturers: Zurn; or equal system of;
 Smith
 Josam

Water Closets: Zurn system Z1203 or Z1204

Wall hung Urinal: Use Zurn system Z1218

Wall hung Lavatory: Use Zurn system Z1231 or Z1236

2.09 FIXTURES: SCHEDULE

- A. Provide fixtures as indicated. Shop drawings are required. China fixtures are white unless indicated otherwise.

P-1 Water Closet: Floor Mounted: (HC)

3049.001 "Madera Flo Wise" vitreous china elongated bowl, siphon jet toilet, 1.28 GPF, top spud, 16-1/2" rim

111 ESS-1.28-DFB-TMO-HW Sloan Sensor Flushometer. Exposed flush valve with wall mounted hardwired sensor operator.

9500C Solid plastic open front seat with check hinge

Bolt caps

Wax ring gasket

P-2 Water Closet: Floor Mounted: (HC)

3049.001 "Madera Flo Wise" vitreous china elongated bowl, siphon jet toilet, 1.28 GPF, top spud, 16-1/2" rim

111 ESS-1.28-DFB-TMO-HW Sloan Sensor Flushometer. Exposed flush valve with wall mounted hardwired sensor operator.

9500C Solid plastic open front seat with check hinge

Bolt caps

Wax ring gasket

P-3 Urinal: (Floor Mounted)

6400.001 "Stallbrook" floor mounted vitreous china stall urinal, washout

3/4" top inlet, 1 GPF

Maguire 1233 Strainer 2" inside caulk

186 ESS-0.5-XL-L/OR-HW-24V Sloan Sensor Flushometer. Exposed flush valve with wall mounted hardwired sensor operator.

P-4 Lavatory: (Countertop)

Provide all labor and material required to install and connect this fixture to the plumbing systems. The fixture will be provided by the General Contractor.

Coordinate delivery, unpacking and parts inventory with the General Contractor.

ETF-80 SMT-4-BOX-CP-0.5GPM-MLM-IR-1-T-FCT Sloan Optima Electronic Hand Washing Faucet less Mixer. For use with tempered water

ETF-460-A 1-1/4" Grid type strainer and tailpiece, chrome plated brass

3/8" CP cold water supply with stop

1-1/2" PVC P-trap with clean out

P-5 Lavatory: (Countertop, Handicapped Use)

Provide all labor and material required to install and connect this fixture to the plumbing systems. The fixture will be provided by the General Contractor.

Coordinate delivery, unpacking and parts inventory with the General Contractor.

ETF-80 SMT-4-BOX-CP-0.5GPM-MLM-IR-1-T-FCT Sloan Optima Electronic Hand Washing Faucet less Mixer. For use with tempered water

ETF-460-A 1-1/4" Grid type strainer and tailpiece, chrome plated brass

3/8" CP cold water supply with stop

1-1/2" PVC P-trap with clean out

Provide Handi-Lav-Guard insulation including angle valve and P-trap assembly.

Truebro Model #101

P-6 Shower:

Provide all labor and material required to install and connect this fixture to the plumbing systems. The fixture will be provided by the General Contractor.

Coordinate delivery, unpacking and parts inventory with the General Contractor.

Provide Connections and Fittings as follows:

Symmons Model 4-295-B Fre-Flo institutional type, vandal resistant, shower head with through wall bolting mount with back plate, chrome plated brass.

1/2" tempered hot water supply with isolation ball valve

Maguire 1266AV 2" shower strainer with 2" FIP outlet

2" P-Trap

P-7 Mop Receptor:

Fiat MSBIDTG-2424 Molded Stone Mop Service Basin

½" hot water supply with ball valve

½" cold water supply with ball valve

830AA Faucet

3" Integral drain with strainer

832AA hose and bracket

889CC mop hanger bracket

SIC3SN Quick drain connector, 3"

3" P-trap

P-8 Drinking Fountain / Bottle Filler:

Halsey Taylor 4420BF1UDBFRK Endura II™ Outdoor Upper Bottle Filling Station Bi-Level with Pet Station Non-Filtered Non-Refrigerated FR.

Unit shall be 316 Stainless, Heavy Duty Vandal Resistant, Laminar Flow, Pet Fountain, Sealed Freeze Resistant. Furnished with Vandal Resistant bubbler.

Product shall be Floor Mount/Freestanding, for Outdoor applications.

Unit shall be lead-free design which is certified to NSF/ANSI 61 & 372 (lead free) and meets Federal and State low-lead requirements.

The installer shall provide an 8" SCH 40 PVC riser with 4" branch connection and 8" cleanout at grade to allow installation of domestic cold water supply with connection at 4'-0" below grade. (Refer to product installation instructions.)

3/8" CP angle supply with stop

1-1/2" PVC P-trap with clean out

1-1/2" waste connection

P-5 Lavatory: (Wall Hung, Handicapped Use)

American Standard 0355.312 "Lucerne", 20.25" x 18.25"

ETF-80 SMT-4-BOX-CP-0.5GPM-MLM-IR-1-T-FCT Sloan Optima Electronic Hand Washing Faucet less Mixer. For use with tempered water

ETF-460-A 1-1/4" Grid type strainer and tailpiece, chrome plated brass

3/8" CP cold water supply with stop

1-1/2" PVC P-trap with clean out

Provide Handi-Lav-Guard insulation including angle valve and P-trap assembly.

Truebro Model #101

END OF SECTION 23 10 00

SECTION 23 80 00 – HVAC: AIR HANDLING SYSTEM**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS

Section 23 01 50 MECHANICAL: VIBRATION ISOLATION

Section 23 02 50 MECHANICAL: PIPE HANGERS AND SUPPORTS

Section 23 03 00 MECHANICAL: FIRE SAFING / FIRESTOPPING

Section 23 04 00 MECHANICAL: INSULATION

Section 23 04 40 MECHANICAL: PIPE CLEANING TESTING

Section 23 85 00 HVAC: EQUIPMENT

Section 23 90 00 HVAC: CONTROL SYSTEM / ANALOG

Section 23 94 00 HVAC: CONTROL SEQUENCE OF OPERATIONS

Section 23 95 00 HVAC: TESTING ADJUSTING BALANCING

1.02 SCOPE:

- A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

1.03 RELATED WORK:

- A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs / Flashing
Openings in walls
Equipment foundations and bases
All temporary heating

- B. Electrical Contractor:

Power wiring for electrical equipment provided within this section.
All duct smoke detectors that are a part of the fire alarm system.

1.04 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following shop drawings shall be prepared (see Section 23 00 00) and submitted for approval within the time period stated: (This listing is not intended to all inclusive – provide submittals for all materials and equipment proposed for use on this project)

Air Handling Ductwork Layout Drawings

Air Handling Ductwork Materials

Steel

Flexible duct connectors

Diffusers, Grilles

Duct Access Panels
Access Panels

Sound lining materials

Roof Intake Ventilators
Louvers

1.06 PROJECT CLOSE-OUT:

- A. Review and provide close-out requirements of this section and Section 23 00 00 Mechanical General Requirements, including:

Testing and Adjusting
Record Drawings
Operating, Maintenance Instructions
Written Guarantee
Lubrication, Filters
Operating, Maintenance Manuals
Cleaning
Test Log

Letters of compliance.

PART 2 - PRODUCTS AND INSTALLATION

2.01 DUCTWORK: GENERAL

- A. Provide all labor, materials, equipment, and supplies to fabricate and install all duct systems, including ductwork, fasteners, hangers, braces, caulking, fire stopping, access doors, flexible connections and all other items necessary and required for a complete and economically operated system as indicated.
- B. Provide all labor, materials and supplies to properly install devices in the ductwork, including but not limited to; sensors, fire alarm equipment, control equipment, smoke detectors, flow devices, provided within other sections of the specifications. This work shall be coordinated and installed as required for proper operations.
- C. Unless otherwise stated or indicated all ductwork shall be constructed following SMACNA standards of lock forming galvanized steel (ASTM A527) with a minimum galvanized coating of 0.90 oz./sf.
- D. Maintain the cleanliness of the duct storage and installation work area such that the duct systems are internally clean. Provide temporary mylar caps during construction to insure that construction dust does not enter the duct systems. All duct openings shall be sealed until connected to equipment. Wipe down all exterior surfaces as necessary prior to project completion.

2.02 SHEET METAL DUCTWORK: RECTANGULAR

A. General:

Provide all of the sheet metal work as indicated on the drawings, as specified, and as required for the air handling, ventilation and exhaust systems. Construct ductwork to meet all functional criteria defined in Section 7 of the 1995 SMACNA “HVAC Duct Construction Standards, Metal and Flexible”, Second Edition, except as noted: All ductwork will not exceed the deflection limits established in The Uniform Mechanical Code Standard 6-1: Standard for Metal Ducts, 1997 Edition.

Ductwork shop drawings must be properly submitted. Any ductwork installed without prior written approval by the specifier shall be replaced at the expense of the contractor.

The contractor must comply with the enclosed specification in its entirety. If on inspections, the specifier finds changes have been made without prior written approval, the contractor will make the applicable changes to comply with this specification, at the contractor’s expense. At the discretion of the specifier, sheet metal gauges, and reinforcing may be randomly checked to verify all duct construction is in compliance.

Erect all ductwork in accordance with the "Standard Practice in Sheet Metal Work" published by the National Association of Sheet Metal Contractors.

B. Duct Sizes / Gauge: Low pressure not to exceed 3” WC static pressure

Rectangular Size	Gauge No.	Center Spacing
0" to 12"	26	48"
13" to 30"	24	48" to 60"

31" to 48"	22	48" to 60"
49" to 60"	20	48" to 60"
61 and more	18	48" to 60"

C. Fabrication:

Provide all ducts true to the dimensions indicated on the drawings.

Galvanized Steel: All interior ducts shall be constructed with G-60 or

better galvanized steel conforming to ASTM A 653/A 653M and A 924 Standards, LFQ, chem treat. Exterior ductwork or duct exposed to high humidity conditions (i.e. kitchen exhausts) shall be G-90 or better galvanized steel, LFQ, chemical treat.

Aluminum: If specified, use aluminum alloy sheets, lock forming quality, conforming to ASTM B209, Alloy 3003, Temper H14. Dimensional tolerance per ANSI H35.2.

Rectangular Duct Deflection Limits: Shall conform to the Uniform Mechanical Code Standard 6-1 – Standard for Metal Ducts, 1997 Edition. Maximum allowable deflection for transverse joints and intermediate reinforcements will not exceed 0.250 inch for duct widths up to 100 inches and will not exceed 0.3 percent of the span for widths greater than 100 inches.

Ducts shall be straight and smooth on the inside with neatly finished joints. Outside surfaces shall be finished such that all sharp edges are removed. All notches for connecting sections of duct and all grooving seam notches shall not be cut deeper than necessary to insure tight corners.

Crossbreak all surfaces over 18" wide.

Longitudinal Seams Rectangular: For longitudinal seams, the Pittsburgh lock seam will be used on all ductwork 36" wide and larger, and may be used on ductwork 35" wide and smaller.

D. Joints Rectangular:

To SMACNA standards. Proprietary products must be tested in accordance with SMACNA procedures. Certified test results must be submitted.

Transverse joints, for ductwork 36" wide and larger shall be constructed with duct connector systems as manufactured by:

Ductmate 35 System

Ward Ductconnector

All ductwork shall be constructed in accordance with system manufacturer's recommendations.

Butyl gasket will be used between all flanges.

Slip Joints: Shall be made in the direction of the air flow with slips at least one gauge heavier than the duct, made in the form of a frame, mitered and riveted at corners to prevent leakage. Slip joints will be accepted for use on ductwork 30" wide or less and subjected to 2" static positive pressure or less.

E. Sealing of Duct Joints:

All ducts shall have mastic type sealants conforming to SMACNA's Class A sealing requirements, SMACNA Manual, 1995, Second Edition.

Apply tape over joints on exhaust ductwork joints.

On exposed architectural ductwork in the conditioned space the mastic may be eliminated.

F. Elbows:

Changes in direction, where space permits, shall be fabricated with the inside radius no less than the dimension of the duct in the plane of the elbow. Turning vanes shall be used where short radius or square elbows are used.

Turning vanes shall be provided as follows:

Short radius elbows up to 26" in width shall be equipped with one vane.

Short radius elbows greater than 26" in width shall be equipped with two vanes.

Vanes in square elbows shall be spaced on 3" radius on diagonal for ducts up to 24" wide, 5" radius for ducts 25" to 36" wide and 7" radius for ducts over 37" wide.

All vanes must be rigid so as not to rattle or vibrate in the air stream and all raw or sharp edges must be removed from the blades. Turning vanes as manufactured by Tuttle and Bailey Company or equal may be substituted for the above.

All fasteners and attachment supports shall be galvanized steel or of other, corrosion resistant, approved material.

G. Hangers, Supports:

Provide strap duct hangers of 16 gauge, 1" wide for ducts to 30" wide, and of 10 gauge, for ducts over 30" wide.

H. Installation:

No pipes or conduits shall pass through any duct without written approval. Where it is impossible to reroute such pipe or conduit, the duct shall be increased to that point to maintain a constant cross-sectional area and a streamlined enclosure for the pipe shall be provided.

All ducts shall be securely anchored to the building construction in any approved manner and shall be so installed as to be completely free from vibration under all conditions of operation. Horizontal ducts shall be supported with iron hangers from concrete inserts, or beam clamps. Vertical ducts in shafts shall be supported at each floor. The contractor shall furnish and erect all necessary supports and cross framing as required.

The contractor shall be responsible for the coordination of the sheet metal installation with the work of all other trades and shall prepare and submit for approval, shop fabrication drawings for all sheet metal work.

All ducts shall be independently supported from the building structure and not from other ducts, flues, conduits, pipe, pipe hangers etc.

Hangers shall be placed at all elbows and changes of direction and at intervals of no greater than 8'-0". Hangers shall be cross-braced, at proper intervals, to prevent duct sway.

I. Ductwork leakage:

Review all requirements for leakage testing within this section of the specifications

The contractor shall be responsible for the coordination of the sheet metal installation with the work of all other trades

2.03 FLEXIBLE CONNECTIONS: DUCTWORK

- A. At connection of ductwork to air handling equipment, provide flexible material, double layer of fiberglass fabric coated with neoprene, 30 ounce per square yard, rated for 250 deg F continuous use, as manufactured by Ventfabrics Inc or approved equal.

2.04 DAMPERS

- A. General: Provide automatic, manual or splitter type volume dampers as indicated on the drawings and where branch ducts split from main ductwork.
- B. Volume Dampers, Quadrant Type: All dampers shall be (2) gauges heavier than the ducts in which they are installed. Damper blades shall be riveted to the supporting rods. Cast or malleable brackets shall be riveted to the sides of duct to support damper rod and shall have lock type quadrant at one end.
- C. Dampers shall be multi-blade type if cross sectional area of ducts exceeds 1.0 square feet.
- D. Splitter Dampers: Provide at all supply takeoffs and as indicated, splitter dampers of length equal to branch duct width to scoop branch duct air out of main duct air stream. Blade of splitter damper shall be adjusted by steel rod fastened to the end of the damper and pilot block with set screws.
- E. Access Plate: Provide 6" X 6" minimum access sheet metal plate in duct at location of all volume dampers. Location shall provide hand access to damper blade. Pass insulation over this plate.
- F. Automatic Control Dampers: All automatic dampers shall be provided as specified under Automatic Temperature Control. Install all automatic dampers.

2.05 ACCESS DOORS - DUCTWORK:

- A. Provide in all ducts where indicated for access to dampers, coils, volume controls, etc. access doors with continuous hinge and cam lock, or double cam lock if necessary. Units shall be complete with 1" insulation on door, 5/8" knock-over edges, 1/2" wide gasket all around and of a minimum size of 14" X 14" overall.
- B. Units shall be as manufactured by:

Advanced-Air Model E5A or Model E5B.

- C. Units sizes shall be determined by duct size, and purpose of accessibility. All fusible links shall be readily accessible. Access door shall be sized at coils such that door is not less than 8" less than duct size.

2.06 ACCESS PANELS:

- A. Furnish access panels where access is required through partitions, ceilings, etc. In all instances, an effort to locate system equipment and appurtenances shall be such that access panels are not required.
- B. Access panels shall be installed within other sections of this specification.
- C. All access panels shall bear the label fire rating of the wall, ceiling assembly in which the panel is to be installed. For rating requirements, submit size and location to the architect.

2.07 FIRE STOPS: DUCTWORK

- A. Where ducts penetrate walls, floors; seal the space around the duct full depth with mineral wool or other non-combustible material. For oversized openings provide sheet metal closure to hold material in place as necessary.

2.08 AIR DIFFUSERS/GRILLES:

- A. General: Provide all air diffusers, registers and grilles of size and air capacity as indicated on the drawings. Registers and diffusers shall be as manufactured by Price or Tuttle and Bailey.
- B. Exhaust Grilles: Provide heavy gauge extruded aluminum and steel return grilles of type with 45 degree deflection and 1/2" spacing, as indicated on the drawings. Return grilles over 4 square feet shall be of steel construction.

Model: Price 500/600 Series

2.09 LOUVERS: FIXED

- A. Furnish architectural louvers of size, blade style, frame type and location as indicated on the drawings. Unless specifically noted otherwise on the drawings or herein the fixed louvers shall be as follows:

Greenheck

Model ESJ-602 single drainable blade

- B. Verify size, placement details prior to fabrication. Coordinate shop drawings. Provide installation instructions to installing contractor. Comply with SMACNA recommendations for fabrication, details, and installation procedures except where otherwise indicated.
- C. Finish: To be approved by Architect.
- D. Materials: Aluminum extrusions; ASTM 221, Alloy 6063-T52
PVC compression gaskets.

Screens: 1/2" mesh, .063 diameter wire.

2.10 LOUVER: INSTALLATION

- A. Locate and place louver units level, plumb, and at indicated alignment with adjacent work. Provide full depth sill pan under all louvers.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes to no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation..

2.11 GAS FIRED WATER HEATER VENTING:

- A. General: Provide water heater venting systems as noted on the drawings and as specified herein. Venting materials and installation shall conform to the requirements of the International Fuel Gas Code and the water heater manufacturer's standards.
- B. Approved Materials:

PVC pipe materials:

DWV ASTM-D2665 or CSA B181.2
Schedule 40, 80, 120 ASTM-D1785 or CSA B137.3
SDR Series ASTM-2241 or CSA B137.3

CPVC pipe materials:

CPVC 41 ASTM-D2846 or CSA B137.6
Schedule 40, 80 ASTM-F441 or CSA B137.6
SDR Series ASTM-F442

Polypropylene:

M & G Duravent PolyPro vent system
Centrotherm InnoFlue vent system

AL29-4C Stainless Steel:

HeatFab Saf-T Vent
Duravent FasNSeal

C. Concentric Vent Termination Kit:

Provide concentric vent termination kits suitable for through roof or through wall installation as indicated on the drawings. Concentric vent termination kits shall be the product of, or approved for use by the water heater manufacturer.

D. System Installation:

The vent pipe shall be supported properly to avoid bending or failure. The water heater manufacturer recommends that the vent pipe be supported every five feet (152 cm) of vertical run and every three feet (91 cm) of horizontal run.

Do not install the vent piping in a manner that will allow water to be trapped in the piping.

All vent (exhaust) pipes shall be pitched a minimum of a ¼ inch per foot back to the water heater (to allow drainage of condensate).

A field supplied condensate Tee fitting and drain hose shall be installed in the intake air piping near the water heater in colder climates with heavy snow accumulations and in areas that regularly experience high humidity. The drain hose should be routed to an adequate floor drain separate from any other condensate drains.

PART 3 - INSULATION PRODUCTS AND INSTALLATION

3.01 INSULATION: GENERAL:

- A. Provide all insulation as specified in a neat and workmanlike manner observing the best practices of the trade. All longitudinal seams shall be flat and facing away from view. Insulation shall be smooth throughout. Vapor barriers, where required, shall be continuous. No raw ends of material shall be permitted; cover same with eight ounce canvas or approved equal.
- B. Ductwork and equipment shall be insulated as specified within Section 230400 – MECHANICAL INSULATION.

END OF SECTION 23 80 00

SECTION 23 85 00 – HVAC: EQUIPMENT:

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

- Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- B. Refer to and coordinate all work with the work of the following listed Sections:

- Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS

- Section 23 01 50 MECHANICAL: VIBRATION ISOLATION

- Section 23 02 50 MECHANICAL: PIPE HANGERS AND SUPPORTS

- Section 23 03 00 MECHANICAL: FIRE SAFING / FIRESTOPPING

- Section 23 04 00 MECHANICAL: INSULATION

- Section 23 04 40 MECHANICAL: PIPE CLEANING TESTING

- Section 23 80 00 HVAC: AIR HANDLING SYSTEM

- Section 23 90 00 HVAC: CONTROL SYSTEM / ANALOG

- Section 23 94 00 HVAC: CONTROL SEQUENCE OF OPERATIONS

- Section 23 95 00 HVAC: TESTING ADJUSTING BALANCING

1.02 SCOPE:

- A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

1.03 RELATED WORK:

- A. Work in conjunction with this section shall be as designated below:

- General Contractor:

- Cutting, Patching, and Painting
 - Openings in roofs / Flashing
 - Openings in walls
 - Equipment foundations and bases
 - All temporary heating

- Electrical Contractor:

Power wiring for electrical equipment provided within this section.

1.04 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following shop drawings shall be prepared (see Section 23 00 00) and submitted for approval within the time period stated above: (This listing is not intended to all inclusive – provide submittals for all materials and equipment proposed for use on this project)

Fans
Exhaust Ventilators

Supports, curbs, frames, vibration isolators for all equipment.

1.06 PROJECT CLOSEOUT:

- A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements, including:

Testing and Adjusting
Record Drawings
Operating, Maintenance Instructions
Written Guarantee
Lubrication
Filters
Operating, Maintenance Manuals
Cleaning
Test Log
Letters of compliance.

PART 2 - EQUIPMENT

2.01 INLINE CENTRIFUGAL TYPE EXHAUST AND RETURN EXHAUST FANS; DIRECT DRIVE:

- A. General: The fans shall be duct mounted supply, exhaust or return fans shall be of the centrifugal, direct driven in-line type. Fans shall of capacity and model as indicated in the SCHEDULE on the Drawings and shall be Model manufactured by Greenheck Fan Corporation of Schofield, Wisconsin, Loren Cook or Bailey.

- B. The fan housing shall be of the square design, constructed of heavy gauge galvanized steel and shall include square duct mounting collars.
- C. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.
- D. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
- E. Motors shall be permanently lubricated and carefully matched to the fan loads. Motors shall be readily accessible for maintenance.
- F. A NEMA 1 disconnect switch shall be provided as standard, except with explosion resistant motors, where disconnects are optional. Factory wiring shall be provided from motor to the handy box.
- G. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.
- H. Each fan shall bear a permanently affixed manufacturers nameplate containing the model number and individual serial number for future identification.

2.02 RELIEF / EXHAUST HOOD:

- A. Provide roof mounted, gravity relief / exhaust air vents of the size, model and capacity as indicated in the SCHEDULE on the Drawings. Units shall be as manufactured by Greenheck Fan Corporation of Schofield, Wisconsin or Loren Cook.
- B. Gravity roof relief ventilators shall be constructed of heavy gauge aluminum or galvanized steel as specified. Hoods shall be constructed of precision formed, arched panels with interlocking seams. Bases shall be constructed so that the curb cap is 6 in. larger than the throat size. Standard base height shall be 12 in. Hood support members shall be constructed of galvanized steel and fastened so that the hood can be either removed completely from the base or hinged open.
- C. Birdscreens constructed of 0.5 in. galvanized steel mesh shall be mounted horizontally across the discharge area of the hood. Relief units with throat widths through 48 in. shall ship assembled when throat lengths do not exceed 96 in..

PART 3 - EXECUTION:

3.01 EQUIPMENT INSTALLATION, GENERAL:

- A. All equipment shall be installed and connected as indicated on the Drawings and in strict accordance with the manufacturer's recommendations. Sufficient clearance to allow effective maintenance shall be provided and sufficient clearance for electrical parts shall be maintained per the requirements of the National Electric Code.

3.02 EQUIPMENT START AND TEST, GENERAL:

- A. All equipment should be started and tested by the HVAC Contractor once the installation is complete and prior to the start of system balancing work.

3.03 FACTORY START AND TEST, GENERAL:

- A. The HVAC Contractor shall schedule manufacturer's start and test work as required such that the work is complete prior to the start of system balancing work. Refer to the individual equipment specifications for manufacturer's start and test requirements.

END OF SECTION 23 85 00

SECTION 23 90 00 – HVAC: CONTROL SYSTEM**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS

Section 23 01 50 MECHANICAL: VIBRATION ISOLATION

Section 23 02 50 MECHANICAL: PIPE HANGERS AND SUPPORTS

Section 23 03 00 MECHANICAL: FIRE SAFING / FIRESTOPPING

Section 23 04 00 MECHANICAL: INSULATION

Section 23 04 40 MECHANICAL: PIPE CLEANING TESTING

Section 23 80 00 HVAC: AIR HANDLING SYSTEM

Section 23 85 00 HVAC: EQUIPMENT

Section 23 94 00 HVAC: CONTROL SEQUENCE OF OPERATIONS

Section 23 95 00 HVAC: TESTING ADJUSTING BALANCING

1.02 SCOPE:

- A. Provide labor, equipment, and materials to complete the work indicated on drawings and herein specified.
- B. The HVAC controls contractor (henceforth referred to as the “Contractor”) shall provide all power wiring, regardless of voltage, including line voltage wiring to all panels, control devices, not indicated on the Electrical Drawings.
- C. Provide all equipment, accessories, wiring and instrument appurtenances required for a complete energy efficient functioning system.
- D. The control system shall consist of, but not be limited to, all controls as specified herein including:
- sensors
 - thermostats
 - valves
 - dampers, damper operators
 - switches
 - gradual switches

relays
wiring, regardless of voltage
wiring conduit systems

- E. Provide actuators for equipment such as dampers, etc., where such actuators are not provided by the equipment manufacturers. Coordinate requirements with the HVAC subcontractor.
- F. All materials and equipment used shall be standard components, regularly manufactured for this type of work and shall not be custom designed especially for this project. All components shall have been thoroughly tested and proven in actual use.
- G. Provide all control and interlock wiring for compressor/condenser units, air conditioning units, etc. unless specifically and clearly stated to be provided by others.
- H. The ATC contractor shall review and study all HVAC drawings and the entire PROJECT SPECIFICATION, including Division 1 and Division 23 Specification Sections, to familiarize himself with the equipment and systems operation and to verify the quantities and types of dampers, operators, alarms, bells, etc., he has to provide. Numerous references to the ATC contractor are made throughout this specification identifying work to be performed under the HVAC section in addition to work specifically indicated under this paragraph. It will be assumed that, if no specific inquiries are made during the bidding period, the HVAC/ATC subcontractors have reviewed all requirements and interfaces between equipment and controls, to result in a complete, integrated and fully operational HVAC system.
- I. Any required changes or updates to the existing workstation hardware/software necessary to meet the requirements stated within this specification are to be included as a part of the work without additional charge.
- J. The Contractor may only sub-contract electrical wiring and field device installation to a locally licensed electrical contractor specializing in controls. Only full-time permanent employees of the Contractor shall be used to design, program, commission, train, and service the temperature control system.
- K. Drawings are diagrammatic only.
- L. The intent of this specification is to provide a system that is consistent with controls currently in place at the facility.
- M. All work shall conform to current Codes and Standards.
- N. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.03 REFERENCES

- A. National Fire Protection Association (NFPA) Standards.
- B. National Electric Code (NEC) and applicable local Electric Code.
- C. Underwriters Laboratories (UL) listing and labels.
- D. UL 916 Energy Management
- E. NFPA 70 - National Electrical Code.

- F. NFPA 90A - Standard for The Installation of Air Conditioning and Ventilating Systems.
- G. Factory Mutual (FM).
- H. American National Standards Institute (ANSI).
- I. National Electric Manufacturer’s Association (NEMA).
- J. American Society of Mechanical Engineers (ASME).
- K. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
- L. Air Movement and Control Association (AMCA).
- M. Institute of Electrical and Electronic Engineers (IEEE).
- N. American Standard Code for Information Interchange (ASCII).
- O. Electronics Industries Association (EIA).
- P. Occupational Safety and Health Administration (OSHA).
- Q. American Society for Testing and Materials (ASTM).
- R. Federal Communications Commission (FCC) including Part 15, Radio Frequency Devices.
- S. Americans Disability Act (ADA)
- T. ANSI/EIA 909.1-A-1999 (LonWorks)
- U. ANSI/ASHRAE Standard 195-2008 (BACnet)
- V. In the case of conflicts or discrepancies, the more stringent regulation shall apply.
- W. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.04 RELATED WORK:

- A. Work in conjunction with this section shall be as designated below:

General Contractor:

- Cutting, Patching, and Painting
- Openings in roofs / Flashing
- Openings in walls
- Equipment foundations and bases
- All temporary heating

- B. The demarcation of work and responsibilities between the ATC Contractor and other related trades shall be as outlined in the following ATC RESPONSIBILITY MATRIX:

ATC RESPONSIBILITY MATRIX				
WORK	FURNISH	INSTALL	Low Volt.	LINE

			WIRING/TUBE	POWER
Control systems low voltage and communication wiring	ATC	ATC	ATC	N/A
Line voltage and power wiring	Div 26	Div 26	N/A	Div 26
Control Systems conduits and raceway	ATC	ATC	ATC	ATC
Automatic dampers	ATC	Div 23	N/A	N/A
Control Relays	ATC	ATC	ATC	N/A
Control systems interface with HVAC Equipment controls	ATC	ATC	ATC	ATC
HVAC Equipment controls interface with control systems	Div 23	Div 23	ATC	Div 26
All control system, equipment, housings, enclosures, and panels.	ATC	ATC	ATC	ATC
Smoke Detectors	Div 26	Div 26	Div 26	Div 26
Fire Alarm shutdown relay interlock wiring	Div 26	Div 26	Div 26	Div 26
Fire Alarm smoke control relay interlock wiring	Div 26	Div 26	ATC	Div 26
Starters, HOA switches	Div 23	Div 26	N/A	Div 26
Control damper actuators	ATC	ATC	ATC	Div 26

*Line voltage wiring required for the automatic control system not indicated on the electrical drawings shall be furnished and installed by the temperature control system contractor in accordance with the requirements of Division 26.

*ATC = Automatic Temperature Control Contractor

1.05 WIRING:

- A. The mechanical/temperature controls contractor(s) shall provide all wiring, relays, transformers, devices, etc. necessary (regardless of voltage) for automatic controls.
- B. Wiring provided by Mechanical Contractor(s) shall be in accordance with the National Electric Code, local and state codes, and Division 26. Wiring shall be in conduit, regardless of voltage, unless noted otherwise.

1.06 QUALITY ASSURANCE:

- A. The control system shall be designed and installed, commissioned, and serviced by manufacturer trained personnel. The ATC Contractor shall have a branch facility within a 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis.
- B. Control contractor shall be a manufacturer authorized system installer.
- C. The manufacturer shall provide full time, on site, experienced project manager for this work, responsible for direct supervision of the design, installation, start up and commissioning of the control system.
- D. The control contractor shall be regularly engaged in the manufacturing, installation and maintenance of digital control systems and shall have a minimum of ten (10) years of demonstrated technical expertise and experience in the manufacture, installation, and maintenance of control systems similar in size and complexity to this project. A maintained service organization consisting of at least ten

(10) competent servicemen for a period of not less than ten years and provide a list of 10 projects, similar in size and scope to this project, completed within the last five years.

- E. Installation: None but competent technicians, regularly employed in the control trade, shall install the system.
- F. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.

1.07 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.
- B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.08 INTERFACE WITH OTHER WORK

- A. A project supervisor shall be assigned to coordinate all aspects of the project installation. The supervisor shall be a direct employee of the authorized Contractor. The supervisor shall be factory-trained in control technology, systems installation, and commissioning software-based systems.
- B. The mechanical subcontractor shall install all wells, pressure tappings, and tappings for flow sensors.
- C. Patching and painting required for the installation will be accomplished by the general contractor. The Contractor is responsible for this coordination.

1.09 SUBMITTALS:

- A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.
- B. The following submittals shall be prepared (see Section 23 00 00) and submitted for approval within the time period stated: (This listing is not intended to all inclusive – provide submittals for all materials and equipment proposed for use on this project)

Control Panels
Low Voltage Wiring
Line Voltage Power Wiring
Conduit systems / appurtenances
Wiring Diagrams / Schematics

Automatic dampers and Operators

Sequence of Operations

Operator's User Manual

1.10 QUALITY ASSURANCE/SERVICE RESPONSE:

- A. The Control Contractor shall be fully licensed at the time of bid to do business in the project jurisdiction. The Control Contractor must have a branch office with a technical staff, complete spare parts inventory, and test and diagnostic equipment to keep systems in operation 24 hours per day, seven days per week. He shall have emergency service available in the local area for temperature control systems for which he is currently performing on-call emergency service 24 hours per day, seven days per week.
- B. Installation: None but competent technicians, regularly employed in the control trade, shall install the system.
- C. Equipment Manufacturer: Control equipment shall be as manufactured by;
 - Honeywell
 - Siemens Building Technologies
 - Johnson Control

1.11 EQUIPMENT OPERATION INSTRUCTION AND MAINTENANCE MANUALS:

- A. On completion and acceptance of the work, furnish for approval three copies of written instructions on the proper operation and maintenance of all equipment and apparatus furnished under this Section of the Specification. Refer to Section 23 00 00 for additional requirements.
- B. Each manual shall be provided with an index sheet listing the contents in alphabetical order and shall contain but not limited to the following material:

Updated copies of all submittal data and shop drawings as specified previously.

Manufacturer's instructions regarding the installation, maintenance and calibration of each component used in the ATC system installed by the ATC contractor.

Copies of all warranties and guarantees issued by each equipment manufacturer.

"As-built" interconnecting wiring diagrams and wire lists of the field installed system with complete, properly identified numbering of each system component and device.

A "User's Manual" detailing the operation of the Automatic Control System. The manual shall describe the hardware operation. This manual shall be submitted under separate cover. The User Manual shall be written for an inexperienced user. It shall describe in layman's language, the functions and procedures of "using" the system.

1.12 VALIDATION:

- A. Check out, calibrate and test all connected hardware to insure that the system performs in accordance with the approved specifications and sequences of operation.

1.13 INSTRUCTIONS AND TRAINING:

- A. Provide a knowledgeable technician to instruct the Owner's personnel in the proper operation and maintenance of the system. See SECTION 23 00 00.

- B. The ATC contractor shall provide three copies of an operator's user's manual describing all operating and routine maintenance service procedures to be used with the system as specified previously. The ATC contractor shall instruct the Owner's designated representatives in these procedures during the start-up and test period.
- C. Material to be covered shall be:
 - Theory
 - Operational logic, situations
 - As installed; Hardware
 - Troubleshooting
 - Sequence of operations

1.14 GUARANTEE / WARRANTY:

- A. All components, parts and assemblies supplied shall be guaranteed against defects in materials and workmanship for a period of one year.
- B. Labor to troubleshoot, repair, or replace system components shall be provided by the Contractor at no charge to the owner during the guarantee period.

1.15 PROJECT CLOSE-OUT:

- A. Review and provide close-out requirements of this section and Section 23 00 00 Mechanical General Requirements, including:
 - Testing and Adjusting
 - Record Drawings
 - Operating, Maintenance Instructions
 - Written Guarantee
 - Lubrication
 - Operating, Maintenance Manuals
 - Cleaning
 - Instructional Period

PART 2 - PRODUCTS AND INSTALLATION:

2.01 ELECTRIC WIRING: GENERAL:

- A. Provide electric wiring and connections required for the automatic control system. Wiring shall be in conduit and shall comply with the Building Code and the NEC.
- B. The ATC system shall be installed by skilled electricians who are properly trained and qualified for this work.
- C. Supervision and checkout of the system shall be by the ATC contractor.
- D. All electric wiring and wiring connections required for the installation of the temperature control system, as herein specified, shall be provided by the temperature control contractor unless specifically shown on the electrical drawings or called for in the electrical specifications.

- E. Power wiring, including line voltage wiring for the control system shall be provided by the temperature control contractor. This power wiring shall be run to a source as directed by the Electrical Engineer.

2.02 DAMPER ACTUATORS:

- A. Damper actuators shall be of corrosion resistant construction (plastics or PVC are unacceptable), and of the proper size to meet system requirements as determined by the ATC contractor. Each actuator shall be provided with the proper spring selected to insure consistent operations over the desired nominal operating span and for proper sequencing with other controls. The actuator assembly shall include the necessary hardware and brackets to allow proper mounting and connection to a standard diameter damper shaft or damper blade.
- B. The actuators shall be the electronic, direct-coupled types which do not require any crank arm and linkage. Actuators shall be UL and CSA listed and shall have a minimum of a 2 year warrantee, manufactured under ISO 9001, International Quality Control Standards. The units shall have a reversing switch and a manual override on the cover and shall be protected against overload at all angles of rotation.
- C. Damper actuators shall be as manufactured by Belimo or approved equal.

2.03 DAMPERS:

- A. Automatic dampers shall be multiple blade, ultra-low leakage type. Dampers shall be installed by the HVAC subcontractor under the supervision of the ATC contractor, except where specifically called for to be provided by equipment manufacturers. Smoke dampers shall be furnished by ATC contractor, unless they are specifically called for to be provided by others, and installed by the HVAC subcontractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the sheet metal subcontractor. All damper frames shall be constructed of 16 gauge galvanized sheet metal and shall have flanges for duct mounting. Damper blades shall not exceed 6" in width. All blades shall be of corrugated type construction, fabricated from two (2) sheets of 22 gauge galvanized sheet steel, spot welded together. Blades shall be suitable for high velocity performance. Damper leakage shall be less than 1% of total CFM, and pressure drop through the dampers shall not exceed 0.125 inches w.g. at 2000 fpm.
- B. All damper bearings shall be made of nylon. Bushings that turn in the bearings shall be oil-impregnated sintered metal.
- C. Replaceable butyl rubber seals shall be provided with the damper. Seals shall be installed along the top, bottom and sides of the frame and along each blade edge. Seals shall provide a tight closing, low leakage damper. Leakage and flow characteristic charts must be submitted to the Engineer prior to approval of dampers.

2.04 POSITIONERS - PILOT RELAYS:

- A. Positive positioning relays shall be furnished and installed on all damper actuators, valve actuators, vane actuators, and all other actuators whenever said actuators are sequenced with any other control device. Additionally, they shall be furnished and installed whenever any control device requires additional power, repeatability, or speed of response, to insure an accurate and operable control system. Positioner shall have field adjustments for both starting pressure and control signal span.

2.05 PANELS:

- A. ATC control panels shall be fully enclosed cabinets with all steel construction. Cabinets shall have hinged door with locking latch on cover plate. All cabinet locks shall be common keyed. Cabinets shall be finished with two coats of enamel paint. Panel shall be wall mounted or free standing as located on mechanical drawings.

2.06 MISCELLANEOUS DEVICES:

- A. Provide all necessary relays, positioners, electric switches, clocks, transformers, etc., to make a complete and operable system.

2.07 START-UP AND COMMISSIONING:

- A. General:

When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. All testing, calibrating, adjusting and final field tests shall be completed by the manufacturer. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power.

Provide any recommendation for system modification in writing to owner. Do not make any system modification, including operating parameters and control settings, without prior approval of owner.

The Temperature Control Contractor shall issue a report based on a sampling of the performance metrics of the system's various control loops. The report shall indicate performance criteria, include the count of conforming and non-conforming system elements, list the non-conforming elements along with performance data.

After manufacturer has completed system start-up and commissioning. Joint commissioning of integrated system segments shall be completed.

2.08 PERFORMANCE VERIFICATION TESTING (PVT) / START-UP AND COMMISSIONING:

- A. General:

When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. All testing, calibrating, adjusting and final field tests shall be completed by the Temperature Control Contractor. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power.

Provide any recommendation for system modification in writing to owner. Do not make any system modification, including operating parameters and control settings, without prior approval of owner.

After manufacturer has completed system start-up and commissioning. Joint commissioning of integrated system segments shall be completed.

Performance Verification Testing (PVT):

The PVT shall demonstrate compliance of the control system work with the contract requirements. The PVT shall be performed by the Contractor and witnessed and approved by the Owner. A Pre-PVT meeting to review the Pre-PVT Checklist is required to coordinate all aspects of the PVT and

shall include the Contractor's QA representative, the Contractor's PVT administrator and the General Contractor's Representative.

Upon successful completion of the PVT, submit a PVT Report to the Owner and prior to the Owner taking use and possession of the facility. Do not submit the report until all problems are corrected and successfully re-tested. The report shall include the annotated PVT Plan used during the PVT. Where problems were identified, explain each problem and the corrective action taken. Include a written certification that the installation and testing of the control system is complete and meets all of the contract's requirements.

2.09 TRAINING:

- A. One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings and a walk through of the facility to identify panel and device locations.
- B. The Temperature Control Contractor shall provide the Owner's Representative with a binder containing product specific training modules for the system installed. All training shall be held during normal working hours of 8:00 am to 4:30 PM weekdays.
- C. Provide 4 hours of training for Owner's designated operating personnel. Training shall include:
- D. Explanation of drawings, operations and maintenance manuals
- E. Walk-through of the job to locate control components
- F. Explanation of adjustment, calibration and replacement procedures
- G. Since the Owner may require personnel to have more comprehensive understanding of the hardware and software, additional training must be available from the Manufacturer. If such training is required by the Owner, it will be contracted at a later date.

END OF SECTION 23 90 00

SECTION 23 94 00 – HVAC CONTROL SEQUENCE OF OPERATION**PART 1 - PART 1 - GENERAL**

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

- B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50 MECHANICAL: ELECTRICAL COMPONENTS
Section 23 85 00 HVAC: EQUIPMENT

Section 23 90 00 HVAC: CONTROL SYSTEM / ANALOG

Section 23 95 00 HVAC: TESTING ADJUSTING BALANCING

1.02 INTENT:

- A. The intention of these Specifications and Drawings is to call for finished work, debugged, tested and ready for operation.
- B. Equipment and / or materials specified in the singular shall be provided in quantities as required for complete systems.

1.03 GENERAL OPERATIONS

- A. Control sequences are generally worded for direct acting type of control. Controls shall be direct or reverse acting to match the fail position of the actuator or device.
- B. Label function of all control panel alarms switches, indicators, and manual control devices. Label units of analog indicators.

PART 2 - SEQUENCE OF OPERATIONS

2.01 GENERAL DESCRIPTION:

- A. Provide a complete control system with an energy conserving sequence of operations to control the heating, and ventilation systems as indicated for this project.

2.02 OCCUPIED / UNOCCUPIED CONTROL:

- A. The HVAC systems shall be sequenced to operate in either the "Occupied", or "Unoccupied" mode of operation through A 7-day programmable time clock located within the mechanical room.

2.03 EXHAUST VENTILATION CONTROL:

- A. Occupied:

The 2-position automatic dampers serving the men's and women's rooms shall cycle to their fully open positions.

The automatic damper at the exhaust fan discharge shall cycle to its fully open position. Once the damper reaches its fully open position, a damper end switch shall signal the exhaust fan to start.

The exhaust fan shall operate continuously.

- B. Unoccupied:

The exhaust fan shall be inoperative.

The automatic damper at the exhaust fan discharge shall cycle to its fully closed position.

The 2-position automatic dampers serving the men's and women's rooms shall cycle to their fully closed positions.

END OF SECTION 23 95 00

1.04 PROJECT ADMINISTRATION:

- A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

1.05 NOTIFICATION / COORDINATION:

- A. The balancing concern shall notify the Engineer at all times when balancing is to be performed. The general contractor and the HVAC contractor shall insure that all systems are ready for balancing/final adjustment prior to notification of the balancing concern to proceed.
- B. Systems shall be fully operational prior to beginning testing, adjusting, and balancing procedures.

1.06 SUBMITTALS REQUIRED:

- A. Agency Data: Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.
- B. Engineer and Technician Data: Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.
- C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.
- D. Maintenance Data: Submit maintenance and operating data that include how to test, adjust, and balance the building systems. Include this data in the maintenance manual.
- E. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems.

1.07 SCHEDULE OF SUBMISSIONS:

- A. Balancing Report Prior to substantial completion. 3 Copies.

1.08 QUALITY ASSURANCE:

- A. Agency Qualifications:

Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting results.

The independent testing, adjusting, and balancing agency shall be certified by NEEB, TAB and/or SMACNA in those disciplines required for this Project.

B. Codes and Standards:

NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems".

ASHRAE: ASHRAE Handbook, 1987 Systems Volume, Chapter 57; Testing, Adjusting, and Balancing.

1.09 BALANCING CONCERN:

A. Selection of the Subcontractor for this work shall be subject to the Owner's approval.

B. Select from the following:

Leonhardt Company, 27 Harvard Street, Brookline, MA

Arden Engineering Service Group, 435 Narragansett Park Dr. Pawtucket, RI.

Thomas-Young Associates, Inc., P.O. Box 567, Marion, MA 02738 (508 748 0204)

1.10 DEFINITIONS:

A. Adjust: To regulate the specified fluid flow rate at the terminal equipment.

B. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.

C. Branch: Duct or pipe serving a single terminal.

D. Branch main: Duct or pipe serving two or more terminals.

E. Main: Duct or pipe containing the system's major or entire fluid flow.

F. Procedure: Standardized approach and execution of a sequence of work operations to yield reproducible results.

G. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These forms should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.

H. Submain: Duct or pipe containing part of the system's capacity and serving two or more branch mains.

I. Terminal: The point where the controlled fluid enters or leaves the distribution system.

J. Test: To determine the quantitative performance of equipment.

1.11 COSTS:

- A. Carry the amount proposed from anyone of the listed firms as a part of the base bid. Indicate with the bid which of the listed firms is included within the base bid.

PART 2 - BALANCING / FINAL ADJUSTMENT

2.01 GENERAL:

- A. Test, adjust and balance the systems provided to achieve design operation and to set and mark all adjustable equipment for economical operation.
- B. Obtain design drawings and specifications for the project and become thoroughly acquainted with the design intent.

2.02 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING:

- A. Before operating the system, perform the following steps:

Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.

Check volume and fire dampers for correct and locked position, and temperature controls for completeness.

Prepare report test sheets for both fans and outlets. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.

Determine best locations in main and branch ductwork for most accurate duct traverses.

Place outlet dampers in the full open position.

Prepare schematic drawing of system ductwork layouts to facilitate reporting.

Lubricate all motors and bearings.

Check fans for proper direction of rotation.

2.03 SYSTEM TESTS, GENERAL:

- A. Scope: Subsequent to final Testing Adjusting and balancing, all control systems shall be adjusted and calibrated such that performance of all equipment is operating as intended.

2.04 MEASUREMENTS, INSTRUMENTS AND SUPPLIES:

- A. Provide all required instrumentation to obtain proper measurements. Instruments shall meet the requirements specified in the referenced standards, and shall be calibrated to the tolerances specified therein. Instruments shall be properly maintained and protected against damage.

- B. Use only those instruments that have the maximum field measuring accuracy and are best suited to the measurement being made.
- C. Apply each instrument as recommended by the manufacturer.
- D. Use instruments with the maximum number of scale subdivisions and with the minimum scale range for the value being measured.
- E. When averaging values, take a sufficient number of readings to give a repeatability error of less than 5%. When measuring a single point, repeat readings until two consecutive identical readings are obtained.
- F. Take all readings with the eye at the level of the indicated value to prevent parallax.
- G. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuating readings.
- H. Take measurements at locations that will render the most accurate data.

2.05 AIR FLOW BALANCE; GENERAL:

- A. Scope: After the completion of the air distribution systems, adjust and balance the systems to deliver air quantities as indicated or as directed.
- B. Perform testing, adjusting, and balancing procedures on each system identified in accordance with the detailed procedures outlined in the referenced standards.
- C. Preliminary Procedures:
 - Adjust and balance flows to specified design quantities with a tolerance of +/- 5%.
 - Adjust and balance supply and return airflows for systems.
 - Patch ductwork, and housings using materials identical to those removed.
 - Seal ducts and test for and repair leaks.
 - Mark equipment settings of controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
 - Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.
- D. Instruments: Calibrate and maintain all instruments used in checking, balancing the system. Perform accuracy tests on instruments whenever requested by Owner, Engineer, or Architect.
- E. Air Measurement: Measure air quantities in main ducts by pitot tube traverse of the entire cross section area of the duct. Openings in ducts for tests shall be sealed with snap-in plugs after tests. Outlet and inlet air quantities shall be determined by direct reading velocity meters.
- F. Air Quantity Adjustments: Total air quantities shall be obtained by adjusting fan speed. Branch duct quantities shall be adjusted by volume or splitter dampers. Permanently mark set points of all dampers. Only minor air quantity adjustment by outlet dampers will be permitted.

- G. Fresh air intake: Test and set all intake dampers, fans, or other devices to be tight closing when off and to allow stated amounts of fresh air intake during operation. Note all amounts of leakage CFM and operating CFM.
- H. Exhaust systems: Test and set all exhaust dampers, fans, or other device to exhaust the required amounts of air. Set exhaust systems to be tight closing when off. Note all amounts of airflow CFM.
- I. Air System Data:
- | | | | |
|-------|------------|------------|------------------------|
| Fans: | Design RPM | Design CFM | Design Static Pressure |
| | Final RPM | Final CFM | Actual Static Pressure |
| | | | (suction - discharge) |
- Fan Motor: Full Load Amps
 Operating Amps
- Grilles, Registers, Diffusers:
- Mark drawings with actual CFM at each outlet, inlet to indicate final adjustment air quantity.

PART 3 - REPORT

3.01 GENERAL:

- A. The balancing concern shall record and submit for evaluation and review three copies of a complete Balancing Report.
- B. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by, the referenced standards.
- C. Prepare a report of recommendations for correcting unsatisfactory mechanical performance when system cannot be successfully balanced or performance tested.

3.02 REPORT FORMAT:

- A. Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced.
- B. In addition to the Report Forms, the Testing Adjusting and balancing results shall also be noted on reproducible drawings of the building provided by the Architect for that purpose. All data as specified herein shall be neatly and accurately indicated.

3.03 REPORT CONTENTS:

- A. Identification of testing, adjusting, and balancing agency, Owner, and Project. Include addresses, contact names, and telephone numbers.
- B. The seal and name, address, telephone number, and signature of the Test and Balance Engineer.

- C. A listing of the instruments used for the procedures, and proof that all instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.
- D. The appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by the Associated Air Balance Council (AABC) and the National Environmental Balancing Bureau (NEBB) for each respective item and system. Prepare an accompanying schematic diagram that includes each item of equipment in the system being tested.

END OF SECTION 23 95 00

SECTION 26 0501 - GENERAL REQUIREMENTS FOR ELECTRICAL TRADES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specifications Sections apply to Work of this Section.

1.2 DESCRIPTION OF WORK

- A. This Section applies equally and specifically to all Contractors supplying labor, equipment and/or materials as required under each Section of this Division.

1.3 INTENT

- A. It is the intent of the Drawings and Specifications to call for finished work, tested and ready for operation.
- B. Any apparatus, appliance, material or work not shown on the 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, even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without 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 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 approved, satisfactory functioning of the entire system without extra compensation.

1.4 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. (Do not scale the Drawings). Refer to the Architectural Drawings and Details for exact locations of fixtures and equipment; where same are not definitely located, obtain this information from the Engineer.
- B. Work under each Section shall closely follow Drawings in layout of work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom.

Where space conditions appear inadequate, Engineer shall be notified before proceeding with installations.

- C. Engineer may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and for proper execution of the work.
- D. Where variances occur between the Drawings and Specifications or within either of the Documents, the item or arrangement of better quality, greater quantity or higher cost shall be included in the Contract price. The Engineer shall decide on the item and the manner in which the work shall be installed.

1.5 SURVEYS AND MEASUREMENTS

- A. Before submitting his Bid, the Contractor shall visit the site and become thoroughly familiar with all conditions under which his work will be installed as he will be held responsible for any assumptions, omissions or errors he makes as a result of his failure to become familiar with the site and the Contract Documents.
- B. The Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, he shall notify the Engineer and shall not proceed with that work until he has received instructions from the Engineer.

1.6 CODES AND STANDARDS

- A. The Codes and Standards listed below apply to all electrical work. Where other Codes or Standards are mentioned in these Specifications, the latest edition or revision shall be followed:
 - 1. RISBC-1 - International Building Code, 2018 Edition, with State of Rhode Island Amendments
 - 2. RISBC-5 - NFPA 70, National Electric Code, 2020 Edition, with State of Rhode Island Amendments
 - 3. RISBC-8 - International Energy Conservation Code, 2018 Edition, with State of Rhode Island Amendments
 - 4. 450-RICR - Rhode Island Fire Safety Code
 - 5. NFPA 1 - Fire Code, 2018 Edition
 - 6. NFPA 72 - National Fire Alarm and Signaling Code, 2019 Edition
 - 7. NFPA 101 - Life Safety Code, 2018 Edition
- B. The following abbreviations may be used within this Division of the Specifications:
 - 1. IES Illuminating Engineering Society
 - 2. NEC National Electrical Code
 - 3. ANSI American National Standards Institute
 - 4. EPA Environmental Protection Agency
 - 5. IEEE Institute for Electrical and Electronic Engineers
 - 6. NEMA National Electrical Manufacturers Association

7. NFPA National Fire Protection Association
 8. OSHA Occupational Safety and Health Administration
 9. UL Underwriter's Laboratories
- C. 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 with the requirements of all Governmental departments having jurisdiction.
- D. The 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 or not shown on Drawings and/or specified.

1.7 DEFINITIONS

- A. The following definitions shall apply to the following terms as they are used by electrical Drawings and in this Division of the Specifications.
1. Change Order - A Change Order is a written order to the Contractor issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in the Contract Sum or the Contract Time.
 2. Contract Time - Unless otherwise indicated, the Contract Time is the period of time allotted in the Contract Documents for Substantial Completion of the Work, as defined in 1.7E, including authorized adjustments thereto.
 3. Contract Sum - The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.
 4. Contractor - The term Contractor, as used in Division 26, means the Electrical Contractor or any Subcontractor to the Electrical Contractor.
 5. Date of Substantial Completion of the Work - The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Engineer when construction is sufficiently complete, in accordance with the Contract Documents, so that the Owner or separate contractors can occupy or utilize the Work or a designated portion thereof for the use for which it is intended.
 6. Engineer - The Engineer is the person lawfully licensed to practice engineering, or an entity lawfully practicing engineering, identified as such in the Owner-Contractor Agreement. The term Engineer means the Engineer or the Engineer's authorized representative.
 7. Install - To put into place and connect equipment and materials as indicated on the Drawings and in the Specifications so that they are completely functional. The equipment and materials may or may not be provided by the Contractor.
 8. Modification - A modification is (1) a written amendment to the contract signed by both parties, (2) a Change Order, (3) a written interpretation by the Engineer necessary for the proper execution or progress of the Work, (4) a written order for a minor change in the work, issued by the Engineer, which does not involve an adjustment in the Contract Sum or extension of the Contract Time and which is consistent with the intent of the Contract Documents.

9. Owner - The Owner is the person or entity identified as such in the Owner-Contractor Agreement. The term Owner means the Owner or the Owner's authorized representative.
10. Product Data - Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
11. Project - The Project, the total construction of which the Work performed under the Contract Documents is a part.
12. Provide - To supply, put into place and connect equipment and materials as indicated on the Drawings and in the Specifications, so that they are completely functional.
13. Samples - Samples are physical examples which illustrate materials, equipment or workmanship, and establish standards by which the Work will be judged.
14. Shop Drawings - Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
15. Subcontractor - A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor means a Subcontractor or a Subcontractor's authorized representative. The term Subcontractor does not include any separate contractor or any separate contractor's subcontractors.
16. Work - The Work comprises the completed construction required of the Contractor by the Contract Documents, and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

1.8 PERMITS AND FEES

- A. The Contractor shall give all necessary notices, obtain all permits, pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with his work. He shall file all necessary Drawings, prepare all Documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for his work and deliver a copy to the Owner's Representative before request for acceptance and final payment for the work.

1.9 COORDINATION WITH OTHER DIVISIONS

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the General Contractor, with information as to openings, chases, equipment locations and panels required by other trades.
- B. The Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference. In general, ductwork, heating and sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer shall make final decisions regarding the arrangement of work which cannot be agreed upon by the Contractors.
- C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment.

- D. If the work under a Section is installed before coordinating with other Divisions or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.

1.10 APPROVALS

- A. The equipment, materials, workmanship, design and arrangement of all work installed under the Electrical Sections shall be subject to the approval of the Engineer.
- B. Within fifteen (15) days after the awarding of a Contract, the Electrical Contractor shall submit to the Engineer for approval, a list of manufacturers of equipment proposed for the work under the Electrical Sections. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.
- C. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, the Contractor shall notify the Engineer in writing within fifteen (15) days of the awarding of the Contract. In such instances, substitutions may be made pending approval by the Engineer or Owner's representative.
- D. Where any specific material, process, method of construction or manufactured article is specified by reference to the catalog number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, the Electrical Contractor shall verify the duty specified with the specific characteristics of the equipment offered for approval. Equipment characteristics and mandatory requirements are to be used where the Contractor proposes to use an approved equal.
- E. If material or equipment is installed before it is approved, the Contractor shall be liable for its removal and replacement at no extra charge to the Owner if, in the opinion of the Engineer, the material or equipment does not meet the intent of the Drawings and Specifications.

1.11 EQUIPMENT DEVIATIONS

- A. Where the Contractor proposes to deviate (substitute) from the equipment as hereinafter specified, he shall do so by making a request in writing. The Contractor shall state in his request for substitution the reason for the deviation and the amount of credit or extra cost involved. A copy of said request shall be included in the Electrical Base Bid along with manufacturer's cuts. The Base Bid shall be based on using manufacturer's equipment as specified with no exceptions.
- B. In these Specifications and on the accompanying Drawings, one or more makes of materials, apparatus or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish and design required for installation.
- C. The details of workmanship, finish, and design and the guaranteed performance of any material, apparatus or appliance which the Contractor desires to substitute for those mentioned herein shall also conform to these standards. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be used providing it conforms, in the opinion of and meets with the approval of the Engineer, to the

requirements of these Specifications. Where two or more names are given as equals, the Contractor must use one of the named equals. Where one name only is used and is followed by the words "or approved equal", the Contractor must use the item named, but he may apply for substitution through the prescribed manner.

- D. Where the Contractor proposes to use an item of equipment other than specified or details on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new Drawings and detailing required therefore shall, with the approval of the Engineer and Engineer be prepared by the Electrical Contractor at no cost to the Owner.
- E. Where such approved deviation requires a different quantity and arrangement of wiring, conduit and equipment from that specified or indicated on the Drawings, the Contractor shall, with the approval of the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.

1.12 CHANGES IN WORK

- A. The Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time by issuing supplemental instructions to the Owner and Contractor.
- B. The Engineer may issue a Change Order which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change. Contractor will prepare and submit an estimate within five days.
- C. The Contractor may propose changes by submitting a request for change to the Engineer, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.
- D. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment to the Contract Sum and Contract Time.

1.13 MANUFACTURER'S IDENTIFICATION

- A. Manufacturer's nameplate, name or trademark and address shall be attached permanently to all equipment and materials furnished under this Division. The nameplate of a Contractor or distributor shall not be acceptable.
- B. When stated in other sections of this Division, material and equipment supplied under this Division shall bear the label of or be listed by the Underwriters' Laboratories, Inc., or other accredited authoritative agencies or testing organizations approved by the authority having jurisdiction.

1.14 SHOP DRAWINGS

- A. Shop Drawings shall be submitted as indicated in individual sections of this division.

- B. If any equipment or materials are not specifically mentioned in individual sections of this division, Contractor shall contact Engineer to determine if shop drawings are required.
- C. No material or equipment may be delivered to the job site or installed until the Contractor has in his possession approved shop drawings for the particular material or equipment.
- D. Shop drawings shall be submitted as soon as practical within fifteen (15) days after the Award of Contract and before any material or equipment is purchased. The Contractor shall submit for approval copies of all shop drawings to be incorporated in the Electrical Contract. Refer to the General Conditions and Supplementary General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.
- E. Shop drawings shall include manufacturer's names, catalog numbers, cuts, diagrams and other such descriptive data as may be required to identify and approve the equipment. Shop drawings shall also include additional requirements indicated in applicable sections of this Division. No consideration will be given to a partial shop drawing submittal.
- F. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment of material being submitted.
- G. Shop drawings shall be specific, with all items submitted for approval clearly identified with red ink. Data of general nature will not be accepted.
- H. Failure of the Contractor to submit shop drawings in ample time for review shall not entitle him to an extension of Contract time and no claim for extension by reason of such default will be allowed, nor shall it entitle him to purchase, furnish and/or install equipment which has not been approved by the Engineer.
- I. Transmit each submittal with an appropriate transmittal letter. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- J. Identify Project, Contractor, Subcontractor or supplier, pertinent drawing and detail number, and specification section number, as appropriate.
- K. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- L. Provide space for Owner or Engineer review stamp.
- M. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.
- N. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

- O. Approval of shop drawings shall not apply to quantity nor relieve the Contractor of his responsibility to comply with the intent of the Drawings and Specifications.
 - 1. Approval of shop drawings is final; no further changes will be allowed without the written consent of the Engineer.
- P. Shop drawings not approved by Engineer shall be revised and resubmitted in accordance with procedures outlined above. All changes made shall be identified.
- Q. Shop drawings stamped "Make Corrections Noted" are not required to be resubmitted. However, Contractor is responsible for insuring that corrections are made before equipment or materials are purchased.
- R. Distribute copies of reviewed submittals to subcontractors and other appropriate parties. Instruct parties to report promptly any inability to comply with provisions.

1.15 RECORD "AS-BUILT" DRAWINGS

- A. The Contractor and each subcontractor shall maintain a separate set of electrical contract prints, reserved exclusively for the purpose of marking As-Built conditions.
- B. The Contractor and each subcontractor shall record on his respective record prints, clearly, neatly, accurately and promptly as the Work progresses, the following data.
 - 1. Changes made resulting from formal change orders or other instructions issued by the Engineer; actual installed conditions and locations; exact location of concealed wiring, reference and dimensions from building features; location and identification of all concealed devices and equipment.
- C. Upon completion of work, the contractor shall transfer the as-built changes to reproducible media that is in the same format as the original design drawings. (For example, if the design drawings were produced with AutoCad, the as-builts shall also be produced with a compatible version of AutoCad.)

1.16 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the work, except as otherwise specified, shall be new and of first-class quality and shall be furnished, delivered, erected, connected and finished in every detail and so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as accepted by the Engineer shall be furnished.
- B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work, together with all skilled workers, helpers and labor required to unload, transfer, erect, connect, adjust, start, operate and test each system.
- C. Unless otherwise specifically indicated on the Drawings or in the Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

- D. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, skillful manner. The Engineer reserves the right to reject any work which has been installed in a sub-standard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra charge to the Owner.

1.17 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workers and shall include repairing all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until finally inspected, tested, and accepted. Work and equipment shall be protected from water, dust and dirt and against theft, vandalism, injury or damage. Material and equipment received on site which is not immediately installed, shall be carefully and securely stored. Open ends of work shall be closed with temporary covers or plugs during construction to prevent entry of obstructing or other foreign material.
- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and connecting up completely of any equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures and shall include the cost of replacing any of the above equipment and fixtures which are missing or damaged by reason of mishandling or failure on the part of the Contractor to protect.

1.18 BASES AND SUPPORTS

- A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, pads and bases required for all equipment furnished under this Division.
- B. Concrete pads shall be furnished and installed by the Contractor, unless indicated otherwise on the Drawings or in the Specifications for switchboards, generators, motor control centers and other freestanding equipment. All pads shall be extended six inches beyond machine base in all directions with top edge chamfered. Insert steel dowel rods into floors to anchor pads. Shop drawings of all foundations and pads shall be submitted to the Engineer for review before they are constructed. When pads are specified to be furnished by others, the Contractor shall furnish all required dimensional and necessary loading information.
- C. Construction of foundations, supports, pads, bases and piers where mounted on the floor shall be of the same finish quality as the adjacent and surrounding flooring material.
- D. All equipment, unless otherwise shown, shall be securely attached to the building structure in an acceptable manner. Attachments shall be of a strong and durable nature; any attachments that are insufficient, in the opinion of the Engineer, shall be replaced as directed without additional expense to the Owner.

1.19 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. The Contractor shall provide, set in place and be held responsible for the location of all sleeves, inserts and anchor bolts required for his work. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.
- B. All conduits passing through floors, walls or partitions shall be provided with sleeves having an internal diameter of one inch larger than the outside diameter of the conduit or insulation enclosing the conduit.

1.20 FIRE-STOPS

- A. The Contractor shall provide UL rated fire-stops for all penetrations through fire-rated walls, ceilings and floors (except slab on grade) in which raceways, conduits, wire, cables, busways or cable trays pass.
- B. The fire-stops shall be filled solidly with mineral fiber or other UL approved fire-stopping material classified for the required hourly rating.
- C. Penetrations through fire-rated walls, ceilings or floors shall be sealed by a UL approved fire-stop fitting classified for an hourly rating equal to the fire rating of the wall, ceiling or floor.

1.21 SEALS

- A. Seal fittings shall be installed on conduits and cables, as required by Articles 500 through 517 of the NEC, which are in or pass through hazardous (classified) areas.
- B. Sealing bushings shall be used on conduit and cable ends to prevent the intrusion of water, a damp or corrosive atmosphere, hot or cold air, or dust.
- C. Thorough wall and floor seals shall be used to provide a positive means of sealing pipes or conduits which pass through the concrete foundations of a structure below grade or below ground water level. Seals shall also be used at entry points through concrete walls or floor which must be sealed.

1.22 CUTTING AND PATCHING

- A. All cutting and patching shall be done by the Contractor, unless indicated otherwise on the Drawings or in the Specifications when cutting and patching is specified for others. The Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.
- B. The Contractor working under this Division shall furnish, locate and set inserts and/or sleeves as required before the floors and walls are built. The Contractor shall be responsible for the cost of drilling, cutting and patching as required for conduits, etc., where sleeves and inserts were not installed or correctly located. The Contractor shall do all drilling required for the installation of hangers.

- C. All holes cut through concrete slabs shall be done with extreme caution to avoid cutting or damaging structural members. No structural members shall be cut without the written approval of the Engineer. Structural steel members shall be cut in a manner directed by the Engineer.

1.23 SCAFFOLDING, RIGGING, HOISTING

- A. The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

1.24 EXCAVATION AND BACKFILLING

- A. All excavation and backfilling required shall be done by the Contractor, unless indicated otherwise on the Drawings or in the Specifications.
- B. When excavation and backfilling is specified to be done by others, it is the responsibility of the Contractor to coordinate sizes, depths, fill and bedding requirements with the other party for any excavation work required under this Division.

1.25 WATERPROOFING

- A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

1.26 ACCESSIBILITY AND ACCESS PANELS

- A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions and the adequate clearance in double partitions and hung ceilings for the proper installation of the work.
- B. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to: Motors; controllers; switchgear, etc. Access doors shall be furnished if better accessibility is required. Approved minor deviations from Drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without the approval of the Engineer.
- C. Access doors in walls, ceilings, floors, etc., shall be furnished and installed by the Contractor, unless indicated otherwise on the Drawings or in the Specifications. It is the responsibility of the Contractor to coordinate and provide information regarding the sizes and quantities of access doors required for his work. When access doors are specified to be provided by others, the Contractor shall arrange his work in such a manner so as to minimize the quantity of access doors required. All items requiring accessibility shall be located in already accessible areas, such as above lay-in ceilings, etc.

- D. Upon completion of the Project, the Contractor shall physically demonstrate that all equipment and devices installed have been located and/or provided with adequate access panels for repair, maintenance and/or operation. Any equipment not so furnished shall be relocated or provided with additional access panels by the installing Contractor at no additional cost to the Owner.
- E. Permanent ladders for access to equipment shall be furnished and installed by the Contractor, unless indicated otherwise on the Drawings or in the Specifications.

1.27 TEMPORARY OPENINGS

- A. The Contractor shall ascertain from his examination of the Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under this Division and he shall provide these openings, unless indicated otherwise on the Drawings or in the Specifications.
- B. When these openings are specified to be provided by others, the Contractor shall give sufficient notice to the other party in time to arrange for the openings. In the event of failure of the Contractor to give sufficient notice, the Contractor shall assume all costs of providing such openings thereafter.

1.28 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 Engineer or the Owner's representative.
- B. The Engineer and the Owner shall be notified 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.

1.29 PAINTING

- A. All materials shipped to the job site under this Division such as panels, plates, etc., shall have prime coat and standard manufacturer's finish, unless otherwise specified.
- B. The Contractor shall perform all painting in areas in accordance with the following:
 - 1. All concealed, non-insulated hangers, supports and other ferrous metal work, except that which are galvanized, shall be painted. Inaccessible conduits, hangers, support and anchors and ducts shall be coated prior to installation.
 - 2. The manufacturer's nameplate data on equipment shall not be painted over. Special care shall be taken to avoid covering or spattering paint on the nameplate.
 - 3. Damaged equipment shop coats shall be touched up in the field.
 - 4. All conduit junction box covers for the fire alarm system shall be painted red.

1.30 TEMPORARY CONSTRUCTION FACILITIES AND SERVICES

- A. Contractor is responsible for providing all temporary facilities and services required. This includes power, lighting, heat, ventilation, water, sanitary facilities, barriers, fences, access roads and structures. Contractor shall keep these areas secure and in a clean and orderly condition, unless indicated otherwise.

1.31 REMOVAL RELOCATION AND/OR ABANDONMENT

- A. Certain items of existing equipment, raceways or wiring may be indicated for removal, relocation, disposal or abandonment.
 - 1. Items noted for removal shall be disconnected and turned over to the Owner or disposed of if the Owner so requests.
 - 2. Items noted for relocation are intended for reuse in another location as designated on the Drawings. It shall be the responsibility of the Contractor to remove said equipment from its present location, store in a safe place and reinstall in its new location. If upon removal there is any question as to the suitability of the equipment or apparatus, said condition shall be brought to the attention of the Engineer in writing.
 - 3. Items noted for removal and disposal shall be disconnected, transported and disposed of by the Contractor. The Contractor shall obtain any and all permits, provide all services, meet all legal requirements, and pay all fees for the disposal of all materials indicated.
 - 4. Items noted for abandonment shall be defined as abandoning in place any item so designated and shall include proper conductor termination within any occupied or open area. In the case of a wiring system, abandonment shall include the disconnection and termination of conductors at their source of supply, such as a circuit breaker. Abandoned conduits shall be capped.
- B. The existing mechanical and electrical services in the existing building must remain in operation during the renovation process.

1.32 CLEANING

- A. The Contractor shall thoroughly clean all equipment of all foreign substances inside and out before being placed in operation.
- B. If any part of a system should be stopped by any foreign matter after being placed in operation, the system shall be disconnected wherever necessary to locate and remove obstructions. The system shall then be cleaned and reconnected. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- C. Upon completion of work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.

1.33 OPERATING INSTRUCTIONS

- A. Upon completion of all work and all tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or his representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least 48 hours notice to the Owner in advance of this period.
- B. The Contractor shall furnish for delivery to the Engineer four (4) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instruction.
- C. The Contractor in the above-mentioned instructions shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- D. An authorized manufacturer's representative shall attest in writing that his equipment has been properly installed prior to start-up. The following equipment are some of which will require this inspection: sound system; fire alarm system; security or emergency power system. These letters will be bound into the operating and maintenance books.

1.34 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the Engineer, a factory-trained service engineering representative shall inspect the installation and assist in the initial start-up and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service engineering representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service engineering representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer.

1.35 GUARANTEES

- A. The Contractor shall guarantee all materials and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by the Owner, unless otherwise indicated in the specifications or on the Drawings.
- B. During this guaranteed period, all defects developing through materials or workmanship shall be corrected or replaced immediately by this Contract when directed by the Engineer without expense to the Owner; such repairs or replacements shall be made to their satisfaction.

END OF SECTION 26 05 01

SECTION 26 0513 - MEDIUM VOLTAGE CABLE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, materials, equipment, accessories, services and tests necessary to provide all conductors, splices and terminations to provide a complete and functional system.

1.3 QUALITY CONTROL

- A. The cable and accessories shall be manufactured by firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. The cable shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere, the Contractor shall submit product literature detailing the properties and description of the cable and accessories.

PART 2 - PRODUCTS**2.1 CABLES**

- A. Cables shall have single stranded aluminum conductor , EPR insulation, concentric copper neutral, and PVC jacket.
- B. Cables shall be Type MV-105 and be rated as noted on the drawings with 133% insulation level.
- C. Cables shall comply with Article 328, Part III of the NEC and UL1072.

2.2 CONDUCTOR

- A. The conductor shall be Class B compressed concentric stranded aluminum.

2.3 CONDUCTOR SHIELD

- A. An extruded conducting layer of thermoset compound with an average thickness of not less than 15-mils shall be applied over the conductor and bonded to the insulation.

2.4 INSULATION SHIELD

- A. The insulation shall have an extruded conducting thermoset polymeric layer applied over it. The layer shall be identified as being conductive.
- B. Directly over the extruded insulation shield shall be bare copper concentric neutral wires.

2.5 TERMINATIONS

- A. Elbow connectors: Shall be rated 200A for load break and 600A for dead break.
 - 1. Load break shall be used for dead front terminations rated 200A at voltages of 15kV or below.
 - 2. Elbows shall be molded of peroxide cured EPDM insulation with molded semi-conducting shield, capacitive test point, stainless steel pulling eye, grounding tab and built-in stress relief.
- B. Cast epoxy-resin type termination: Provide for the live front termination of single conductor, solid insulated, non-metallic jacketed type cable for voltages up to 25 kV.
 - 1. Termination shall be the product of one manufacturer who shall provide all components in kit form, including complete instructions to be followed for fabrication and installation. The termination shall consist of free flowing epoxy-resin material molded about the insulated conductor and conductor end at the lug or solder seal.
 - 2. The component materials shall be in packaged form ready for mixing without opening or removing the material from the package. Terminations for shielded conductors shall include taped or preformed stress cones with a shield ground connection brought out through the insulation and covering, and grounded at installation.

PART 3 - EXECUTION

3.1 GENERAL

- A. Verify condition of raceways, ductbanks, handholes and manholes before installing cable.

3.2 INSTALLATION

- A. Installation shall be in accordance with manufacturer's instructions and Article 326 of the NEC.
 - 1. Cable delivered to the job site shall be inspected for physical damage before acceptance. Handle and store cable to prevent damage before installation. Cable and all accessories shall be protected from weather and field conditions.
 - 2. All raceways shall be swabbed clean before pulling cables. Avoid abrasion and other damage to cables during installation.
 - 3. Provide and use a tension monitor gauge during each cable pull, and if maximum pulling tension is exceeded per cable manufacturer's specifications, the cable shall be removed

and replaced. Suitable pulling equipment and lubricants shall be employed. Do not exceed manufacturer's minimum bending radius.

4. Cables installed in manholes shall be looped along walls to provide the longest route. Avoid interference with duct entrance. Rack cables neatly and securely with appropriate racking systems.
5. Cables installed in manholes shall be suitably fireproofed, using approved fireproofing tape and applied in a half-lapped wrapping method.
6. Cable shield grounding shall be provided at each termination.

3.3 INSPECTION

- A. Prior to energizing, all cable and terminations shall be inspected for proper workmanship and any damaged or misapplied equipment replaced.
- B. Each cable shall be tested before energizing using VLF test method. A written report shall be submitted to the Engineer that details testing procedure and results.

END OF SECTION 26 05 13

SECTION 26 0519 - CONDUCTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, materials, equipment, accessories, services and tests necessary to provide all Conductors in accordance with Drawings and Specifications.

1.3 QUALITY CONTROL

- A. The Conductors shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. The attached tag, reel or smallest container in which product is packaged shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere, Contractor shall submit product data detailing electrical and physical characteristics of all conductors to be used.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Conductor construction and applications shall comply with Article 310.104 of the NEC.
 - 1. Conductors shall be copper, soft drawn, and annealed, and shall not be less than 98 percent conductive.
 - 2. Conductors shall be minimum Class B stranding and sized according to Articles 310.106(A) and 310.15 of the National Electric Code (NEC) with exceptions as follows:
 - a. Conductors that are flexed such as those routed to door mounted devices shall have a minimum of Class C stranding.
 - 3. Conductor insulation for circuits rated below 600 volts, except low-level signal cables, shall be type THHN/THWN or XHHW rated for 600 volts, except as specifically noted on the Drawings. Conductor insulation in oily locations shall also be rated type MTW.
 - 4. Conductors shall be twisted for all low level signals such as annunciators, RTD, telephones, etc. Conductor shielding shall be required when recommended by equipment

manufacturer or when indicated otherwise. Refer to Section 283100 for fire alarm conductor requirements.

5. Conductor marking shall comply with Article 310.120 of the NEC.
6. Conductor identification shall comply with Article 310.110 of the NEC, to indicate each conductor's function.
7. Single conductors, No. 10 AWG or smaller, shall have their outer identification be solid and of continuous color for the entire length to conform to the color code listed below denoting function and/or polarity. Conductors larger than No. 10 AWG may be black and have both ends of each conductor marked with colored tape or labels especially designed for electrical coding.

	120/208 Volt System	277/480 Volt System
Phase:	Black, Red, Blue	Brown, Orange, Yellow
Neutral:	White	Gray
Ground:	Green	Green

8. Multi-conductor cables shall be identified as above for power systems and may follow their own color codes for control systems.
9. Grounding conductors and equipment grounds, unless bare, shall have a green covering.
10. Conductors for control circuits above 24 volts shall be a minimum size of No. 14 AWG.
11. Conductors for control circuits 24 volts and below shall be a minimum size of No. 16 AWG.
12. Lighting and power circuit conductors shall be a minimum size of No. 12 AWG.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use of other wire, cable, material and methods other than indicated in this section, shall be only as specifically indicated otherwise on the Drawings or with written approval from the Engineer.
- B. All wiring and cables shall be installed, as a minimum, as required by the latest edition of the NEC, with special attention to Article 310.
- C. Control Wiring:
 1. All control wiring shall be installed in strict compliance with all provisions of NEC Article 725; Class 1, Class 2 and Class 3 Remote Control, Signaling and Power Limited Circuits; or if classified as non-power limited, in accordance with NEC general requirements. Control cables and wires shall be listed as being suitable for the purpose and location. Cables shall be marked in accordance with NEC Article 725.
 2. All control wiring shall be suitably supported; either run in conduit, or attached continuously to building structural members, or independent support system; subject to Engineer's approval. Do not attach to plumbing piping, sprinkler piping, electrical conduit or suspended ceiling. Cable ties shall be used to bundle control or other wiring not installed in conduit. Cable ties installed in environmental air plenums shall be plenum rated.
- D. Conductors:
 1. A separate neutral conductor shall be provided for all 20A, single pole branch receptacle and lighting circuits on each phase. Where a shared neutral conductor must be used for

single phase circuits on different phases, it shall have an ampacity that is a minimum of 173% of the phase conductors. For example, if the phase conductors are No. 12 AWG, then the neutral must be at least a No. 8 AWG.

2. All conductors in vertical runs of conduit shall be supported within the conduit in accordance with Article 300.19 of the NEC.
3. Conductors with thermoplastic insulation shall not be pulled at temperatures lower than 320 F (00 C).
4. Unless otherwise indicated on the Drawings or specified herein, only conductors of a single voltage level or function type shall be run in one raceway. Low level, control and power circuits shall not be mixed.
5. Conductors shall be connected directly to devices without the use of lugs only when the device is designed for direct connection and has a wire clamp or pressure plate. In addition, solid conductors, where permitted, may be directly connected to devices such as receptacles, where wires shall be formed into a loop to fit around the terminal screws.
6. Conductors shall be connected to devices using ring or locking fork terminals if the device is not designed for direct connection. The terminals shall be sized to match both the wire size, wire type and screw size.
7. Conductor identification shall include at each end of a conductor and at each junction or pull box, the source identification number for each conductor (panel and circuit numbers).
8. Any conductor that is damaged (nicked) shall be re-spliced or replaced.
9. Wires and cables shall be carefully handled during storage and installation to avoid mechanical injury to conductor, insulation, or covering. Any damaged conductors shall not be installed.
10. No wire or cable shall be pulled into raceway systems until work that could cause damage to wiring has been completed.
11. Wires and cables shall, insofar as practical, be continuous from origin to termination without running splices. All splices shall be located in an enclosure suitable for splices.
12. Installation of wires and cables shall include provisions for hangers, racks, cable cleats and supports necessary to make a neat and substantial installation.
13. Wires and cables of all branch circuits at panelboards, fixtures, equipment and wiring devices shall be identified in accordance with Section 260553.
14. Each feeder cable in pull boxes, panels and at equipment shall be tagged with proper feeder number and phase designation.
15. Wiring in panelboard gutters, cabinets, switches, wireways, and such equipment shall be neatly formed and tied with cable ties and straps. Cable ties and straps shall be tool-applied or self-clinching types of one-piece molded construction. Bodies shall be of nylon and clinching clips shall be spring bronze.
16. Feeding tubes shall be used where cables pass into raceways. To avoid injury, cable shall not be subjected to bending less than 6 times its overall diameter.

E. Connectors:

1. Solderless connectors shall be used for terminals, taps and splices for wires and cables.
2. Connectors shall be sufficiently large to enclose all strands of conductor. Conductor shall be securely fastened and shall not loosen under vibration or normal strain.
3. Twist-on wire connectors (wire nuts) shall be used for splices in wires of size No. 10 AWG or smaller. Splices and taps in wires No. 8 and larger shall be made with solderless connectors designed for the purpose.

F. Lubricants: Lubricants shall be used where necessary to pull wire or cable. Lubricant shall not cause deterioration of conductor insulation.

- G. Splices and Taps: Splices and taps shall be taped with UL listed tapes providing insulation not less than that of the conductors.

END OF SECTION 26 0519

SECTION 26 0520 - METAL CLAD CABLE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, materials, equipment, accessories, services and tests necessary to provide all Metal Clad (MC) Cable in accordance with Drawings and Specifications.

1.3 QUALITY ASSURANCE

- A. MC Cable shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. MC Cable shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere, Contractor shall submit product data detailing electrical and physical characteristics of all types of MC cable to be used. Include information on additional or oversized neutral conductors.

PART 2 - PRODUCTS**2.1 CONDUCTORS**

- A. Conductors shall be copper, soft drawn, and annealed, and shall not be less than 98 percent conductive.
- B. Conductors shall be minimum Class B stranding and sized per applicable codes including NEC Article 310.106(A) and 310.15.
- C. Conductor insulation for circuits rated below 600 volts, except low level signal cables, shall be type THHN/THWN or XHHW rated for 600 volts, except as specifically noted on the Drawings.

2.2 CABLE

- A. MC Cable shall comply with Article 330, Part III of the National Electric Code (NEC) and UL1569.
- B. A suitable cable tape shall be applied over the assembly to hold the core together and provide bedding for the armor.
- C. An aluminum or galvanized steel interlocked armor shall be applied over the cable core.
- D. An extruded covering of PVC shall be applied over the armor when such covering is required. Minimum thickness at any point shall be not less than 70% of the required average thickness. The covering shall be sunlight resistant.
- E. MC Cable shall have a marker tape applied longitudinally under the armor which complies with Article 310.120 of the NEC.
- F. MC Cable identification shall comply with the applicable codes, including NEC Article 310.110 to indicate each conductor's function.
- G. For fire alarm applications, MC Cable shall be rated as FPL and be 2 hour rated for penetrations.

	120/208 Volt System	277/480 Volt System
Phase:	Black, Red, Blue	Brown, Yellow, Orange
Neutral:	White	Gray
Ground:	Green	Green

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cable:
 1. All MC Cable shall be installed in accordance with Article 330, Part II of the NEC and manufacturer's instructions.
 2. Use of other cable, material and methods other than indicated in this section, shall be only as specifically indicated otherwise on the Drawings or with written approval from the Engineer.
 3. MC Cable shall be carefully handled during storage and installation to avoid mechanical injury to conductor, insulation, or covering. Any damaged cable shall not be installed.
 4. Installation of cable shall include provisions for hangers, racks, cable cleats and supports necessary to make a neat and substantial installation. Cable shall not be supported from conduit, piping or light fixture supports.
 5. MC Cable identification shall include at each end of a cable and at each junction or pull box, the source identification number for each conductor (panel and circuit numbers).
 6. Each feeder cable in pull boxes, panels and at equipment shall be tagged with proper feeder number and phase designation.
 7. Any MC Cable which is damaged, shall be replaced.
 8. Fittings used for connecting MC Cable to boxes, cabinets or other equipment shall be identified for such use.

9. MC cable may be used in place of EMT and wire for wiring of lighting and receptacle circuits, where it can be concealed. See Section 260519, para. 3.1 D.1 for neutral conductor requirements.
- B. Connectors:
1. Connectors shall be sufficiently large to enclose all strands of conductor. MC Cable shall be securely fastened and shall not loosen under vibration or normal strain.
 2. Solderless connectors shall be used for terminals, taps and splices for conductors.
 3. Spring type connectors (wire nuts) shall be used for splices in wires of size No. 10 AWG or smaller. Splices and taps in wires of size No. 8 AWG and larger shall be made with solderless connections designed for the purpose.
- C. Splices and Taps:
1. Splices and taps shall be taped with UL listed tapes providing insulation not less than that of the conductors.

END OF SECTION 26 0520

SECTION 26 0526 - GROUNDING AND BONDING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. Provide a fully functional grounding system consisting of all electrodes, cables, terminations, bushings, markings, jumpers, devices and accessories.

1.3 QUALITY ASSURANCE

- A. The equipment and accessories shall be of standard or custom design manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. Components used in the system shall bear the Underwriters' Laboratories (UL) Label where applicable.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere the Contractor shall submit product literature detailing dimensions, components, manufacturer's installation requirements and product limitations.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. All components used in grounding system shall comply with Article 250 of the National Electric Code (NEC).
 - 1. Ground Rods: Ground rods shall be copper or copper-clad steel 5/8" x 10' minimum.
 - 2. Mechanical Connectors: Connectors shall be bronze and be UL listed for their application.
 - 3. Exothermic Connections: Exothermic connections shall be equal to "CADWELD" connections.
 - 4. Grounding bushings shall be UL listed and sized for their application.
- B. CONDUCTORS

- C. Conductors installed underground shall be bare stranded copper, of sizes as indicated on the drawings, and in direct contact with the earth. Backfill to be tamped to avoid voids around conductors.
- D. Conductors installed in raceways shall be solid or stranded, bare or green insulated for sizes smaller than #10 AWG. For sizes #10 and larger conductors shall be stranded and insulated with green or green with yellow trace insulation.
- E. Grounding electrode conductors shall be sized as indicated. Where no size is given, size in accordance with Article 250.66 of the NEC.
- F. Bonding jumpers shall be sized in accordance with Article 250.28(D) of the NEC.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All products shall be installed in accordance with Article 250 of the NEC and the manufacturer's requirements.
- B. The grounding electrode system shall comply with Article 250, Part III of the NEC, and shall include the following electrodes (if available) bonded together:
 - 1. Metal underground water pipe in accordance with Article 250.52(A)(1) of the NEC.
 - 2. Metal in-ground support structure in accordance with Article 250.52(A)(2) of the NEC.
 - 3. Concrete encased electrode in accordance with Article 250.52(A)(3) of the NEC.
 - 4. Ground ring in accordance with Article 250.52(A)(4) of the NEC.
 - 5. Rod and pipe electrodes in accordance with Article 250.52(A)(5) of the NEC.
 - 6. Other listed electrodes in accordance with Article 250.52(A)6 of the NEC.
 - 7. Plate electrodes in accordance with Article 250.52(A)(7) of the NEC.
 - 8. Other local metal underground structures in accordance with Article 250.52(A)(8) of the NEC.
- C. When a metal underground water pipe is used as the grounding electrode, a supplemental electrode shall be provided in accordance with Article 250.53(D)(2).
 - 1. Verify that final backfill and compaction has been completed before driving rod electrodes.
 - 2. Install ground rods in locations indicated on Drawings.
- D. When the grounding electrode conductor (GEC) is installed in metal raceway, the raceway shall be bonded to the GEC at both ends.
- E. All metallic, non-current carrying items within the structure shall be bonded to the grounding systems in accordance with Article 250.104 of the NEC. Such items shall include, but not necessarily be limited to the following: structural steel, metal sheathing, water and gas piping and other equipment that would constitute an electrical hazard if not grounded.
- F. All separately derived systems as defined by Article 100 of the NEC shall be grounded in accordance with Article 250.30 of the NEC

3.2 TESTING

- A. Testing: Test grounding electrode system using approved methods and instruments. Resistance must not exceed 10 Ohms. Additional grounding electrodes shall be required if resistance exceeds 10 Ohms. Submit a report to the Owner and Engineer detailing test methods and results.

END OF SECTION 26 0526

SECTION 26 05 29 - HANGERS AND SUPPORTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, materials, equipment, accessories, services and tests necessary to provide all Supporting Devices in accordance with Drawings and Specifications.

1.3 QUALITY ASSURANCE

- A. The Supporting Devices shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere, provide product data detailing electrical and physical characteristics of all supporting devices, including weight loading capacity.

PART 2 - PRODUCTS**2.1 GENERAL**

- A. All supports shall have corrosion resistant finishes.
- B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

2.2 MECHANICAL SUSPENSION CHANNEL

- A. Channel shall be factory formed of 12 gauge steel and shall have a minimum outside cross section measuring 1-1/2" x 1-1/2"
- B. Channel shall be used for supporting wall mounted equipment in wet or damp locations, and for parallel runs of conduit.

2.3 ANCHORS AND FASTENERS

- A. Expansion anchors, pre-cast insert system and preset inserts shall be used in concrete structural elements and on solid masonry walls.
- B. Beam clamps and spring steel clips shall be used on structural steel elements.
- C. Expansion and self-drilling anchors shall be used on concrete surfaces.
- D. Toggle bolts and hollow wall fasteners shall be used for plaster, gypsum board and hollow masonry partitions.
- E. Sheet metal and wood screws shall be used on sheet metal and wood surfaces respectively.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. At a minimum, supporting devices for raceways, boxes, cables and other equipment shall be in accordance with the applicable Articles of the National Electric Code (NEC). Additional support shall be provided where required by the Engineer or the equipment manufacturers.
- B. Use of other supporting devices, material and methods other than indicated in this section shall be only as specifically indicated otherwise on the Drawings or with written approval from the Engineer.
- C. Nails, strap iron and wire shall not be permitted.
- D. Supports shall not be fastened to pipes, ducts or conduits.
- E. Structural members shall not be cut or drilled without obtaining permission from the Engineer.
- F. Install surface-mounted cabinets and panelboards with a minimum of four anchors.
- G. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION 26 0529

SECTION 26 0531 - CONDUIT**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, materials, equipment, accessories, services and tests necessary to provide all Supporting Devices in accordance with Drawings and Specifications.

1.3 QUALITY ASSURANCE

- A. Conduit and fittings shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. The Conduits shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere, Contractor shall submit product data, detailing electrical and physical characteristics of all types of conduit to be used, including fittings.

PART 2 - PRODUCTS**2.1 CONDUIT AND FITTINGS**

- A. Shall be, as a minimum, as required by the National Electric Code (NEC).

2.2 RIGID GALVANIZED STEEL CONDUIT (RGS)

- A. Shall consist of steel with thoroughly welded seams, galvanized inside and out, and uniform in wall thickness. Conduit shall be supplied in 10-foot lengths, threaded at each end, with a coupling on one end, and protector on the other end. The rigid steel conduit shall be of sufficient weight, quality, and toughness to be free of blisters and withstand cracking and peeling during bending. Rigid steel conduit shall comply with Article 344, Part III of the NEC and UL6.
- B. Threaded fittings shall be made of full weight material and treated with the same protective coatings required for rigid conduit.

- C. Conduit bodies shall be manufactured from malleable iron with zinc or cadmium finished both inside and outside or be manufactured with copper free aluminum. Conduit bodies shall have heavy threaded hubs, covers, and, in damp locations, stainless steel screws and neoprene gaskets.

2.3 INTERMEDIATE METAL CONDUIT (IMC)

- A. Shall consist of steel with thoroughly welded seams, galvanized inside and out, with uniform wall thickness. Conduit shall be supplied in 10-foot lengths with a coupling on one end. IMC shall comply with Article 342, Part III of the NEC and UL-1242.
- B. Fittings shall be the same as specified for rigid steel conduit.

2.4 ELECTRICAL METALLIC TUBING (EMT)

- A. Shall be of welded steel construction and manufactured of lightweight cold rolled steel. The exterior shall be protected by an electro-galvanized coating and the interior shall be coated with enamel or galvanized. Electrical metallic tubing shall comply with Article 358, Part III of the NEC and UL797.
- B. Fittings for electric metallic couplings and connectors shall be of the threadless, compression type conduit 2'' and smaller. Set screw fittings shall be used for conduits over 2''. Box connectors shall have insulated throats. Other fittings shall be the same as for rigid steel conduit.

2.5 FLEXIBLE METAL CONDUIT (FMC)

- A. Shall be constructed of continuous interlocking bands of zinc coated steel and shall be complete with fittings approved for this type of conduit. A separate identified ground wire shall be utilized for equipment grounding with approved grounding bushings. Flexible metal conduit shall comply with Article 348 of the NEC and UL1.

2.6 RIGID NONMETALLIC CONDUIT (RNC)

- A. Shall be equal to Schedule 40 or 80 PVC pipe with solvent connected joints.
 - 1. When installed underground, Schedule 40 shall be used.
 - 2. If encased in concrete, type EB may be used.
- B. Plastic conduit, fittings, and cement shall be produced by the same manufacturer, and shall be in conformity with Article 352, Part III of the NEC and UL651.

2.7 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Shall be a raceway of circular cross section having an outer liquidtight non-metallic sunlight-resistant jacket over an inner flexible metal core. It shall be in conformity with Article 350, Part III of the NEC and UL360.

- B. Liquidtight fittings shall be steel or malleable iron with cadmium or zinc finish, and approved for grounding.

PART 3 - EXECUTION

3.1 GENERAL

- A. All wiring, conduit, and fittings, shall be installed, as a minimum, as required by the applicable articles of the NEC.
- B. Use of other conduit material and methods, other than indicated in this section, shall be only as specifically indicated otherwise on the Drawings or with written approval from the Engineer.
- C. All raceways shall be of the size required by National, State, and local electrical codes for the number of cables indicated.
- D. All conduits which cross or run through building control/expansion joints shall have corresponding fittings as required.
- E. Metallic conduit systems shall be installed and assembled to provide a continuous circuit of low impedance. All joints shall be tight and where necessary, protected against corrosion.
- F. No wire shall be pulled into the conduit system until it is complete in all details. In the case of concealed work, it shall not be pulled into the conduit system until all rough plastering is completed. The ends of the conduits shall be tightly plugged to exclude dust, moisture, plaster, or mortar while the building is under the process of construction.
- G. All conduit shall be of the size required by the National, State, and Local Electrical Codes for the number of wires indicated and in no case be smaller than 1/2" except for home run lighting branch circuits and conduits installed in concrete slabs shall be a minimum of 3/4". In addition, home run conduit for lighting branch circuits shall be sized to receive an additional circuit to the number required.
- H. Conduit runs are shown diagrammatically; the exact locations shall be determined on the job. Exposed conduit shall be installed parallel with or at right angles to the building walls and beams wherever possible.
- I. The Drawings indicate the desired location of equipment. If an indicated location proves to be impractical because of interference with other trades, the Engineer shall be consulted to determine an alternate location.
- J. All empty conduits shall include a fish wire for ease of future cable installation.
- K. All outlet boxes, switches, receptacles, and conduit runs, etc., shall be poured in place where practical. The Contractor will coordinate this task so that installation can occur while concrete forms are being erected.
- L. All conduits passing through floors or walls shall be provided with sleeves having an internal diameter of one inch (1") larger than the outside diameter of the conduit or insulation enclosing the conduit.

- M. A 12 inch clearance shall be maintained between conduit and any surfaces with temperatures exceeding 1040 F (400 C).
- N. All conduit installed below grade shall have sealing bushings installed at each end.
- O. Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect conductors from abrasion.

3.2 RIGID GALVANIZED STEEL CONDUIT (RGS)

- A. All interior wiring shall be installed in rigid galvanized steel threaded conduit where in direct contact with the earth, in wet locations or where subject to mechanical injury, except where specifically indicated otherwise.
- B. All exterior wiring designated to be run in conduit shall be installed in rigid galvanized steel threaded conduit, except where specifically indicated otherwise.
- C. Installation of rigid galvanized steel conduit shall be in accordance with Article 344, Part II of the NEC.

3.3 INTERMEDIATE METAL CONDUIT (IMC)

- A. Intermediate metal conduit shall be used where indicated on drawings, and may be substituted for rigid galvanized steel conduit in some instances, with prior approval from the Engineer.
- B. Installation of IMC shall be in accordance with Article 342, Part II of the NEC.

3.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Liquidtight flexible metal conduit shall be used in any damp or oily location for the final connection to motors, switches, equipment subject to vibration, or other devices where flexibility is required. The length shall not exceed six (6) feet without approval of the Engineer.
- B. Installation of liquidtight flexible metal conduit shall be in accordance with Article 350, Part II of the NEC.

3.5 FLEXIBLE METAL CONDUIT (FMC)

- A. Flexible metal conduit may be used in dry locations for the final connection to recessed lighting fixtures, switches, or other devices where flexibility is required. The length shall not exceed six (6) feet without approval of the Engineer.
- B. Installation of flexible metal conduit shall be in accordance with Article 348, Part II of the NEC.

3.6 RIGID NONMETALLIC CONDUIT (RNC)

- A. Rigid nonmetallic conduit shall be used underground and where noted on the drawings.

- B. Installation of rigid nonmetallic conduit shall be in accordance with Article 352, Part II of the NEC.
- C. When installed exposed outdoors, provide an expansion fitting for any straight length exceeding 5 feet between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.

3.7 ELECTRICAL METALLIC TUBING

- A. All wiring not subject to the above conditions shall be installed in Electric Metallic Tubing, except where specifically indicated otherwise.
- B. Installation of electrical metallic tubing shall be in accordance with Article 358, Part II of the NEC.

END OF SECTION 26 0531

SECTION 26 0533 - BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, materials, equipment, accessories and services necessary to provide all outlet, device, junction and pull boxes in accordance with Drawings and Specifications.

1.3 QUALITY ASSURANCE

- A. Boxes shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. Standard boxes shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere, Contractor shall submit product data detailing electrical and physical characteristics of all boxes to be supplied, including dimensions.

PART 2 - PRODUCTS

2.1 BOXES

- A. All boxes shall comply with Article 314, Part III of the National Electric Code (NEC). Standard boxes shall also comply with UL50.
- B. Cast Device Boxes shall be manufactured from malleable iron with zinc or cadmium finish both inside and outside or be manufactured with copper free aluminum. Cast device boxes shall have heavy threaded hubs.
 - 1. Covers in damp, wet and outdoor locations shall be gasketed, rain tight, and installed with stainless steel screws.
- C. Steel Device Boxes such as outlet, ceiling, pull, gang, utility, switch, masonry and concrete boxes shall be of 14 gauge galvanized steel. Steel device boxes shall be provided with all plaster rings, extensions, bars, hangers, etc. to make a complete installation.
- D. Large Steel Device Boxes, either of standard size or custom built shall be of 12, 14, or 16 gauge steel, have welded joints and also have an enamel or galvanized finish.

2.2 WARNING SIGNS

- A. Warning signs shall be provided in accordance with Article 314.72(E) of the NEC for all boxes when nominal voltage within is greater than 600V.
 - 1. Signs shall be permanent with letters at least 1/2" in height.
 - 2. Signs shall read "DANGER HIGH VOLTAGE KEEP OUT".

PART 3 - EXECUTION

3.1 INSTALLATION OF BOXES

- A. All new boxes shall be installed in accordance with Article 314, Part II of the NEC.
 - 1. Boxes shall be sized 50% larger than the minimum size required by Article 314 of the NEC.
 - 2. Use of other boxes, material and methods other than indicated in this section shall be only as specifically indicated otherwise on the Drawings or with written approval from the Engineer.
 - 3. The Drawings indicate the desired location of equipment. If an indicated location proves to be impractical because of interference with other trades, the Engineer shall be consulted to determine an alternate location.
 - 4. All surface mounted boxes within 2 feet of the floor and those installed in damp or wet areas shall be cast device boxes.
 - 5. Boxes shall be provided wherever they are necessary or required to complete installation, even if not specifically shown on Drawings.
 - 6. Boxes shall be designed to accommodate the equipment or apparatus to be installed either in them or attached to them. Where boxes of a standard size are not available for a particular requirement, special boxes shall be manufactured and finished to comply with the requirements.
 - 7. Boxes shall be furnished of a size and type to meet the requirements of each type of concrete construction. Standard boxes shall be furnished as required by each type of construction.
 - 8. Boxes shall be secured firmly in place and set true and square with the building lines. Openings for installation of boxes shall be neatly cut so the device or wall plate will cover the entire opening.
 - 9. Barriers shall be provided where two or more electric systems have wires or connections in the same box.
 - 10. Plaster rings shall be furnished of the required depth so as to meet the conditions for all locations where plaster construction is specified to be installed. In concrete ceiling construction, fixture back boxes designed for this purpose shall be provided.

END OF SECTION 26 0533

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and other Sections of this Specification apply to work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, materials, accessories, and services necessary to provide identification of wire and equipment in accordance with the drawings and specifications.

1.3 QUALITY ASSURANCE

- A. All identifying markings shall be checked for accuracy of text and location.

PART 2 - PRODUCTS

- 2.1 Nameplates shall be black or white plastic with 1/4-inch high, engraved lettering through to a white or black core.
- 2.2 Wire and cable markers shall be tie-on type tags in a clear plastic sheath or snap on plastic clips. Other markers may be acceptable if approval of Engineer is obtained before installation.

PART 3 - EXECUTION**3.1 NAMEPLATE INSTALLATION**

- A. Nameplates shall be fastened to equipment with drive screws or rivets, centered on the equipment and mounted parallel to the equipment lines.
 - 1. In no case shall embossed tape labels be used.
 - 2. Items of equipment listed below shall be provided with a nameplate:
 - a. Distribution Switchboards and Panelboards
 - b. Power and Lighting Panelboards
 - c. Switchgear
 - d. Disconnect Switches
 - e. Transfer Switches
 - f. Motor Control Centers
 - g. Motor Control Devices
 - h. Control and Terminal Cabinets
 - i. Contactors
 - j. Fire Alarm Panels

3.2 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, wiring troughs, outlet and junction boxes and at load terminals. Identify conductor with branch circuit or feeder number, and panel or switchboard designation, for all power and lighting circuits.

END OF SECTION 26 05 53

SECTION 26 1200 - MEDIUM VOLTAGE TRANSFORMERS**PART 1 - GENERAL**

- 1.1 RELATED DOCUMENTS: Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specification Sections apply to work of this Section.
- 1.2 DESCRIPTION OF WORK: All labor, materials, equipment, accessories and services necessary to furnish and deliver three-phase, pad-mounted transformers, as specified herein, to a location specified by the owner.
- 1.3 QUALITY CONTROL:
 - A. The transformers shall be manufactured by firms regularly engaged in the manufacture of similar equipment and whose products have been in satisfactory use in similar service for not less than five years.
 - B. The transformers shall be manufactured and installed in compliance with all applicable IEEE/ANSI C57 standards for liquid-filled and pad-mounted transformers.
 - C. Transformers shall meet minimum efficiency requirements of DOE 2016.
- 1.4 SUBMITTALS:
 - A. Submit product information detailing electrical and physical characteristics of the equipment, installation requirements and shop drawings showing all dimensions, weight, lifting provisions and nameplate data, and all manufacturers' test reports for tests described in section 2.2 of this specification.

PART 2 - PRODUCTS**2.1 PAD-MOUNTED TRANSFORMER:**

- A. The transformer shall be compartment type, self-cooled and suitable for mounting on a concrete or fiberglass pad.
- B. The average temperature rise of the windings, measured by the resistance method, shall be 65°C when the transformer is operated at rated kVA output in a 40°C ambient.
- C. Coolant and insulating fluid shall be a UL classified, less-flammable liquid comprised of edible vegetable oils and food grade performance enhancing additives.
 1. The fluid shall be non-toxic, non-bioaccumulating and completely biodegradable – FR3 or equal.
 2. The fluid shall have a minimum open cup flash point of 330°C and minimum open cup fire point of 350°C.
- D. The transformer shall meet all UL requirements for classification of less-flammable liquids per NFPA 70 (National Electric Code), section 450.23.
 1. Transformer tank shall be capable of withstanding an internal pressure of 12 psig without rupture.
 2. Pressure relief device shall have a minimum pressure relief capacity of 350 SCFM at 15 psi.

3. Transformer shall include primary high amp expulsion fuses in series with partial range current limiting back up fuses. Fuses designed to vent during operation shall be located external to the tank.
- E. The high and low voltage compartments shall be separated by a steel barrier. The low voltage compartment shall be on the right. The high voltage door shall not be capable of being opened until the low voltage door has been opened.
- F. A recessed, captive, penta-head or hex-head bolt that meets the dimensions per IEEE Std C57.12.28 standard shall secure all access doors.
- G. The following accessories shall be included:
 1. Nameplate in low voltage compartment
 2. One inch upper filter press and filling plug
 3. Drain/sampling valve located externally
 4. Tap changer for de-energized operation
 5. Liquid level gauge
 6. Pressure relief valve
 7. Dial-type thermometer with maximum temperature indicator
 8. Pressure/vacuum gauge
 9. (2) 2.5% full capacity below normal and (2) 2.5% full capacity above normal taps
- H. The transformer shall be of sealed tank construction of sufficient strength to withstand a pressure of 7 psi without permanent distortion. The cover shall be welded and the fastenings tamper resistant. When required, cooling panels will be provided on the back and front of the tank. Lifting eyes and jacking pads will be provided.
- I. The core and coil assembly shall be wound core type design with copper or aluminum windings using high grade, grain-oriented silicon steel laminations carefully annealed after fabrication to restore high magnetic permeability.
- J. High voltage terminations shall be dead front. Dead front bushings shall be one piece integrated, 15 kV for use with separable connectors. Bushings shall be externally clamped and front removable.
- K. Low voltage bushings shall be molded epoxy and provided with blade type spade terminals arranged for vertical take-off. The neutral shall be grounded to the tank by a removable strap.
- L. Ratings:
 1. Capacity: As noted on drawings
 2. Voltage: As noted on drawings
 3. Frequency: 60 Hz
 4. Impedance: 5.75%
 5. BIL: 95 kV primary, 30 kV secondary

2.2 TESTING: The following tests shall be conducted:

- A. Ratio
- B. Polarity

- C. Phase rotation
- D. No-load loss
- E. Excitation current
- F. Impedance voltage
- G. Load loss
- H. Applied potential
- I. Induced potential
- J. Impulse test

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Ground transformer in accordance with Section 260526.
- B. Verify all dimensions in the field before setting the transformer on pad.
- C. Prior to energizing, verify all high and low voltage connections for proper installation and workmanship.
- D. Measure secondary voltage and adjust taps if required to attain secondary voltage within 2% of rated voltage.
- E. Installation shall be left clean with no foreign materials left inside or around transformer installation.

END OF SECTION 26 1200

SECTION 26 2416 - PANELBOARDS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, materials, equipment, accessories, services and tests necessary to provide all panelboards in accordance with Drawings and Specifications.

1.3 QUALITY ASSURANCE

- A. Panelboards shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. Panelboards shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere, the Contractor shall submit product literature detailing all dimensions, voltage, main bus and/or circuit breaker ampacity rating, branch circuit breaker ratings, integrated short circuit capacity, lug sizes, enclosure type and branch circuit breaker arrangement.

PART 2 - PRODUCTS**2.1 PANELBOARDS**

- A. Panelboards shall be of the dead-front safety type and shall be manufactured in accordance with Article 408 Part IV of the National Electric Code (NEC) and UL67.
 - 1. Fusible panelboards shall have switch sizes and fuses as indicated on Drawings. Switches shall be horsepower rated with quick-make and quick-break mechanisms.
 - 2. Panelboard schedules, as shown on the drawings, shall be checked for required breaker or switch sizes prior to fabrication of the panelboards.
 - 3. Each panelboard shall be provided with a copper ground bus 1/4" x 1" x 8" minimum or equal to 1/3 the capacity of the phase bus. Bus shall be drilled and tapped for ground connections in the field.
 - 4. Panelboards designated for use as lighting panelboards shall have branch circuit breakers that are UL listed as type SWD for lighting circuits.

5. Minimum short-circuit rating for panelboards and branch devices shall be as indicated on panel schedules. Unless otherwise noted, all panelboards shall be fully rated.
- B. Branch Over-Current Protective Devices:
1. Circuit breaker panelboards shall have automatic short circuit and over-current protective devices having an "on", "off", and tripped position of the operating handle. All multi-pole breakers shall common trip and be so designed that an overload on one pole automatically causes all poles to open. They shall be of the quick-make and quick-break type, and shall have inverse time trips.
 2. Circuit breakers shall be manually operated with a mechanism for adjusting settings for instantaneous and overload trip operation for frame sizes larger than 100A.
 3. Circuit breakers used for air conditioning equipment shall be HACR type.
- C. Lighting and power panels shall be equipped with solderless lugs in the mains only, unless otherwise indicated, and of such size as required to accommodate the size cables shown on the drawings. The panels shall be suitable for flush or surface mounting, as shown on the drawings. Lugs shall be designed to accept copper or aluminum wire.
- D. Cabinets and trim shall be thoroughly cleaned and trim shall be finished with shop priming coat and one shop finish coat of gray lacquer unless indicated otherwise. Each panel shall be furnished with a hinged door in a cover that is hinged to the cabinet, combination spring lock and catch, directory frame and two (2) keys. All panel locks shall be keyed alike and a neatly typed directory identifying each circuit shall be provided in the frame.
- E. Unless indicated elsewhere, load centers shall not be used.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of panelboards shall be in accordance with Article 408 of the NEC and the manufacturer's instructions.
1. Panelboards shall be installed plumb and the top of the enclosure shall not exceed six feet above finished floor. For panelboards that exceed six feet overall height, the bottom of the enclosure is no more than four inches above finish floor and the centerline of the top most device handle does not exceed six foot six inches above finished floor.
 2. Each panelboard shall have a neatly typed directory installed identifying loads served by each branch circuit breaker.
 3. All panelboards shall be left clean with all debris removed from gutters and enclosures.
 4. Working clearance around panelboards shall be in accordance with Article 110 of the NEC.
 5. Lighting, receptacle, power and distribution panelboards shall be provided at locations shown on the drawings and in accordance with the panelboard schedules. Panelboards shall be set in place in advance of construction work, permitting them to be built in with the structure and avoiding the need for unnecessary cutting and patching.
 6. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
 7. All unused spaces shall have filler plates installed.
 8. Provide and install a plastic engraved nameplate as described in Section 260553.

9. All terminations shall be properly and accurately torqued per manufacturer's specifications using the appropriate torque screwdriver or torque wrench.
10. All scratches and digs shall be repainted.

END OF SECTION 26 2416

SECTION 26 2726 - WIRING DEVICES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract, including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. Provide all labor, materials, equipment, accessories, services and tests to provide a complete and functional installation.

1.3 QUALITY ASSURANCE

- A. All devices shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. All wiring devices (or packages which contain them) shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere the Contractor shall submit product literature detailing the electrical and physical characteristics of the equipment. Literature shall include outline drawings, including all dimensions, colors, configurations and installing provisions and manufacturer's installation requirements.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. The drawings indicate the various types, locations and connections of wiring devices to be installed complete with outlet boxes and cover plates.
 - 1. Duplex receptacles shall be specification grade, three-wire grounding type, 20A, 125V, NEMA 5-20R configuration with binding screws for back and side wiring, unless indicated otherwise.
 - 2. Special service receptacles shall be as specified on the drawings.
 - 3. Toggle type switches shall be specification grade, 20 Amp rated (120/277 volt) silent operation and be single pole, two pole, three-way or four-way as noted elsewhere.
 - 4. Line voltage dimmers shall be compatible with LED fixtures.
 - 5. Color of devices shall be chosen by the architect unless otherwise noted.

6. Device plates shall be brushed aluminum, one piece, single or multi-gang, unless otherwise noted. Screws shall be of metal with counter-sunk heads with color to match the finish of the plate.
7. Ground fault circuit interrupting receptacles shall be specification grade, 20 Amp, 120 volt rated and will trip at 4-6 milliamperes of ground current. Suitable device plates shall be provided.
8. Poke-through devices shall comply with the requirements of Article 300-21 of the National Electric Code (NEC) (fire spread ratings) and be rated for the floor structure in which it is installed (1, 1-1/2 or 2 hour fire rated floors). Above floor accessories shall include devices for connections of power, data or communication systems as noted elsewhere.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All devices shall be installed according to the NEC. Particular attention is to be paid to the requirements of Articles 110.14 (terminations) and 250.148 (grounding conductors to boxes).
- B. The electrical contractor shall confirm the exact location of devices with respect to door swings, structure, equipment arrangement and accessibility before roughing in. Where conflicts are found to exist, the Engineer will establish the exact location of the device.
- C. Devices shall be installed only in boxes that are clean and free of excess building materials, dirt or debris.
- D. Where devices are to be installed flush in walls suitable plaster rings or box extensions shall be employed to assure a flat, flush and neat installation.
- E. Devices installed in unfinished areas or above accessible ceiling spaces shall have galvanized cover plates installed.
- F. Device grounding shall be by bonding jumper. Devices employing yoke grounding only, shall not be used.
- G. All devices shall be installed plumb and level at the following mounting heights, unless indicated otherwise:

Wall Switches	44" Above Finish Floor
Convenience Receptacles	18" Above Finish Floor
Counter Receptacles	6" Above Counter Top
Dimmers	44" Above Finish Floor
Telephone/Data Outlet	18" Above Finish Floor
Wall Mounted Telephone	44" Above Finish Floor

- H. After installation, all devices shall be tested for proper operation and polarity.

END OF SECTION 26 2726

SECTION 26 2813 - FUSES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specification Sections apply to the Work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. All labor, material, accessories and services to provide appropriate fuses in equipment or enclosures in accordance with the Drawings and Specifications.

1.3 QUALITY ASSURANCE

- A. All fuses shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
 - 1. Fuses provided as part of this Contract shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere the Contractor shall submit product literature detailing the electrical and physical characteristics of the fuses used including ampacity, interrupting rating, time-current curves, voltage, peak let-through rating and manufacturer's application data.

PART 2 - PRODUCTS

- 2.1 All fuses shall comply with Article 240, Part VI of the National Electric Code (NEC). Class L, RK1 and RK5 fuses shall comply with UL198C.
- 2.2 Provide fuses with UL class, voltage and current ratings, as indicated on Drawings. If no class is specified, provide fuse class as follows:
 - A. Main service feeder and lighting load feeder switches larger than 600 Amperes: Class L.
 - B. Main service feeder and lighting load feeder switches less than 600 Amperes: Class RK1, RK5
 - C. Motor load feeder switches: Class RK1, RK5 - Dual Element.
 - D. Motor branch circuits: Class RK1, RK5 - Dual Element.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fuses in accordance with manufacturer's instructions and with the label oriented so that the manufacturer's name, type, size and class are easily readable.
 - 1. Provide one spare fuse for each fuse installed throughout the project.
 - 2. Provide one fuse puller for each different size fuse installed for Owner's use.

END OF SECTION 26 2813

SECTION 26 2819 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. Provide all labor, materials, equipment, accessories, services and tests to provide a complete and functional installation of switches in accordance with Drawings and Specifications.

1.3 QUALITY ASSURANCE

- A. All switches shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. Switches shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere the Contractor shall submit product literature detailing the electrical and physical characteristics of the equipment. Literature shall include outline drawings, including all dimensions, weights and installing provisions and manufacturer's installation requirements.

PART 2 - PRODUCTS

2.1 SWITCHES

- A. All switches shall comply with Article 404, Part II of the National Electric Code (NEC) and UL98.
 - 1. Switches shall be heavy duty type, 2-pole or 3-pole as required, fused or non-fused, with or without neutral, as indicated on the drawings, in NEMA-1 enclosure unless otherwise indicated and of the current and voltage rating to match the equipment served. All switches shall have provisions for terminating equipment ground conductors.
 - 2. Switches shall be horsepower rated and have quick make quick break mechanisms.
 - 3. Switches shall have externally operable handles interlocked to prevent opening door with handle in the "ON" position and provision for pad locking handle in the "OFF" position.
 - 4. Fusible switches shall have reinforced fuse clips and fuses provided in accordance with Section 262813.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Switches shall be provided at locations shown and as required by the NEC.
 - 1. All switches shall be installed in accordance with the manufacturer's instructions and Article 404, Part I of the NEC.
 - 2. The drawings indicate the desired location of the switches. If an indicated location proves to be impractical because of interference with other equipment or architectural features the Contractor shall bring the interference to the Engineer's attention and the Engineer shall determine alternate mounting locations.
 - 3. All equipment shall be labeled in accordance with Section 260553 to indicate equipment served.
 - 4. Provide adhesive label on the inside of the door for each switch that indicates the UL fuse class and size for replacement.
 - 5. Switches shall be left in clean condition, with doors closed and no foreign objects left inside or around enclosures.

END OF SECTION 26 2819

SECTION 26 2913 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specification Sections apply to the work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. Provide all labor, materials, equipment, accessories, services and tests to provide a complete and functional installation for manual motor starters, magnetic motor starters and combination magnetic motor starters in accordance with the Drawings and Specifications.

1.3 QUALITY ASSURANCE

- A. All devices shall be manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. Motor control equipment shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere the Contractor shall submit product literature detailing the electrical and physical characteristics of the equipment. Literature shall include outline drawings, including all dimensions, colors, configurations, accessories and manufacturer's installation requirements.

PART 2 - PRODUCTS

2.1 MOTOR STARTERS

- A. All motor starters shall be horsepower and voltage rated, be of NEMA size as required for motor horsepower and be factory assembled.
 - 1. All starters with 120 volt coils shall be provided with control transformers, including properly sized fuses and fuse blocks.
- B. Manual Motor Starters: Manual motor starters shall be toggle type, single or two pole, horsepower rated with thermal overload and spare set of auxiliary contacts, in a NEMA 1 enclosure unless otherwise indicated on the Drawings. All single phase motors shall be provided with manual motor starters unless otherwise noted.

- C. Magnetic Motor Starters: Unless otherwise indicated on the Drawings, magnetic motor starters shall be complete with three-leg solid state overload relay, 120 volt coil, two (2) spare sets of auxiliary contacts, pilot light, hand-off-auto selector switch and NEMA 1 enclosure. All three phase motors shall be provided with magnetic motor starters unless otherwise noted.
- D. Combination Magnetic Motor Starters: Combination magnetic starters shall have motor circuit protector breakers with adjustable starting current settings, fusible or non-fusible disconnect switches as indicated on Drawings.
 - 1. Unless otherwise indicated on the Drawings, combination magnetic starters shall be complete with three-leg solid state overload relay, 120 volt coil, two (2) spare sets of auxiliary contacts, pilot light, hand-off auto selector switch and NEMA 1 enclosure.
- E. Solid State Overload Relays: Shall have manual/automatic reset, trip indication, field adjustable trip range and provide phase loss/phase imbalance protection and ambient temperature compensation.
- F. All motor starters shall comply with Article 430 Part VII of the National Electric Code (NEC) and UL508.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All starters shall be installed in accordance with Article 430 of the NEC and the manufacturer's instructions.
 - 1. All starters shall be installed true and plumb, mounted to suitable backboard or support structure, with the center of the enclosure 4'-0" above finished floor.
 - 2. Select and install overload heater elements in manual starters to match nameplate data of motors served.
 - 3. Set trip current on solid state overload relays to match nameplate data of motors served.
 - 4. Install fuses in fusible combination starters and provide adhesive label on the inside of the cover indicating UL fuse class and size for replacement.
 - 5. Provide and install identification plates indicating load served in accordance with the requirements of Section 260553.
 - 6. Install fuses for control transformers.
 - 7. Perform operational tests to assure the proper operation of the equipment.
 - 8. Starter enclosures shall be left clean and free of foreign objects or construction debris from inside or around the enclosure.

END OF SECTION 26 2913

SECTION 26 5100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specification Sections apply to the Work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. Provide a fully functional lighting system as described in this Section. The drawings indicate the type, general arrangement, lamps, accessories and control of the various lighting fixtures to be installed. The catalog numbers of the various fixture manufacturers indicate the physical and functional requirements with respect to certified photometrics, light distribution, unit efficiency, operating temperature, data and accessories.

1.3 QUALITY ASSURANCE

- A. The luminaires and accessories shall be of standard or custom design manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. The luminaires shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere the Contractor shall submit three copies of product literature detailing dimensions, mounting style, photometric data, lamps, sockets, lenses, air handling characteristics, hardware, materials, lamp and ballasts ratings and manufacturer's instructions and recommendations.
- B. Luminaires shall not be purchased or delivered to the project without the approval of the Engineer/Architect.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Construction of all luminaires shall be in accordance with Article 410, Part VII of the National Electric Code (NEC). Flush and recessed fixtures shall also comply with Article 410, Part XI of the NEC.

- B. All luminaires provided shall be furnished complete with lamps, all necessary trim, gasketing, diffusers, lenses, ballasts, mounting hardware and accessories as indicated on the Drawings and fixture schedule.
 - 1. Lamps shall be of the type and wattage indicated on the fixture schedule.
 - 2. Catalog numbers indicated in schedules do not necessarily include plaster frame, special mounting and other fittings which may be required for proper installation, but these devices shall be provided where applicable and necessary.

2.2 LED LIGHT FIXTURES

- A. General:
 - 1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
 - 2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
 - 3. LED drivers shall include the following features unless otherwise indicated:
 - a. Minimum efficiency: 85% at full load.
 - b. Minimum Operating Ambient Temperature: -20° C. (-4° F.)
 - c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
 - d. Integral short circuit, open circuit, and overload protection.
 - e. Power Factor: ≥ 0.95 .
 - f. Total Harmonic Distortion: $\leq 20\%$.
 - g. Comply with FCC 47 CFR Part 15.
 - 4. LED modules shall include the following features unless otherwise indicated:
 - a. Comply with IES LM-79 and LM-80 requirements.
 - b. Minimum CRI 80 and color temperature 3000° K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
 - c. Minimum Rated Life: 50,000 hours per IES L70.
 - d. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.
- B. LED Downlights:
 - 1. Housing, LED driver, and LED module shall be products of the same manufacturer.
- C. LED Troffers:
 - 1. LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.
 - 2. Housing, LED driver, and LED module shall be products of the same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Shall be in accordance with Article 410 of the NEC and the manufacturer's instructions.
- B. Luminaires stored at the job site shall be protected from damage due to construction activity and weather. Any damaged equipment shall be replaced.
- C. Fixtures installed in suspended ceiling shall have installed a minimum of two hangers independent of the suspended ceiling grid. In no case shall fixtures be suspended from or attached to ductwork or other piping systems.

- D. All lenses and reflectors shall be left cleaned and any cracked or broken lenses replaced.
- E. Surface ceiling mounted fixtures shall be provided with quarter inch spacers and all pendant or cable hung fixtures shall have appropriate canopies.
- F. Recessed luminaires shall have proper housings to suit the ceiling structure they are to be installed in. Fixtures shall be installed so that no light leaks appear between the fixture and the ceiling.
- G. Install quantity, type, wattage, and color lamps indicated for each fixture type.
- H. Replace all lamps which are found to have failed during any inspection of installed fixtures.

END OF SECTION 26 5100

SECTION 26 5600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract including General and Supplementary General Conditions and other Specification Sections apply to the Work of this Section.

1.2 DESCRIPTION OF THE WORK

- A. Provide a fully functional outdoor lighting system as described in this Section. The drawings indicate the type, general arrangement, lamps, accessories and control of the various lighting fixtures to be installed. The catalog numbers of the various fixture manufacturers indicate the physical and functional requirements with respect to certified photometrics, light distribution, unit efficiency and operating temperature data.

1.3 QUALITY CONTROL

- A. The luminaires and accessories shall be of standard or custom design manufactured by Firms regularly engaged in the manufacture of similar types and whose products have been in satisfactory use in similar service for not less than five years.
- B. The luminaires shall bear the Underwriters' Laboratories (UL) Label.

1.4 SUBMITTALS

- A. In addition to submittals specified elsewhere the Contractor shall submit product literature detailing dimensions, mounting style, photometric data, lamps, sockets, lenses, hardware, materials, lamp and ballasts ratings and manufacturer's instructions and recommendations.
- B. Luminaires shall not be purchased or delivered to the project without the approval of the Engineer/Architect.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Construction of all exterior fixtures shall be in accordance with Article 410 Parts VII and XII of the National Electric Code (NEC).
- B. All luminaires provided shall be furnished complete with lamps, all necessary trim, gasketing, diffusers, lenses, ballasts, mounting bases, poles, pole brackets, accessories, and mounting hardware, as indicated on the Drawings and fixture schedule or as otherwise required.

1. All exterior luminaires shall be UL listed and labeled for use in wet locations.
2. Lamps shall be of the type and wattage indicated on the fixture schedule.

2.2 LED LUMINAIRES

- A. General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.
- B. Material and specifications for each luminaire are as follows:
 1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
 2. Each luminaire shall be rated for a minimum operational life of 50,000 hours at an average operating time of 11.5 hours per night. This life rating must be conducted 40C ambient temperature.
 3. The rated operating temperature range shall be -30°C to +40°C.
 4. Each luminaire is capable of operating above 100°F [37°C], but not expected to comply with photometric requirements at elevated temperatures.
 5. Photometry must be compliant with IESNA LM-79 and shall be conducted at 25°C ambient temperature.
 6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
 7. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
 8. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.

2.3 REFLECTORS: Reflectors shall utilize high purity anodized specular or patterned aluminum with the beam shape indicated.

2.4 ADJUSTABLE FIXTURES

- A. In adjustable fixtures, provide aiming lock devices.
- B. Fixtures with adjustable lamps and using lamps with asymmetrical light patterns shall have an aiming stop which can be permanently set so that the lamp shall remain correctly positioned after service or re-lamping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All luminaires shall be installed in accordance with Article 410 of the NEC and the manufacturer's instructions.

- B. Luminaires stored at the job site shall be protected from damage due to construction activity and weather. Any damaged equipment shall be replaced.
- C. Bond luminaires, metal accessories and metal poles to branch circuit equipment grounding conductor.
- D. All lenses and reflectors shall be left cleaned and any cracked or broken lenses replaced.
- E. Adjustable fixtures shall be properly targeted.
- F. All luminaires shall be tested for proper operation and cleaned prior to project acceptance.
- G. Install quantity, type, wattage and color lamps indicated for each fixture type.
- H. Replace all lamps which are found to have failed during any inspection of installed fixtures. Make inspection six months after acceptance of the installation.

END OF SECTION 26 5600

SECTION 31 1000 – SITE CLEARING**PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including Division 01 – General Requirements, apply to work of this section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda.

1.2 RELATED SECTIONS

- A. Selective Demolition
- B. Selective Clearing and Thinning
- C. Earthwork
- D. Soil Erosion and Sediment Control

1.3 DESCRIPTION OF WORK

- A. This work shall consist of clearing and grubbing, clean-up, cutting and removing trees and stumps, stripping and stockpiling topsoil, removing and disposing of all vegetation and any other obstructions and undesirable materials within the project site which are not designated or permitted to remain.

1.4 PROTECTION

- A. Prior to commencing the work, all areas shown on the plans as existing tree save areas and new tree line shall be identified, clearly marked and protected until accepted. Storage of building construction items, vehicle parking or access shall be allowed only in areas designated by the A/E, and approved by the Owner. Any damaged plant materials resulting from neglect by the General Contractor or his Subcontractors shall result in a monetary and/or plant material exchange.
- B. All other non-treed areas indicated to remain in its natural state shall also be protected by the Contractor. Any resulting damage due to the Contractor's neglect shall be restored to the satisfaction of the A/E. If restoration is not satisfactory, then sufficient monies to cover damage shall be withheld from the Contractor.

- C. Contractor shall protect treed and environmentally sensitive areas by installing snow fence or any such barriers necessary to protect these areas. Trees to be saved within work area shall be protected by snow fence installed at the drip line.

1.5 RESTRICTIONS

- A. Prior to clearing operations, Contractor shall clearly and plainly mark the limits of clearing and grubbing, as indicated on plans. No clearing or cutting shall be done prior to such field determination. Contractor shall relate the tree lines from the horizontal control geometry and other control points as plan referenced.
- B. When limits of clearing have been physically and clearly marked together with building stakes, I then notify the A/E for an on-site review of the clearing limits. Failure of the Contractor to notify the A/E prior to commencing this work shall result in forfeiture of payment for this work.
- C. It is the declared and acknowledged intention that, other than those areas required for existing and new building and physical structures, roads, walks, parking areas and site grading, the remainder of site shall remain in its natural state.

1.6 SAFETY

- A. All operations required under this section shall be conducted in a safe manner employing whatever means are necessary to provide safety to all persons on the project site.

PART 2 - PRODUCTS

2.1 BALED HAY

- A. Hay shall be mowings of acceptable herbaceous growth reasonably free from noxious weeds or woody stems and shall be reasonably dry. No salt shall be used.
- B. Hay bales shall be approximately 36" long x 18" wide x 24" high.
- C. Hay bales shall be anchored with 2" x 2" x 3' long wooden stakes as shown on plans.

2.2 SILT FENCE

- A. Silt fence shall be Enviro Fence manufactured by Mirafi, Propex Silt Stop manufactured by Amoco Fabrics Company, or equal.

2.3 COMPOST FILTER SOCK

- A. Compost Filter Sock shall be Filtrexx Soxx, manufactured by Filtrex, or equal.

- B. Compost Filter Sock is to be approximately 12” diameter.
- C. Compost Filter Sock shall be anchored and installed in accordance with manufacturers specifications.
- D. Compost use for filter sock shall be as specified by manufacturer.

2.4 TEMPORARY SLOPE SEED MIX FOR STABILIZATION OVER WINTER

A. <u>COMMON NAME</u>	<u>PROPORTION BY WEIGHT</u>	<u>PURITY %</u>	<u>GERMINATION %</u>
1. Red fescue, Creeping or Pennlawn	70	98	90
2. Perennial Ryegrass	15	95	90
3. Colonial Bentgrass or Astoria	15	98	85

PART 3 - EXECUTION

3.1 CLEARING

- A. Clearing shall consist of felling and cutting up or trimming of trees, and satisfactory disposal of trees together with downed timber, snags, brush, shrubs, fences, logs, rubbish, rock walls or other debris occurring within areas indicated on the plans as new construction.
- B. Trunks of trees may not be cut off more than 6" above original ground surface, in areas to be cleared where grubbing is not required.
- C. Trunks of trees at the top of slopes, where rounding of slopes occur to meet existing ground and tree line, shall be cut off flush with or below the final slope line.

3.2 GRUBBING

- A. Grubbing shall consist of removal and satisfactory disposal of stumps and buried roots larger than 1-1/2" diameter, to a depth of 18" below surface of original ground, except stumps within proposed building, structural foundation, roadways and parking area shall be entirely removed.
- B. Areas to be grubbed shall be as follows:

1. New road and paved areas.
2. Areas occupied by building to a horizontal distance of 6' outside the building walls or to the toe of slopes for buildings on fill.
3. In cut areas for the entire width of cut.
4. In non-paved areas required to be filled, if depth of fill is less than 2'.
5. Except for building, structural foundation, roadways and parking areas, no grubbing shall be required in areas where the height between the subgrade and original ground surface exceeds 3'. The remaining stumps may be left provided they do not extend more than 6" above the ground surface.

3.3 DISPOSAL OF CLEARED AND GRUBBED MATERIALS

- A. The Contractor shall dispose of the trees, brush, shrubs and other perishable material by any of the following methods:
 1. The Contractor may sell or salvage all merchantable timber from clearing and grubbing operations.
 2. The Contractor may chip trees on the site, for use as directed by A/E; all surplus chips shall become the property of the Contractor.
- B. No burning of trees, brush, shrubs or perishable material will be allowed on project site.
- C. Stumps, roots and perishable materials shall be removed from the project site prior to Earthwork operations.

3.4 STRIPPING

- A. The Contractor shall remove to the extent ordered and satisfactorily transport and store all suitable topsoil for use as loam.
- B. Stored area shall be on-site. If there are no suitable storage areas located on-site and approved by the A/E, then Contractor shall make provisions to store topsoil elsewhere for use of the project.
- C. All stripped topsoil shall remain the property of the Owner (unless otherwise stipulated in writing) and no material shall be hauled off-site until A/E is notified. Failure of the Contractor to notify the A/E prior to hauling any topsoil off-site shall result in forfeiture of payment for this work.
- D. Stripped topsoil shall be obtained from open fields, grassed areas, or other areas as deemed appropriate by the A/E, containing organic material suitable for loaming operations. The depth of stripping shall vary based on subsurface information provided elsewhere in these specifications and actual site conditions. In any event, soils shall be removed to the minimum depth of topsoil. Mixing of subsoils shall be accepted. The depth of soil removal shall be verified in the field. All stripped topsoil shall be screened and tested for suitability for use under lawns and adjusted as required.
- E. Any stripped topsoil not required for this project shall remain the property of the Owner unless Contractor is directed to remove surplus topsoil from site, which he shall do at no additional

expense to the Owner. If surplus topsoil and subgrade is to remain on site, the material shall be placed and seeded in accordance with the specifications and as directed by A/E at no additional expense to the Owner.

3.5 UNSUITABLE MATERIAL

- A. Excavated unsuitable material shall be separated and classified as unsuitable material, unsuitable non-hazardous material and unsuitable hazardous material.

3.6 TEMPORARY CONSTRUCTION FENCE

- A. Contractor shall furnish, place and maintain a temporary construction fence of the size, type and locations indicated on the plans or as directed by the A/E.

END OF SECTION 31 1000

SECTION 31 1005 - SITE PREPARATION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including Division 01 – General Requirements, apply to work of this section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, Latest Edition with latest addenda.

1.2 RELATED SECTIONS

- A. Section 312000 – Earthwork

1.3 DESCRIPTION OF WORK

- A. This work shall consist of clearing and grubbing, clean-up, stripping and stockpiling topsoil, riprap, removing and disposing of all vegetation and any other obstructions and undesirable materials within the project site which are not designated or permitted to remain.
- B. When limits of disturbance have been physically and clearly marked, Contractor shall then notify the A/E for an on-site review of the limits.
- C. It is the declared and acknowledged intention that, other than those areas required for existing and new building and physical structures, roads, walks, parking areas and site grading, the remainder of site shall remain in its natural state.

1.4 SAFETY

- A. All operations required under this section shall be conducted in a safe manner employing whatever means are necessary to provide safety to all persons on the project site.

PART 2 - PRODUCTS**2.1 BALED HAY**

- A. Hay shall be mowings of acceptable herbaceous growth reasonably free from noxious weeds or woody stems and shall be reasonably dry. No salt shall be used.
- B. Hay bales shall be approximately 36" long x 18" wide x 24" high.

C. Hay bales shall be anchored with 2" x 2" x 3' long wooden stakes as shown on plans.

2.2 COMPOST FILTER SOCK

A. Compost Filter Sock shall be Filtrex Soxx, manufactured by Filtrex, or equal.

B. Compost Filter Sock is to be approximately 12" diameter.

C. Compost Filter Sock shall be anchored and installed in accordance with manufacturers specifications.

D. Compost use for filter sock shall be as specified by manufacturer.

PART 3 - EXECUTION

3.1 CLEARING

A. Clearing shall consist of removal of rubbish, rock walls or other debris occurring within areas indicated on the plans as new construction.

3.2 UNSUITABLE MATERIAL

A. Excavated unsuitable material shall be separated and classified as unsuitable material, unsuitable non-hazardous material and unsuitable hazardous material.

3.3 TEMPORARY CONSTRUCTION FENCE

A. Contractor shall furnish, place and maintain a temporary construction fence of the size, type and locations indicated on the plans or as directed by the A/E.

END OF SECTION 311005

SECTION 31 1010 - MAINTENANCE OF SITE

PART 1 - GENERAL

1.1 GENERAL

- A. This item shall consist of site maintenance during the demolition and construction phases of the work. Included but not limited to are sweeping adjacent to the project at least once a week and covering stockpiled material as ordered by the A/E.

PART 2 - PRODUCTS - (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 METHODS, EQUIPMENT AND MATERIALS

- A. The methods, equipment and materials used for maintenance of the site shall be acceptable to the A/E prior to performing any of the necessary work.

END OF SECTION 31 1010

SECTION 31 1200 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specifications, apply to this work.

1.2 RELATED SECTIONS

- A. Section 31 2000 – Earthwork: for soil materials, excavating, backfilling and site grading.
- B. Section 31 1005 – Site Preparation
- C. Section 31 3205 – Soil Erosion and Sediment Control

1.3 DESCRIPTION

- A. Summary: It is the intent to include under this Contract the selective demolition and removal of existing site structures and accessories of every description within the project limit line (see special notes and limit of construction as noted on the site demolition plans) which at present exists and extends above and below the ground level, including, pavements, floor slabs, foundations and rubble, and where required, to fill the voids with clean, compacted gravel borrow in preparation for new construction. Do not use any rubble to fill voids.
- B. Work To Be Performed: Furnish all labor, materials, equipment and services necessary to complete the work indicated, and without limiting the generality thereof includes:
 - 1. Building structures, steel guards, platforms, steps, wood and metal framing, ramps, building walls, foundations, paving materials of all description and all related items necessary to perform and complete such work.
 - 2. Demolition and removal of site improvements.
 - 3. Disconnecting, capping or sealing, and abandoning site utilities in place.
 - 4. Disconnecting, capping or sealing, and removing site utilities.
 - 5. Protection of work, existing construction and equipment to remain in use.
 - 6. Gathering of rubbish and items materials removed under this Section and its removal from the project site.
- C. It is not the intent herein to describe all items and work required to be removed under this Section. The Contractor shall assure himself that all of the work to be removed, not otherwise specified herein or described under other Sections, but shown on the Drawings, shall be removed under this Section at no additional cost to the Owner.
- D. The Contractor shall also examine other Sections of these specifications and familiarize himself with their provisions regarding the removal of existing items and work. He shall understand

that all items and work not specifically mentioned to be removed by the requirements of other Sections of these specifications shall be removed as part of the work under this Section.

1.4 SCHEDULING

- A. Before beginning the removal of work and demolition, the Contractor shall consult jointly with the Owner and Engineer to determine the schedule of work, exact places, times and days during which the removal and demolition work may or may not be carried on, and to determine further reasonable requirements, particularly in regards to noise prevention, dust prevention, weather protection, safety precautions and school schedule.

1.5 EXAMINATION OF PREMISES

- A. The Contractor will be held to have examined the premises before submitting proposals for the work and to have satisfied himself as to existing conditions under which he will be obliged to operate or that will in any way affect the work under this Contract, also the character and amounts of materials and debris to be removed. No allowance will be made in this connection for error or negligence of the Contractor.

1.6 USE OF PREMISES

- A. All apparatus, storage and the operation of workmen in connection with activities under this Section shall be confined to limits of the Contract as shown on the Drawings and shall not encumber the premises at any time. Storage will not be permitted on the property without the approval of the Owner, and in no case will storage be permitted outside the property without obtaining the necessary permits from the appropriate authorities.
- B. All trucks carrying loose, dry material such as debris, plaster, broken concrete masonry, etc., shall be covered by tarpaulins to prevent blowing away or spillage. All spillage of whatever nature shall be promptly taken up and removed.

1.7 ACCESS AND EGRESS

- A. The most diligent attention shall be paid to maintaining adequate passage to and from all exits at all times. Before any work is done which will significantly alter access or egress patterns, consult the Owner and Engineer and obtain their approval. Under no circumstances block or interfere with the free flow of people at legally required exits, or in no way alter the required conditions of such exits.

1.8 PROTECTION

- A. The Contractor shall take all precautions and use whatever protective devices, shoring, guard rails and the like as may be required to assure that the remaining and adjacent portions of the existing work which is to remain is substantially supported and/or not loaded beyond safe limits.

- B. Use tools and methods that will not transfer heavy shocks, vibrations and other disturbances to existing buildings.
- C. Do not allow demolition debris to accumulate, and when outside sprinkle it with water to hold down dust when handling and loading.

1.9 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option. All materials are to be disposed legally.

1.10 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Proposed dust-control measures.
- C. Proposed noise-control measures.
- D. Schedule of demolition activities indicating the following:
 - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
 - 2. Dates for shutoff, capping, and continuation of utility services.
- E. Inventory of items to be removed and salvaged.
- F. Landfill records for record purposes indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- G. Records indicating off-site disposal of building debris and solid waste, including receipted acceptance by each facility.

1.11 QUALITY ASSURANCE

- A. Pre-demolition Conference: Conduct conference at Project site to comply with pre-installation conference requirements of Division 1 Section "Project Meetings."

1.12 PROJECT CONDITIONS

- A. Owner assumes no responsibility for actual condition of buildings to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Protection of Adjacent Structures:
1. The work of demolishing the buildings and structures shall be carried on in a manner that will insure the safety of adjacent property and persons occupying such property against any damages or injuries which might occur from falling debris or other cause, and so as not to interfere with the use of adjacent buildings, roadways and structures or the free and safe passage to and from the same.
 2. Take every precaution to guard against any movement or settlement of adjacent buildings, sidewalks, utilities or streets, and provide and place at the sole expense of the Contractor, bracing or shoring necessary or proper in connection therewith, and be solely and entirely responsible for the complete safety and support of such buildings, and be solely liable for any such movement or settlement and any damage or injury caused thereby or resulting therefrom. If at any time the safety of any adjacent building or structure shall appear to the Engineer, Owner or to the Contractor, to be endangered, then cease operations and at the sole expense of the Contractor, however great the same may be, take all proper means to support such building or structure and do not resume operations until permission has been secured in writing from the Engineer.
 3. The Contractor shall take adequate precautions to protect all walks, roads, streets, curbs, pavements, lawns, trees and planting, on or off the premises, and shall repair and replace or otherwise make good, as directed by the Engineer, any such or other damage so caused at no cost to the Owner.
- C. Perimeter fencing for the project to be in place prior to any demolition work.
- D. Erosion controls to be in place prior to any demolition work.

1.13 SCHEDULING

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.
- B. Any noisy demolition work to occur on third shift.
- C. Contractor shall notify Dig-Safe at 811 prior to any work to verify location of all utility lines, pipes, wires and conduits.

PART 2 - MATERIALS

2.1 DISPOSAL OF WORK REMOVED

- A. All non-salvageable refuse and debris which accumulates as a result of work under this Section shall be removed. No refuse or debris of any nature shall be allowed to accumulate to the detriment of the work. **Remove refuse and debris from site daily.**

- B. All existing items removed under this Section shall become the responsibility of the Contractor and legally disposed of off site at his expense, unless existing items to be removed are specifically noted on the Drawings to be relocated or unless otherwise directed by the Owner to be rendered to and become the property of the Owner.
- C. All objects, trim and items identified by the Owner to be rendered to and become the property of the Owner, shall be delivered by the Contractor to a storage facility at no additional cost to the Owner.
- D. Burn no debris on the site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- C. Inventory and record the condition of the items to be removed and reinstalled and items to be removed and salvaged.
- D. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
- B. Contractor shall be solely responsible for disconnecting and sealing indicated utilities serving structures to be demolished before start of demolition work.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off utility services serving structures to be demolished.
 - 1. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Before starting the removal of work, the Contractor shall arrange for the disconnection of active utility services in the areas to be worked in. All work on existing utility services shall be accomplished by the respective trades or utility company having jurisdiction.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- D. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of buildings to be demolished and adjacent buildings to remain.
- E. Adequate protection of persons and property shall be provided at all times. All work shall be executed in such a way as to avoid hazard to person and property, interference with the use of camp sites, and interruption of free passage to and from such camp sites. All demolition work shall conform to the requirements of the Rhode Island Department of Public Safety.

3.4 CONDUCT OF WORK

- A. Where new work joins or abuts existing work, cutting shall be carefully and accurately done true to lines indicated. Where concrete work is required to be cut, cutting shall be done by abrasive wheel, saws or coring. No jackhammers will be allowed at these areas unless otherwise approved by the Engineer.
- B. All materials indicated on the Drawings to be removed shall be taken down in a manner so as not to damage the existing materials to remain.
- C. The work shall be conducted with prime consideration given to the requirements specified herein, and to this end the Contractor shall maintain close coordination and cooperation with the Engineer.
- D. The Contractor will have full access to the premises and the property up to the project limit lines. The Contractor shall take reasonable care to minimize disturbances to the adjacent property and abutting property owner.
- E. Coordinate and cooperate with work of other trades involved in the disconnecting and/or maintenance of existing active mechanical or electrical lines.
- F. Existing and proposed toilet facilities shall not be used for discharging waste, debris or any other type of material required to be disposed of.

3.5 EXPLOSIVES

- A. Explosives: Blasting and the use of explosives will not be permitted for demolition of existing structures.

3.6 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Water supply will be provided for pollution control at no cost to the Owner. Comply with governing environmental protection regulations.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Clean adjacent buildings, streets, trees, plantings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.7 DEMOLITION

- A. Building Demolition: Demolish buildings as indicated on plans and remove from the site. Use methods required to complete Work within limitations of governing permits and regulations, and as follows:
 - 1. Break up and remove concrete slabs on grade.
 - 2. Dispose of demolished items and material promptly. On-site storage or sale of removed items is prohibited.
- B. Below-Grade Construction: Demolish and remove all foundation walls and other below-grade construction.
- C. Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of buildings and pavements with soil materials according to requirements specified on the plans in conformance with Section 312000 "Earthwork."
- D. Damages: Promptly repair damages to adjacent facilities, grounds and landscaping caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Disposal of the material shall be done in such a manner that there shall be no accumulation of any demolition material which may, in the opinion of the Owner, any local, State or Federal Official, the Fire Department, or any other public agency having jurisdiction, constitute a hazard. When necessary, a disposal site accepting hazardous materials will be utilized.
- B. Burning: Do not burn demolished materials. Burning of any kind is not allowed on the site.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

- D. Completely remove all protection when the work is completed or when ordered in writing by the Engineer.

3.9 CLEAN UP

- A. Remove from the project site all materials and debris resulting from the work of demolition. Storage of such materials on the project site will not be permitted. The project site shall be safe, clean and holes filled and compacted with clean fill upon completion of the demolition and site clearance work.
- B. Repair any sidewalk, curb, or pavement surface which has been damaged or destroyed during the demolition operations. Said repairs to sidewalk or pavement surfaces shall be accomplished by applying bituminous concrete or regular concrete, as applicable in a manner satisfactory to the Engineer and Owner.

END OF SECTION 31 1200

SECTION 31 2000 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 01 – Specifications Section, apply to this Section.

1.2 RELATED REQUIREMENTS

- A. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, Latest Edition with latest addenda.

1.3 SPECIAL CONDITIONS

- A. The Contractor shall notify "Dig-Safe" in Rhode Island at 811, prior to any excavation.

1.4 SUMMARY

- A. This Section includes the following:

1. Preparing and grading subgrade for footings, slabs-on-grade, walks, pavements, and landscaping.
2. Excavating all materials and backfilling for buildings and structures, including open cut rock excavation and trench rock excavation for installation of site utilities.
3. Drainage and moisture-control fill course for slabs-on-grade.
4. Subbase course for walks and pavements.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches within building lines.
7. Excavating and backfilling for underground mechanical and electrical utilities and appurtenances.
8. Grading and compaction requirements.

1.5 UNIT PRICES

- A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:
 1. 24 inches outside of concrete forms other than at footings.
 2. 12 inches outside of concrete forms at footings.
 3. 6 inches outside of minimum required dimensions of concrete cast against grade.
 4. 6 inches beneath bottom of concrete slabs on grade.

5. 6 inches beneath invert elevation of pipe in trenches, and the greater of 24 inches wider than pipe diameter or 42 inches wide.
- B. Adjustments in Contract Price will be made due to quantity of rock encountered, based on unit prices for rock removal mutually agreed upon.

1.6 DEFINITIONS

- A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Subbase Course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.
- E. Base Course: The layer placed between the subbase and surface pavement in a paving system.
- F. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.
- G. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.7 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for the following:
 1. Each type of plastic warning tape.
 2. Filter fabric.
- C. Samples of the following:

1. A 25 lb. sample of each proposed fill and backfill soil material from on-site or borrow sources for use for grain size analysis, with sample source clearly identified. Submittal shall be a minimum of two weeks prior to anticipated use.
2. 12-by-12-inch sample of filter fabric.
3. The Contractor shall submit a Dewatering Plan before commencing any dewatering operations. The plan shall describe the basic components of the dewatering system proposed and method of operation. The contractor shall furnish all labor, materials, and any incidentals necessary to complete dewatering operations at no additional cost to the owner.

D. Test Reports: In addition to test reports required under field quality control, submit the following:

1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources.
2. One optimum moisture-maximum density curve for each soil material.
3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.

E. Site Characterization of All Off-Site Borrow Sources:

The following information shall be submitted to the Owner for review at least two weeks prior to use of an off-site borrow source. No soil materials shall be brought to the site without approval by the Owner. Off-site borrow materials must be free of chemical contamination and must be characterized in accordance with this section. Materials brought on-site by the Contractor and characterized to be contaminated will not be accepted and shall be legally disposed off off-site by the Contractor at no cost to the Owner. Any on-site materials or work adversely impacted by the presence of the contaminated borrow materials shall be replaced or repaired at no cost to the Owner.

1. Site Data: Information regarding the off-site borrow source and material, as follows:

- a. location of the borrow source site;
- b. present and past usage of the source site and material; and
- c. any previously existing report(s) associated with an assessment of the source site as it relates to the presence of oil or hazardous materials.

F. Quality Control Testing for Off-Site Borrow Materials:

1. In the event that site characterization of off-site borrow sources indicates that soils are acceptable for use, then chemical testing will not be required. It is anticipated that chemical testing would not normally be required for material from customarily utilized commercial borrow sources. However, if the materials are suspected of being contaminated based on review of the site characterization data, chemical testing will be required as directed by the Owner's representative. The chemical testing shall be completed by the Contractor at no additional cost to the Owner.
2. Chemical Test Data: Each material source requiring testing shall be sampled by a person experienced in sample collection who is a professional engineer registered in the State of Rhode Island, registered geologist, certified by the Rhode Island Department of Health,

for the following analyses:

- a. Volatile Organic Compounds, (EPA 8240 plus Hazardous substance List (HSL) Parameters;
 - b. Acid and Base Neutral Extractable Organic Compounds, (EPA 8270);
 - c. Pesticides/PCBs (EPA 8080);
 - d. Total Petroleum Hydrocarbons (Infrared Method)(EPA 9071/418.1);
 - e. Thirteen Priority Pollutant Metals (EPA 7000 Series)
 - f. Total Cyanide (EPA 9010); and
 - g. Total Phenols (EPA 9065).
 - h. Any additional tests deemed necessary by A/E.
3. Soil samples shall be obtained and tested in accordance with criteria established by the Owner's Representative, and results submitted for review and approval prior to use on site.
- G. Photographs of existing adjacent structures and site improvements.

1.8 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of all authorities having jurisdiction.
- B. Testing and Inspection Service: Owner will engage soil testing and inspection service, to perform testing of soil materials proposed for use in work and to provide field testing facilities for quality control testing during excavation and fill operations.
1. Cooperate with testing and inspection service as it obtains samples of existing soil materials and furnish testing service with necessary samples of haul-in fill materials.
- C. Preconstruction Conference: Conduct conference at Project site to comply with requirements of Division 01 – Section “Project Meetings”.
1. Before commencing site construction, meet with representatives of the governing authorities, Owner, Architect, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.
- D. Materials placed and compacted which do not conform to project specifications for the application shall be removed and replaced with suitable material as directed by the A/E at no additional cost to the Owner.

1.9 PROJECT CONDITIONS

- A. Existing Utilities: Locate existing underground utilities in areas of work. Where utilities are to remain in place, provide adequate means of protecting during excavation operations.
 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility Owner immediately for directions. Cooperate with Owner and with public and private utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfactory of utility Owner.
 2. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Architect/Engineer and then only after acceptable temporary utility services have been provided.
 - a. Provide minimum of 72-hour notice of proposed interruption to Owner.
Do not interrupt existing utility until receipt of written notice to proceed.
 3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. Gravel Borrow: This material shall conform to RIDOT materials M.01.02 (Column Ib of Table 1).
- C. Common Borrow: This material shall conform to RIDOT material specification M.01.01.
- D. Bedding Material: This material shall conform to RIDOT material specification M.01.04, Crushed Stone 100% shall pass 1-1/2" sieve.
- E. Drainage Fill: Shall conform to pervious fill RIDOT section M.01.03.
- F. Filtering Material: This material shall conform to RIDOT material specification M.01.07.
- G. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 BRICK AND MORTAR

- A. Sewer Brick: Standard size, ANSI/ASTM C 32, Grade SM.
- B. Mortar Materials: Dry packaged, proportioned for Type M unit masonry mortar, complying with ANSI/ASTM C 387.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep.
 - 1. Tape Colors: Provide tape colors to utilities as follows:
 - a. Red: Electric.
 - b. Yellow: Gas, oil, steam, and dangerous materials.
 - c. Orange: Telephone and other communications.
 - d. Blue: Water systems.
 - e. Green: Sewer systems.
- C. Filter Fabric: Manufacturer's standard non-woven synthetic, chemically resistant, non biodegradable pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.
 - 1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
 - a. Grab Tensile Strength (ASTM D 4632): 100 lb.
 - b. Apparent Opening Size (ASTM D 4751): #100 U.S. Standard sieve.
 - c. Permeability (ASTM D 4491): 150 gallons per minute per sq. ft.
 - d. Minimum weight of 6 oz. per square yard.
- D. Lean Concrete: Minimum compressive strength equal to 3000 psi, with a slump not exceeding seven inches.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

- C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

- A. Prevent surface water, precipitation and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.
 - 1. Do not allow water to accumulate in excavations. Install dewatering system to maintain groundwater levels at least two (2) feet below the bottom of excavation. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
 - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure to convey water removed from excavations and rain water to collecting or run-off areas. Do not use trench excavations for site utilities as temporary drainage ditches.
- B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.3 CUTTING PAVEMENT

- A. Excavations made on pavement shall be made in a careful manner so as to cause the least amount of damage to the pavement. Pavement and/or cement concrete will be cut 6 inches either side of the maximum allowable trench width. Any damage to the cut line due to the excavations, backfilling or removal of temporary pavement shall be re-cut to neat lines at no additional cost to the Owner, prior to replacement of the specified finished pavement. The width of pavement removed shall be kept as narrow as practicable. Existing pavement and base course disturbed or damaged beyond the pavement lines indicated shall be replaced by the Contractor to match existing pavement and base course, at no additional cost to the Owner.
- B. Contractor shall remove and dispose of existing bituminous concrete pavement off site as necessary to perform work of this contract as indicated. Removal of pavement shall be done in a neat manner by saw cutting a neat edge.
- C. Contractor shall saw cut, remove and dispose of concrete and bituminous walk pavement off-site as is necessary to perform the work of this contract. Removal of concrete and bituminous walks shall be performed in a neat manner at the nearest joint of the remaining walk pavement.
- D. Excavated pavement shall not be mixed with other excavated material which is to be used as backfill, and shall be removed immediately from the site of the work.

3.4 EXCAVATION

- A. Classified Excavation: Excavation is classified and includes excavation to required subgrade elevations. Excavation will be classified as earth excavation or rock excavation as follows:
1. Earth excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with soil and other materials encountered that are not classified as rock or unauthorized excavation.
 2. Rock excavation shall mean removal and disposal of rock material as directed by A/E.
 3. All rock removal shall be in conformance with local and state authorities having jurisdiction over this work.
 4. Definition of "rock excavation" shall mean:
 - a. Materials that cannot be removed effectively with soil excavating equipment, such as rock material or aggregate conglomerate deposits so firmly cemented as to possess the physical characteristics of solid rock.
 - b. Concrete or masonry structures larger than 1 cubic yard in volume, and not less than 13" in least dimension.
 - c. Reinforced concrete larger than 1 cubic yard in volume, reinforcement area more than 1/2 percent of cross sectional area perpendicular to reinforcement in either direction, and not less than 8" in least dimension.
 - d. Boulder 1 cu. yd. or more in volume, sound rock material in ledges, bedded deposits and unstratified masses which cannot be removed without blasting.
 - e. The definition of "Trench Rock" is rock required to be removed and disposed for the installation of trenches requiring an excavation 3' wide or less, and greater than 5' deep, or the removal and disposal of rock encountered in the construction of masonry culverts and structures having a clear span of less than 8 feet.
 5. When, during excavation, material is encountered that Contractor may classify as rock excavation or trench rock, such material shall be uncovered and A/E notified by Contractor. Contractor shall not proceed with excavation or rock excavation. Failure on part of Contractor to uncover such material and notify A/E will cause forfeiture of Contractor's right of claim for payment of rock excavation.
 6. Soft or disintegrated rock or hardpan which can be removed with a hand pick or power operated excavating machines, or loose or previously blasted rock, will not be considered as rock excavation.
 7. Before rock removal commences, the Contractor shall uncover all ledge to be removed. Elevations shall be taken by a registered land surveyor employed by the Owner. The surveyor will be paid by the Contractor.
 8. Surveyor shall develop cross sections to show and determine rock quantities for payment purposes. Cross sections shall be reviewed by the A/E. Payment for rock removal shall be based on "Methods of Measurement" or "paylines" as stated within the project specifications and drawings. Contractor shall be paid only in accordance with calculated quantities and not for actual rock removed.
 9. Rock excavation may also be accomplished utilizing ripping, hoe ramming or other mechanical means to loosen and remove rock.
 10. Wherever rock is shattered below grade and is unfit for foundations, the shattered rock shall be removed and replaced as specified. No extra payment will be made for over excavation or backfill as required.
 11. Rock shall be removed to a depth of 12" below lawn areas.

3.5 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

3.6 EXCAVATION FOR STRUCTURES

- A. Excavate material to facilitate construction of embankments, roads, parking areas, pavements, structures, and other site improvements to the lines and grades indicated, and deeper as required. Where unsuitable materials such as uncontrolled fill, trash, peat, wood, tree stumps, logs, construction/building debris, topsoil, or other materials that may compress, decay, or collapse or are otherwise considered not to be acceptable foundation bearing soils are encountered inside building footprints, excavation and replacement with compacted Engineered Fill or other acceptable, approved materials will be required.
- B. Excavation for building foundation construction shall be performed to the top of undisturbed naturally deposited inorganic soils or stable, unshaken bedrock. Engineered Fill shall then be placed and compacted, as described below, to bring the area to foundation or slab subgrade. If unsuitable materials are encountered around the perimeter of the building limits, excavate outward and downward at a 1.5H:1V slope, to the top of undisturbed naturally deposited inorganic soils or stable, unshaken bedrock. "All unsuitable materials within the footprint of the building shall be removed to the top of undisturbed natural deposited inorganic soils or stable, unshaken bedrock.
- C. Conduct bulk excavation utilizing appropriate methods and equipment in sufficient quantity and sizes to expeditiously complete the excavation required to perform the work as specified and indicated on Drawings.
- D. Coordinate the sequence of excavation with ground conditions and water encountered, weather and precipitation, erosion control, structure forming and construction, cold weather protection, dewatering, utility construction, and as necessary to provide a stable excavation and to ensure the safety of all persons and equipment within the excavation at all times during construction.
- E. Continuously remove surplus excavated materials from the site as excavation proceeds, transporting materials over legal haul routes, and permanently disposing of materials at legal disposal areas in accordance with permits obtained by the Contractor and pertinent regulations.
- F. Protect soil subgrades from disturbance caused by construction activities, water, and freezing.
- G. Exercise care to preserve the material below and beyond the limits of excavation. Where excavation is carried below required grade, backfill to subgrade as specified.
- H. Remove unstable bottom material. Remove large stones, debris, and unsuitable soils from the excavation bottoms.
- I. Temporary cut slopes shall be constructed no steeper than 1.5H:1V. Some sloughing and raveling should be anticipated in temporary slopes.

- J. Upon completion of excavations, notify the Owner and make the excavation available to the Owner or the Owner's representative to observe the condition of the excavated surface prior to and during subgrade preparation operations.
- K. Excavation for the convenience of the Contractor shall conform to the limits acceptable to the Owner and shall be at no additional cost to the Owner.
- L. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.10 foot. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Underground Tanks, Basins, Drainage Structures and Mechanical or Electrical Appurtenances: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot. Do not disturb bottom of excavations intended for bearing surface.

3.7 EXCAVATION SUPPORT SYSTEM

- A. The Contractor shall furnish, put in place, maintain and remove, as required and/or necessary for safe and proper construction, all excavation support systems which may be required to support the sides of excavation preventing damage to adjacent property and structures.
- B. The Contractor shall submit, for review by A/E, design and erection drawings, details, material specifications, and design computations for excavation support systems as required; bearing the seal of a professional Engineer who is experienced in this type of work and is registered in Rhode Island.
- C. The excavation support system shall be designed to be compatible with dewatering and pumping systems.
- D. Work shall not proceed until such time as the Contractor's submission has been reviewed and questions relative to his proposed method resolved to the satisfaction of the A/E.
- E. Support system shall be installed to prevent any movement of earth which could in any way diminish the width of excavation, or cause caving or undermining of structures or pavement beyond that necessary for proper construction or otherwise injure the work or workmen, and to prevent delay of the work.
- F. Support system shall be installed in such a manner to avoid loss of material from behind the sheeting. Care shall be taken not to trim beyond the face of which the sheeting will be driven. Care shall be taken to prevent voids behind the sheeting. If such voids do occur they shall immediately be filled with bank run gravel and compacted.

- G. The Contractor shall leave in place, to be imbedded in the backfill, all sheeting and bracing which the A/E directs in writing to be left in place. The A/E shall direct at what elevation the sheeting to be left in place shall be cut off.
- H. All bracing, which is to be removed, shall be removed in such a manner as not to endanger the construction or other structures. All voids left by the removal shall immediately be filled with bank run gravel and compacted with suitable tools to the satisfaction of the A/E.
- I. All bracing, together with the use of prefabricated steel trenching boxes, shall be provided by the Contractor at no additional expense to the Owner.
- J. The Contractor shall be responsible for the adequacy of his excavation support system and shall be solely responsible for any damage or injury to new or completed work as a result of failure of or lack of use of shoring, sheeting and bracing.

3.8 PUMPING AND DEWATERING

- A. The Contractor shall furnish all pumps, equipment, power and attendance to maintain and operate such pumping and dewatering systems consisting of any means and devices, including spare units in case of breakdown, which accomplish the removal and prompt disposal of all water entering the foundation excavation, pits and trenches. The pumping manner, method or both shall be sufficient to ensure that ground water is controlled at levels which will permit all work to be performed in dry conditions.
- B. The Contractor shall submit plans, details, and specifications for his dewatering systems to the A/E for review and comment prior to installation.
- C. Operation of the system may be shut down, but the system shall be left in place, and only on the written order of the A/E and after the foundation work is complete to such an extent that it will not be damaged when flooded.
- D. Where in the judgment of the A/E, for reasons of safety, or for the benefit and progress of the work, the system should be put back in operation, such emergency work shall begin within four (4) hours of the A/E's verbal notice.
- E. Water shall be removed from the site during pumping and dewatering operations by whatever expeditious means available to the Contractor in cooperation with the Owner's representative and their requirements.
- F. Water shall not be disposed of in any manner which may cause damage to surrounding lands or structures and in no case shall be disposed of in an existing sanitary sewer, storm drain, or drainage structure.
- G. Water level shall be maintained at a depth of 2 feet or greater below excavated surface elevation during construction.

3.9 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.10 CLOSING ABANDONED UNDERGROUND UTILITIES

- A. Close open ends of abandoned underground utilities indicated to remain with sufficiently strong closure to withstand pressures which may result after closing.
 - 1. Close open ends-of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs, or other suitable method for type of material and size of pipe. Do not use wood plugs.
 - 2. Close open ends of concrete and masonry utilities with not less than 8" thick brick masonry bulkheads, constructed to fill opening.
 - a. Lay brick in mortar, forming a full bed with ends and side joints in one operation and with maximum 3/8" wide joints. Protect fresh masonry from freezing or from rapid drying and maintain protection until mortar has set.
 - 3. Close open ends of all other pipes and conduits with caps specifically made for that material.

3.11 APPROVAL OF SUBGRADE

- A. Notify Architect/Engineer when excavations have reached required subgrade.
- B. When Architect/Engineer determines that unforeseen unsatisfactory soil is present, continue excavation and replace with systematically placed and compacted backfill or fill material as directed.
 - 1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Architect/Engineer at no cost to the Owner.
- D. Compacted Fill Surfaces: Compacted Engineered Fill, or other fill materials, which become disturbed, contaminated with clay or otherwise unacceptable to the Owner's Representative shall be removed and replaced with acceptable Engineered Fill at no additional cost to the Owner.

3.12 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect/Engineer, at no cost to the Owner.

1. Fill unauthorized excavations under other construction as directed by the Architect/Engineer, at no cost to the Owner.
- B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the A/E, at no cost to the Owner.

3.13 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Provide erosion control measures around perimeter of stockpiles. Cover to prevent wind-blown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
 2. Establish soil and material stockpiles on site only at locations acceptable to the Owner.

3.14 BACKFILL

- A. Backfill excavations promptly, but not before completing the following:
 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Testing, inspecting, and approval of underground utilities.
 4. Concrete formwork removal.
 5. Removal of trash and debris from excavation.
 6. Removal of temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. No backfill shall be placed except in the presence of the Owner or Owner's representative.

3.15 FILL

- A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
 1. Plow, scarify, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
- B. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil, and re-compact to required density.
- C. Place fill material in layers to required elevations for each location listed below.

1. Under grassed areas, use common borrow material.
2. Under walks and pavements, use gravel borrow.
3. Under steps and ramps, use gravel borrow.
4. Under building slabs, use gravel borrow except for the last 12" use drainage fill.
5. Under footings and foundations, use gravel borrow.
6. Under piping and conduit, provide gravel borrow and bedding material where indicated under piping or conduit; shape to fit bottom 90 deg. of cylinder.

3.16 MOISTURE CONTROL

- A. Uniformly moisten, moisture condition, or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
 - a. Stockpile or spread and dry removed wet satisfactory soil material.
- B. Wet Weather: If fill material placement, spreading, rolling, or compaction operations are interrupted by heavy rain or other unfavorable conditions, do not resume such operations until ascertaining that the moisture content and density of the previously-placed soil are as required by these specifications.

3.17 COMPACTION

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.
- C. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557:
 1. Under structures, building slabs, steps, and pavements, compact the top 12 inches below subgrade and each layer of backfill or fill material at 95 percent maximum dry density.
 2. Under walkways, compact the top 6 inches below subgrade and each layer of backfill or fill material at 95 percent maximum dry density.
 3. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill or fill material at 90 percent maximum dry density.
- D. Material in conformance to paragraph 2.1 herein which are placed and compacted to less than the specified density shall be:

1. Re-compacted as required to achieve specified density.
2. Removed and replaced with properly placed and acceptably compacted material.

E. Compaction by puddling is prohibited.

3.18 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between existing adjacent grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 0.10 foot.
 2. Walks: Plus or minus 0.10 foot.
 3. Pavements: Plus or minus 1/2 inch.
- C. Grading Inside Building Lines: Grade the surface of fill under building slabs smooth and even, free of voids, as specified, and to required elevation. Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.19 SUBBASE AND BASE COURSES

- A. Under pavements and walks, place subbase course material on prepared subgrades. Place base course material over subbases to pavements.
1. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95 percent of ASTM D 4254 relative density.
 2. Shape subbase and base to required crown elevations and cross-slope grades.
 3. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
 4. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.
- B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders at least 12 inches wide of acceptable soil materials and compact simultaneously with each subbase and base layer.

3.20 DRAINAGE FILL

- A. Under slabs-on-grade, place drainage fill course on prepared subgrade.
 - 1. Compact drainage fill to required cross sections and thickness.
 - 2. When compacted thickness of drainage fill is 6 inches or less, place materials in a single layer.
 - 3. When compacted thickness of drainage fill exceeds 6 inches thick place materials in equal layers, with no layer more than 6 inches thick nor less than 3 inches thick when compacted.

3.21 FIELD QUALITY CONTROL

- A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
 - 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.
 - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
 - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the A/E.
 - 2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Architect.
 - 3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 - 4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
 - 5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.
- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.

3.22 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace material to depth directed by the A/E; reshape and recompact at optimum moisture content to the required density.
- C. Settling: Where settling occurs within 1 year after project completion, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. All unsuitable material, and suitable material not required for the proper completion of the contract, shall become the property of the Contractor, and shall be removed and properly disposed of off-site at no additional cost to the Owner.
- B. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, debris, and pavement, and legally dispose of it off the Owner's property, at no cost to the Owner.
- C. Disposal: Transport surplus satisfactory soil to designated storage areas on the Owner's property. Stockpile or spread soil as directed by Architect.
 - 1. Remove waste material, including unsatisfactory soil, pavement, trash, and debris, and legally dispose of it off the Owner's property, at no cost to the Owner. Contractor to obtain and pay for all necessary permits or licenses for off-site disposal.

END OF SECTION 31 2000

SECTION 31 2010 - EARTHWORK UTILITIES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the contract, including General and Specification Supplementary Conditions and Division 1, apply to the work of this section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, Latest Edition with latest addenda.

1.2 RELATED SECTIONS

- A. Section 31 2000 – Earthwork
- B. Section 33 4100 – Storm Drainage System

1.3 DESCRIPTION OF WORK

- A. Work under this section includes, but is not necessarily limited to, the following:
 - 1. Excavating and trenching.
 - 2. Filling, backfilling and compaction.
 - 3. Rough grading to required tolerances.
 - 4. Filling, as directed.
 - 5. The placing of earth for forming and shaping embankments.
 - 6. All sheeting and shoring where required and/or necessary.
 - 7. Maintaining benchmarks, monuments, and other reference points, obtaining accurate replacement of final grade of any disturbed or destroyed, or that must be removed due to the nature of the work, furnishing certification by a registered professional surveyor that all disturbed items have been accurately relocated.
 - 8. Written notice of readiness of excavations, fill materials, fill areas, compacted fills, and items requiring review and/or inspection.
 - 9. Maintaining excavations and trenches free of water and performing construction work under dry conditions.
 - 10. Excavations, stock piling and placing material suitable for filling and backfilling.
 - 11. Removing from site all debris, unsuitable material and excess excavated material as specified and/or as directed by A/E.
 - 12. Restoration to original grades and condition properties damaged by any activity related to the work, taking adequate precautions to avoid settlement or cave-in of properties higher than site, silting, erosion, or other damage to properties lower than site.

1.4 QUALITY ASSURANCE

- A. If, in the opinion of the A/E, the specified materials do not conform to material specifications any required sieve analysis as deemed necessary by the A/E shall be performed by an independent testing laboratory selected by the A/E. This testing shall be paid for by the Contractor at no expense to the Owner.

1.5 MEASUREMENT AND PAYMENT

- A. General: The contract prices bid and payment thereof shall constitute full compensation for all labor, equipment, tools, supplies, materials, and work incidental and necessary to satisfactorily complete the work as specified, as shown on the drawings and as directed.
- B. Trench Excavation and Backfill: No separate payment will be made for earth excavation, dewatering, bedding, sand blanket, saw cutting pavement, backfill, compaction or work items necessary to install and backfill all pipe and structures but the cost of the work will be considered to be included in the contract price. Earthwork will be as indicated on the drawings and as specified. This work included the following: Excavation and disposal of pavements; removal, hauling and stockpiling of excavated materials; re-handling, hauling, and placing of stockpiled material in the work to be used as backfill in the upper section of the trench; excavation and disposal of surplus and/or unsuitable materials; placement of fill materials; compaction and grading of fills, backfills, embankments and subgrades; all necessary dewatering; protection of existing pipelines, utilities and structures; sheeting and bracing not left in place; bedding material compacted in place to the lines, grades and limits directed by the A/E; sand blanket compacted in place to the lines, grades and limits directed by the A/E.
- C. Furnishings of Water: The furnishings of water used for sprinkling and wetting the material during the construction operations in connection with the compaction of fills, backfills, borrow and embankments will be considered the responsibility of the Contractor. No payment will be allowed for this item of work. Contractor shall obtain appropriate permits for meters and pay for water use.
- D. Damaged or Disturbed Items of Work: All damaged or disturbed items of work, or items required to be removed and replaced due to construction purposes and operations that are not listed in the bid, shall be restored, replaced or repaired by the Contractor in a manner satisfactorily to the A/E at no additional expense to the Owner.
- E. Test Pits: Excavation and backfilling for test pits, if directed by the A/E, or as indicated on the plans, shall be measured and paid for on a per each basis as listed in the unit price bid.
- F. Borrow: Gravel borrow will be compacted in place to the lines, grades and limits as directed by the Engineer.
- G. Below Grade Excavation: Bedding material used to replace below grade excavation will be compacted in place to the lines, grades and limits as directed by the Engineer, and paid for on a cubic yard basis as listed in the unit prices bid.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Grain-size distribution curve shall be furnished to A/E by a soil test lab Engineer licensed by the State of Rhode Island and approved by the A/E.
- B. Areas from which fill material is obtained shall have been completely stripped of topsoil and subsoil to undisturbed naturally deposited inorganic soil. No fill shall be brought to site or purchased until such material shall have been reviewed by A/E. Fill shall conform in quality to sample as selected by A/E.
- C. See Earthwork Specification Section 31 2000 for Soil Materials and Accessories.

PART 3 - EXECUTION

3.1 GENERAL EXCAVATION REQUIREMENTS

- A. The extent of excavation open at any one time shall be controlled by the conditions, but shall always be confined to the limits prescribed by the A/E.
- B. No excavated material shall be placed on lawns, driveways or other private property without written consent of Owner.
- C. The Contractor shall take all necessary measures to protect trees not to be removed from the site of the work against damage from machinery and from excavated material. Branches and roots shall not be cut unless permitted by the A/E.
- D. Trees, cultivated plants, shrubs and hedges which might be damaged by the Contractor's operations shall be protected or shall be transplanted, cared for and replanted. If such trees, plants, shrubs or hedges are damaged to the degree that their growth or beauty is affected, they shall be replaced by the Contractor at his own expense. All surfaces which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found just prior to the start of construction.
- E. The restoration of existing property shall be done as promptly as practicable and not left to the end of the construction work.
- F. Excavation and backfill operations adjacent to existing utilities, structures and construction shall be done in such a manner as will prevent the loss of ground or caving in of excavations, the undermining, damage or disturbing of existing pipelines, utilities, and structures or any completed construction of the project. Backfill shall be placed, compacted, and done in such a manner as to prevent future settlement and damage to the existing pipelines, utilities, structures, or construction. Existing pipelines, utilities, structures, new construction, or property damaged due to excavation, backfilling and settlement of the backfill, shall be the responsibility of the Contractor and shall be corrected in a manner satisfactory to the A/E, at no additional expense to the Owner.

- G. Unsuitable excavated material shall systematically be separated and removed from suitable material to the satisfaction of A/E.
- H. Unsuitable material shall be promptly removed off-site at no expense to the Owner.
- I. Surplus suitable material shall be the property of the Owner and stored on site as directed, or at the Owner's request, this material shall be removed from the site by the Contractor at no additional cost to the Owner.
- J. Support banks of excavations, as required by local, state and federal regulations, to protect persons and property, using suitable combinations of shoring, sheet piling, bracing or other methods.
- K. Excavations shall be carried to design depths.
- L. If excavation is carried beyond line or below grade, except as directed, or subgrade is made unsatisfactory by act or neglect of Contractor, he shall remove such unsatisfactory material. No extra payment will be made for replacement with bank run gravel or first-class bedding.
- M. Contractor shall provide adequate dust control during earthwork operations.
- N. Contractor shall provide and maintain temporary barricades and traffic controls as required.

3.2 PROJECT CONDITIONS

- A. "Dig-Safe" Damage Prevention System: All Contractors or Subcontractors performing drilling, boring, augering, jetting, sheeting or pile installation, demolition, excavation or like work shall, prior to commencement of these activities, contact utility companies having responsibility for underground transmission systems for information relative to locations of existing underground utilities and/or appropriate dig-safe damage prevention and notification agency. Provide Dig-Safe number to clerk of the works in writing.
- B. Adequate protection measures shall be provided to protect workmen and pedestrians passing by the site. Streets adjacent property shall be fully protected throughout the operations.
- C. Shoring, sheeting, and bracing and/or prefabricated trenching boxes shall be provided to prevent caving, erosion, or gullying sides of excavation.
- D. Provide for surface drainage and erosion control during the period of construction in a manner to avoid creating a nuisance to adjacent areas. Keep all excavations free of water during the entire progress of the work, regardless of the cause, source, or nature of the water.

3.3 CUTTING PAVEMENT

- A. Excavations made on pavement shall be made in a careful manner so as to cause the least amount of damage to the pavement. Roadway pavement in state highways, local roads, private ways, sidewalks, and easements having Class 1 and Class 2 Bituminous concrete pavement shall be cut prior to trench excavation. Pavement and/or cement concrete will be cut

6 inches either side of the maximum allowable trench width. Any damage to the cut line due to the excavations, backfilling or removal of temporary pavement shall be recut to neat lines at no additional cost to the Owner, prior to replacement of the specified finished pavement. The width of pavement removed shall be kept as narrow as practicable. Existing pavement and base course disturbed or damaged beyond the payment lines indicated shall be replaced by the Contractor to match existing pavement and base course, at no additional cost to the Owner.

- B. Contractor shall remove and dispose of existing bituminous concrete pavement off-site as is necessary to perform work of this contract as indicated. Removal of pavement shall be done in a neat manner by saw cutting a neat edge.
- C. Contractor shall saw cut, remove and provide off-site disposal of concrete and bituminous walk pavement as is necessary to perform the work of this contract. Removal of concrete and bituminous walks shall be performed in a neat manner at the nearest joint of the remaining walk pavement.
- D. Excavated pavement shall not be mixed with other excavated material which is to be used as backfill and shall be removed immediately from the site of the work.

3.4 ROCK EXCAVATION AND DISPOSAL

- A. Rock excavation shall mean removal and disposal of rock material as directed by A/E.
- B. The Contractor shall be solely responsible for any damage, direct or indirect, arising from rock removal operations and shall hold the Owner and A/E harmless from any costs, liens, charges, claims, or suits, including the costs of defense arising from such damage, real or alleged. No blasting will be allowed at this project without permission from the Owner.
- C. All rock removal shall be in conformance with local and state authorities having jurisdiction over this work.
- D. Definition of "Rock Excavation" shall mean:
 - 1. Materials that cannot be removed without systematic drilling and hoe ramming, such as rock material in ledges.
 - 2. Concrete or masonry structures larger than 1 cubic yard in volume, and not less than 13" in least dimension.
 - 3. Reinforced concrete larger than 1 cubic yard in volume and not less than 9" in least dimension.
 - 4. Boulders 1 cubic yard or more in volume, sound rock material in ledges, bedded deposits and unstratified masses, which cannot be removed by normal excavation techniques.
- E. When, during excavation, material is encountered that Contractor may classify as rock excavation, such material shall be uncovered and A/E notified by Contractor. Contractor shall not proceed with excavation of this material until A/E has classified material as earth excavation or rock excavation. Failure on part of Contractor to uncover such material and notify A/E will cause forfeiture of Contractor's right of claim for payment of rock excavation.

- F. Excavated rock shall be removed from the site or deposited in such areas or locations selected by the Contractor with the approval of the A/E and the Owner.
- G. Soft or disintegrated rock or hardpan which can be removed with a hand pick or power operated excavating machines, or loose or previously blasted rock will not be considered as rock excavation.
- H. Before rock excavation commences, the Contractor shall uncover all ledge to be removed. Elevations shall be taken by a registered land surveyor, not employed by the Contractor. Surveyor will be paid by Contractor. After completing rock removal, elevations shall be taken again by the surveyor. Amounts of ledge removed shall be within the limits indicated on the drawings and will be agreed to by the Contractor and Owner. Excess rock removal and backfill material will be at contractor's expense.
- I. Contractor shall develop cross sections to show and determine rock quantities for payment purposes. Cross sections shall be reviewed by the A/E.
- J. The Contractor shall obtain written permission and approval of method from local or other authorities having jurisdiction before proceeding with the work. Explosives shall not be stored, handled and employed at this project without permission from the Owner. In general, no blasting will be allowed. Any damage caused by the work of the Contractor shall be repaired to the full satisfaction of the A/E.
- K. Wherever rock is shattered below grade and is unfit for foundations the shattered rock shall be removed and replaced as specified. No extra payment will be made for overbreak or backfill as required.
- L. No blasting shall be permitted without permission from the Owner. The Contractor shall familiarize all personnel on the project, the A/E and the general public with the implemented system.
- M. No explosives, caps, detonators and fuses shall be stored on the site.
- N. The Contractor shall be responsible for determining any safety requirement on this particular site so as not to endanger life, property, utility services, any existing or new construction, or any property adjacent to the site.

3.5 TRENCH EXCAVATION

- A. Trenches shall be excavated in such a manner and to such widths as indicated on the contract drawings to allow pipes to be laid and joints to be formed and to allow for sheeting and shoring, dewatering and for removing and replacing unsuitable materials. Trenches shall be excavated to lines and grades shown on the drawings and shall include the removal of materials such as clay, pavements, sand gravel, soft or disintegrated rock, which will be removed without blasting or drilling, and boulders less than 1 cubic yard volume.
- B. Wherever rock is encountered in trench excavation, rock shall be removed by a method acceptable to the A/E to the lines and grades indicated on the plans, or to a minimum depth of 12 inches beneath the pipe barrel.

- C. Final decision as to suitability of excavated material for use as backfill or fill shall be made by the A/E. If, in the judgment of the A/E, the excavated material is unsuitable, the Contractor shall import bank run gravel to make up the deficiency.

3.6 TRENCH BACKFILL

- A. Trenches and structure excavations shall not be backfilled until all required inspections have been satisfactorily performed and until the work as installed conforms to other requirements specified in the several sections covering the installation of the work. Trenches and other excavations shall be backfilled as soon as practicable with the specified material.
- B. All pipes under this contract are to be laid in "first class bedding" as indicated on the contract drawings. Prior to backfilling the trench, the space on both sides of the pipe to a depth equal to half the diameter of the pipe shall be backfilled with "first class bedding" material. This layer shall be carefully tamped using tools acceptable to the A/E to obtain maximum compaction around and under the pipe at the same time being extremely careful not to cause movement of the pipe in either a lateral or vertical direction.
- C. Gravel borrow backfill shall be deposited in the trench uniformly on both sides of the pipe for the entire width of the trench and to a depth not less than 12 inches over the top of the pipe. This layer shall be thoroughly compacted to the satisfaction of the A/E.
- D. The balance of the backfill, to subgrade or finish grade as indicated, shall be made using trench excavated materials unless the Contractor is otherwise directed by the A/E to use bank run gravel as hereinbefore specified. The balance of backfill shall be random backfill spread in layers not exceeding 6 inches, each layer shall be dampened, thoroughly compacted by tamping or other acceptable method and shall contain no rock, stones or boulders larger than 6-inches in their greatest dimensions. The material shall be free from frozen material, clods of earth, brush or any other perishable or objectionable matter which would prevent proper consolidation or might cause subsequent settlement.
- E. Compaction by water-jetting, puddling or ramming is prohibited. Where it is necessary to obtain maximum compaction, power tampers shall be used. The method of compacting shall be reviewed by the A/E.
- F. During filling and backfilling operations pipelines will be reviewed by the A/E to determine whether any displacement of the pipe has occurred. If the inspection of the pipelines shows poor alignment, displaced pipe or any another defects, the defects designated by the Owner shall be remedied in a satisfactory manner by the Contractor at no additional expense to the Owner.
- G. The backfill material shall be compacted to at least 95% of the maximum laboratory dry density as determined in accordance with ASTM D 1557, Method D.

3.7 MANHOLE AND/OR CATCH BASIN EXCAVATION

- A. Excavations shall be of sufficient size to permit connections to and construction of the structures as shown and specified and to allow for sheeting and bracing, pumping and drainage and for removing and replacing unsuitable material as required.
- B. Excavation shall include the removal of materials such as clay, pavements, sand, gravel, soft or disintegrated rock, and other materials which will be removed without blasting or drilling, and boulders less than 1 cubic yard in volume.
- C. The extent of excavation shall be 24 inches wider than the base of the structures, and 6 inches below the base of the structures.

3.8 MANHOLE, AND CATCH BASIN BACKFILL

- A. Manholes, drop inlets and catch basins excavations shall not be backfilled until all required inspections have been satisfactorily performed and until the work as installed conforms to other requirements specified in the several sections covering the installation of the work.
- B. All manholes, drop inlets and catch basins shall be laid on a 6-inch layer of "first class bedding". This layer shall be carefully tampered using acceptable methods and tools to obtain maximum compaction under the structures.
- C. The balance of the backfill, to subgrade or finish grade as indicated, shall be made using acceptable backfill materials. The balance of backfill shall be spread in layers not exceeding 6 inches, each layer shall be dampened, thoroughly compacted by tamping or other method and shall contain no rock, stones or boulders larger than 6-inches in their greatest dimensions. The material shall be free from frozen material, clods of earth, brush or any other perishable or objectionable matter which would prevent proper consolidation or might cause subsequent settlement.
- D. Compaction by waterjetting, puddling or ramming is prohibited. Where it is necessary to obtain maximum compaction, such as under paved and parking lot areas and slabs on grade, power tampers shall be used. The method of compacting shall be reviewed by the A/E.
- E. Compact soil to at least 95% of the maximum laboratory dry density determined in accordance with ASTM D 1557 Method D.

3.9 STRUCTURE EXCAVATION

- A. All structure excavations shall conform to Section 31 20 00 - "Earthwork".

3.10 BACKFILL AND COMPACTED FILL

- A. Fill, backfill and compact fills as necessary to complete the work with hand and/or suitable power equipment.
- B. No fill material shall be placed on frozen soil, nor shall snow, ice or frozen earth be brought in as fill. Fill material shall not be placed on material which has been affected by frost moisture.

- C. Surface of backfill or fill in reach being constructed shall be maintained approximately level.
- D. Acceptable on-site material and/or off-site borrow, shall be placed in successive, even, horizontal layers to a depth no greater than 6" loose measure. Stones larger than 6" shall be removed prior to compaction of each lift.
- E. After each layer of backfill or fill has been spread, cleared of large stones and inspected, lift shall be compacted by not less than 4 complete coverages with specified roller, to 95 percent maximum dry density specified, as determined by laboratory tests in accordance with ASTM D 698-66, and field tests in accordance with ASTM D 1556-64.
- F. Backfill or fill around pipes within building using hand tools to a point of 12" above pipe. Compact remainder of such backfill or fills using small tools such as power-driven tampers and vibrators, to suit fill materials.
- G. Keep power-driven, rider-operated spreading, compacting and other heavy equipment away from walls, a minimum distance equal to height of fill above footings.
- H. Where backfill or fill is placed around, or on, two sides of any structure, carry it up evenly. Avoid displacement or other damage to such structure.
- I. Work shall be done in a manner that damage to construction, particularly dampproofing or waterproofing and other protective covering is avoided. Should damage occur, stop work in that area, repair damage, and request review of repairs before resuming work in this area.

3.11 COMPACTION EQUIPMENT

- A. Rubber-tired roller-compactor, having 4 wheels equipped with pneumatic tires of such size and ply as can be maintained at pressures between 80 and 100 psi with 25,000 lb. wheel load during rolling operation. Roller-wheels shall be located abreast, and so designed that each wheel will carry approximately equal load in traversing over even ground. Spacing of wheels shall be such that distance between nearest edges of adjacent tires will not be greater than one-half width of one tire at operating pressure for 25,000 lb. wheel load. Roller shall have body suitable for ballast loading such that load per wheel may be varied, if so directed, between 10,000 lb. and 25,000 lb. Roller shall be towed at speeds not exceeding 10 miles per hour.
- B. Acceptable drum type vibratory compactor operating at not less than 2000 vibrations per minute.
- C. In any event, regardless of equipment used, compaction of soil shall meet the relative densities stated in this section.

END OF SECTION 31 2010

SECTION 31 2319 – DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SUMMARY

- A. Section includes construction dewatering.
- B. Related Sections:
 - 1. Division 01 Section "Construction Progress Documentation" for recording preexisting conditions and dewatering system progress.
 - 2. Division 31 Section "Earthwork" for excavation, backfilling, and site grading.
 - 3. Division 33 Section "Subdrainage" for permanent foundation wall, underfloor, and footing drainage.
 - 4. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda and revisions.

1.3 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Design dewatering system, including comprehensive engineering analysis by a qualified State of Rhode Island registered professional engineer, using performance requirements and design criteria indicated.
 - 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 5. Remove dewatering system when no longer required for construction.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

- B. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
 - 1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
 - 2. Include a written plan for dewatering operations including control procedures to be adopted if dewatering problems arise.
- C. Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a State of Rhode Island registered professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and Designer.
- B. Field quality-control reports.
- C. Other Informational Submittals:

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to dewatering including, but not limited to, the following:
 - a. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
 - b. Geotechnical report.
 - c. Proposed site clearing and excavations.
 - d. Existing utilities and subsurface conditions.
 - e. Coordination for interruption, shutoff, capping, and continuation of utility services.
 - f. Construction schedule. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - g. Testing and monitoring of dewatering system.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Engineer no fewer than five days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Engineer's Construction Manager's Owner's written permission.

- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
 - 2. The geotechnical report is included elsewhere in the Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

- C. Provide temporary grading to facilitate dewatering and control of surface water.

- D. Monitor dewatering systems continuously.

- E. Promptly repair damages to adjacent facilities caused by dewatering.

- F. Protect and maintain temporary erosion and sedimentation controls during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
- E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.
 - 1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION 31 2319

SECTION 31 3205 - SOIL EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 01 – General Requirements, apply to this Section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, Latest Edition with latest addenda.

1.2 RELATED SECTIONS

- A. Section 31 1005 – Site Preparation

1.3 DESCRIPTION OF WORK

- A. Furnish and install temporary control measures as needed during the progress of the work or as ordered by the A/E during the life of the contract to control water pollution through use of mulches, grasses, hay bale check dams, netting, fiber mats, silt fences, compost filter socks, and other erosion control devices and methods.
- B. The Contractor shall attend a pre-construction meeting to discuss in detail his intended construction sequence and accompanying soil erosion and sediment control program.
- C. The Contractor is responsible for compliance with the rules and regulations governing the enforcement of the Rhode Island Freshwater Wetlands Act.

1.4 SUBMITTALS

- A. Submittals listing proposed materials including manufacturer's product data and test reports verifying conformance with design guidelines shall also be provided.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Silt Fence: Silt fence shall be Enviro Fence by Mirafi, Propex Silt Stop manufactured by Amoco Fabrics Company, or equal.
- B. Baled Hay Erosion Check: The baled hay shall be approximately 36"x 18"x 24".

- C. Hay Bales: Hay bales shall be mowings of acceptable herbaceous growth reasonably free from noxious weeds or woody stems and shall be reasonably dry. Hay bales shall be approximately 36" long x 18" wide x 24" high. Bales shall be anchored with 2" x 2" x 3' long wooden stakes.
- D. Compost Filter Sock: Compost Filter Sock shall be Filtrex Soxx, manufactured by Filtrex, or equal, shall be approximately 12" diameter and shall be anchored and installed in accordance with manufacturers specifications.

PART 3 - EXECUTION

3.1 PREPARATION

- A. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time. Temporary pollution control measures will be used to correct conditions that develop during construction, that were not foreseen during the design stage, that are needed prior to installation of permanent pollution control features, or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project, at no additional cost to the Owner.
- B. Where erosion has been identified during the pre-construction meeting, or has been identified during construction as being a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion control measures may be required between successive construction stages.
- C. Contractor shall have on-site all necessary hay bales, silt fence, and storm drainage piping etc., prior to undertaking any work that may cause erosion.
- D. The A/E will limit the area of excavation, borrow and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible, justified and indicated on plans at no additional costs to Owner.
- E. In the event of conflict between these requirements and pollution control laws, rules and regulations of the federal, state or local agencies, the more restrictive laws, rules, or regulations shall apply.

3.2 INSTALLATION LOCATION OF COMPOST FILTER SOCK, BALED HAY AND SILT FENCES

- A. During the construction phase, baled hay will be placed and maintained around all catch basins. Compost filter sock and/or silt fences will be installed prior to clearing and grubbing. Silt and debris will be removed from catch basins and base of compost filter socks, silt fences and baled hay at end of construction. The use of silt baskets in catch basins shall be used.

3.3 SPECIAL INSTRUCTIONS

- A. Compost filter socks, silt fence and/or baled hay shall be inspected during storm events, after each rainfall of one-inch magnitude or greater, prior to weekends, and prior to any forecasted storm events. Weekly inspection reports by the Contractor shall be submitted to the A/E by the Contractor.
- B. Damage to compost filter sock, silt fence or hay bales shall be repaired immediately upon discovery and not more than 4 hours from time of observed damage.
- C. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the A/E, such work shall be performed by the Contractor at his own expense.
- D. It is also the Contractor's responsibility to maintain the placement of compost filter sock, hay bales and silt fences.
- E. Contractor shall also be required to install and maintain temporary erosion control measures within a time frame agreeable to the A/E.
- F. Temporary pollution control may include construction work outside the project limits where such work is necessary as a result of utility installations and equipment storage sites.
- G. The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor.
- H. Contractor is responsible for all dewatering and erosion control.

END OF SECTION 31 3205

SECTION 31 3700 – RIPRAP

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda.

1.2 DESCRIPTION OF WORK

- A. This work shall consist of the furnishing and placing of riprap consisting of sound, durable, angular shaped stones placed on prepared bedding and in conformity with these specifications and the lines, grades, thickness and typical details shown on the drawings.
- B. The location of the riprap shall be as shown on the drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The riprap shall be in accordance with the latest revision of the Rhode Island Department of Transportation, Standard Specifications for Rhode Island Bridge Construction, Section M.10.03 RIPRAP.
- B. Bedding for riprap shall conform to quality requirements of Section M.10.03.1 of the before mentioned Standard Specifications.
- C. The stone for riprap shall conform to Section M.10.03.2 of the Standard Specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The riprap shall be installed in accordance with the Standard Specifications Section 920.03 Construction Methods.

END OF SECTION 31 3700

**SECTION 31 3719 - GROUTED BOULDERS, STACKED GROUTED BOULDERS,
AND GROUTED BOULDER RETAINING WALLS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This WORK shall consist of installing grouted boulders, stacked grouted boulders, and grouted rock retaining walls constructed at the location (s) shown on the DRAWINGS.

1.2 RELATED SECTIONS

- A. The following is a list of SPECIFICATIONS which may be related to this section:
1. Section 31 2300, Excavation and Fill.
 2. Section 31 2319, Dewatering.
 3. Section 31 2333, Trenching and Backfilling.
 4. Section 31 3700, Riprap

1.3 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. T85, Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate.
 - b. T103, Standard Method of Test for Soundness of Aggregates by Freezing and Thawing.
 - c. T104, Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
 2. ASTM International (ASTM):
 - a. C39, Standard Test Method for Compressive Cylindrical Concrete Specimens.

- b. C150, Standard Specification for Portland Cement.
- c. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).

1.4 DEFINITIONS

- A. Terms “boulders,” and “rock,” may be used interchangeably in this section.

1.5 SUBMITTALS

- A. CONTRACTOR shall submit a mix design in writing to ENGINEER for approval prior to placement of any grout.
- B. CONTRACTOR shall cooperate with ENGINEER in obtaining and providing samples of all specified materials.
- C. CONTRACTOR shall submit certified laboratory test certificates for all items required in this section.

1.6 QUALITY ASSURANCE

- A. Mock-up:
 - 1. Prior to the construction of any grouted rock walls, CONTRACTOR or SUBCONTRACTOR who is constructing the walls for CONTRACTOR shall show ENGINEER an example of similar rock walls that they had constructed previously.
 - 2. After acceptance of this previous WORK, CONTRACTOR or SUBCONTRACTOR shall construct approximately one hundred (100) square feet of grouted rock wall as shown on the DRAWINGS for approval by ENGINEER.
 - 3. If the construction is approved, CONTRACTOR or SUBCONTRACTOR shall construct the rest of the grouted rock wall. If the construction is not approved, CONTRACTOR shall make any changes required by OWNER and ENGINEER to obtain approval and construct the remainder of the wall as approved.

PART 2 PRODUCTS

2.1 MATERIALS

A. Boulders

1. Boulders shall meet the requirements of Section 313700 Riprap.
2. Rhyolite rock shall not be used for any grouted boulders.
3. Gradation:
 - a. Each load of boulders shall conform to the dimensions specified on the DRAWINGS and in Section 31 37 00 Riprap, Boulders, Soil Riprap, and Bedding
 - b. Boulders for a boulder edge shall have a maximum ratio of largest to smallest rock dimension shall be 1.5 or as shown on the DRAWINGS. Grouted walls shall be constructed of rock having a mean diameter of nine (9) inches to eighteen (18) inches.
 - c. Control of gradation will be by visual inspection.
 1. In the event ENGINEER determines the boulders to be unacceptable, ENGINEER will pick two random truckloads to be dumped and checked for gradation.
 2. Mechanical equipment and labor needed to assist in checking gradation shall be provided by CONTRACTOR at no additional cost to OWNER if the boulders do not meet the specified gradation.
 3. If the boulders do meet the gradation specified, OWNER will pay for the equipment and labor required for checking.
4. Color:
 - a. The color of boulders shall meet the requirements of Section 313700, Riprap, Boulders, Soil Riprap, and Bedding.

B. Grout:

1. Concrete for the grout shall be an approved batch meeting the following requirements:
 - a. All grout shall have a minimum 28-day compressive strength equal to 3,200 psi.
 - b. One cubic yard of grout shall contain a minimum of six (6) sacks of Type II Portland cement.
 - c. A maximum of 25% Type F Fly Ash may be substituted for the Portland cement.
 - d. Aggregate for the grout shall consist of 70% natural sand (fines) and 30% 3/8-inch rock (coarse).
 - e. Slump shall be four (4) inches to six (6) inches.

- f. Air entrainment shall be 5.5% - 7.5%.
- g. Grout shall contain one and one-half (1-1/2) pounds of Fibermesh, or approved equivalent, per cubic yard of grout.
- h. Grout shall contain one and one-half (1-1/2) pounds of Fiber mesh, or approved equivalent, per cubic yard of grout.
- i. Color Additive in required amounts shall be used when so specified by contract.

PART 3 EXECUTION

3.1 GROUTED BOULDERS AND STACKED GROUTED BOULDERS

- A. Grouted boulders shall be placed at the locations as shown on the DRAWINGS and installed with the following requirements:
 - 1. Subgrade:
 - a. The subgrade to receive each boulder shall be excavated and any unstable material shall be removed.
 - b. Grouted Boulders shall be placed on subgrade without granular bedding unless approved by ENGINEER.
 - c. Material approved by ENGINEER shall be placed and compacted in a maximum of four-inch (4") lifts to ninety five percent (95%) of Maximum Standard Proctor Density (ASTM D698) to re-establish the subgrade of each boulder.
 - d. Unstable material shall be removed from the PROJECT site and disposed of by CONTRACTOR. Removal and replacement of unstable material shall only be completed at the direction of ENGINEER and shall be paid for under Muck Excavation.
 - e. Subgrade shall be excavated a minimum of 6" to a maximum of 12" behind boulders.
 - f. Backfill behind boulders shall be compacted to ninety five percent (95%) Maximum Standard Proctor Density (ASTM D698). Care shall be taken during compaction to avoid disturbing and/or damaging the integrity of the boulder channel edge.
 - g. Finished grades and subgrade for boulders shall be determined from the height of each boulder used.

2. Boulders

- a. The top of all boulders shall be as indicated on the DRAWINGS.
- b. The boulders shall be carefully picked and arranged so that adjacent rock surfaces match within two (2) inches in top elevation and two (2) inches along the vertical exposed face or channel side of rock.
- c. Boulders shall be placed such that adjacent boulders “touch” each other and voids do not exceed four (4) inches. It is the intent of construction to minimize voids and grout placed between boulders.
- d. CONTRACTOR shall, if deemed necessary, support the boulders from falling over before and during the placement of grout, backfill, and completing compaction WORK on either side of the boulder.
- e. Smaller rocks shall be “chinked in” to fill all voids behind the boulders. Smaller rocks shall also be used to “chink in gaps larger than four (4) inches. Placement shall be approved by ENGINEER prior to grouting.

3. Grouting:

- a. Prior to placing the grout, any type of debris, fines, smaller rock, or silt shall be removed from around or under and on the boulders.
- b. Dewatering shall be implemented to guarantee that the grout will not be placed in water and for a period of twenty-four (24) hours after the grout has been placed.
- c. Keep boulders receiving grout wet at all times prior to receiving grout.
- d. The concrete grout shall be placed by injection methods by pumping under low pressure, through a two- (2") inch maximum diameter hose to ensure complete penetration of the grout into the void area as detailed on the DRAWINGS. The grout mix shall be stiffened and other measures taken to retain the grout between the boulders.
- e. Grout placement shall begin at the bottom of the lowest boulder and proceed upward to ensure no air voids exist between the grout, sub-base, and boulders.
- f. Grout shall be placed up to a height of one-half (1/2) of the diameter of the top row of boulders or as directed by ENGINEER and shall be placed in the voids and behind the boulders and not on the surface of the rocks.
- g. A “pencil” vibrator shall be used to make sure all voids are filled between the boulders from the subgrade and around the boulders to a depth as shown on the DRAWINGS. The “pencil” vibrator may be used to smooth the appearance of the surface, but CONTRACTOR shall use a wood float to smooth and grade the grout around the boulders.

- h. Grout between boulders shall be recessed one third (1/3) the diameter of the boulders on the side facing the channel.
- i. Grout should be troweled out and finished to minimize visibility.
- j. Clean and wash any spillage before the grout sets so the visual surfaces of boulders will be free of grout to provide a clean, natural appearance, or if washing does not clean off grout residue, CONTRACTOR shall wash off any grout residue with muriatic acid and water, using a brush to scrub off the residue.
- k. Grout shall receive cold or hot weather protection in accordance with Section 33000, Cast-in-Place Concrete.

3.2 GROUTED BOULDER RETAINING WALLS

- A. Grouted boulder retaining walls shall be placed at locations as shown on the DRAWINGS and installed with the following requirements:
 - 1. The grouted boulder walls shall be constructed to the dimensions shown on the DRAWINGS and shall be constructed with a one (1) horizontal to four (4) vertical batter on the front and back face, with a minimum width of one (1) foot at the top of the wall.
 - 2. The stone of the wall shall be laid to form substantial masonry presenting a neat, finished appearance.
 - 3. Headers shall hold the heart of the wall to the face and shall occupy at least twenty percent (20%) of the area and they shall be evenly distributed.
 - 4. The length of stretchers shall not exceed three (3) times their rise.
 - 5. Spalls and pinnars shall be used in the backing only where necessary and will not be allowed in the face.
 - 6. Face Stones:
 - a. Face stones shall be laid to break joints so that each rock laid rests on two beneath it.
 - b. Rock shall be hand graded so that only the larger stones are used in the face.
 - c. All face stones shall be pitched to a string line on straight walls or laid to batter stakes for curved walls such that the batter is consistent with respect to all parts of the wall and shall meet the minimum requirements set forth in the detail.
 - d. The degree of roughness on the exposed face shall be measured with a six-foot (6') straightedge supported between adjacent projections and stone face.

- e. Variations in excess of three (3) inches, measured from the straight edge to the extreme depression in the stone, will not be permitted.
- f. Rear faces shall present approximately plane surfaces and shall in general conform to the detail.

7. Grouting:

- a. Prior to placing the grout, any type of debris, fines, smaller rock, or silt shall be removed from around or under and on the boulders.
- b. Dewatering shall be implemented to guarantee that the grout will not be placed in water and the area will remain dewatered for a period of twenty-four (24) hours after the grout has been placed.
- c. The surface of the boulders receiving grout shall be wet at all times prior to receiving grout.
- d. Grout shall be placed to fill all voids between, under and the throughout the boulder walls and shall be recessed approximately one-third (1/3) the diameter of the boulders from the face of the wall in order to give a “dry stacked” appearance.
- e. A “pencil” vibrator shall be used to make sure all voids are filled between the boulders from the subgrade and around the boulders to a depth as shown on the DRAWINGS. The “pencil” vibrator may be used to smooth the appearance of the surface, but CONTRACTOR shall use a wood float to smooth and grade the grout around the boulders.
- f. Any “loose” rocks shall be regrouped by machine or hand methods.
- g. Clean and wash any spillage before the grout sets on the outside face and top of walls such that the visual surfaces of the rocks are free of grout to provide a clean natural appearance, or, if washing does not clean off grout residue, then CONTRACTOR shall wash off any grout residue with muriatic acid and water, using a brush to scrub off the residue.
- h. Grout shall receive cold or hot weather protection in accordance with Section 33000, Cast-in-Place Concrete.

END OF SECTION 31 3719

SECTION 31 4000 - SHORING AND BRACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda.

1.2 RELATED SECTIONS

- A. Section 31 2000 – Earthwork
- B. Section 31 2010 – Earthwork Utilities

1.3 SUMMARY

- A. Extent of shoring and bracing work includes, but is not limited to, the following:
 - 1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
 - 2. Maintenance of shoring and bracing.
 - 3. Removal of shoring and bracing, as required.
- B. Building excavation is specified in another Section 310000 - Earthwork.

1.4 SUBMITTALS

- A. Layout Drawings: Provide layout drawings for shoring and bracing system and other data prepared and sealed by a registered Professional Engineer licensed in the State of Rhode Island. System design and calculations must be acceptable to local authorities having jurisdiction and the A/E.

1.5 QUALITY ASSURANCE

- A. Supervision: Engage and assign supervision of shoring and bracing work to a qualified foundation consultant.

- B. Regulations: Comply with local codes and ordinances of governing authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Before starting work, check and verify governing dimensions and elevations. Survey condition of adjoining properties. Take photographs to record any prior settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.
- B. Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations. Locate datum level used to establish benchmark elevations sufficiently distant so as not to be affected by movement resulting from excavation operations.
- C. During excavation, resurvey benchmarks weekly, employing a licensed Land Surveyor licensed in the State of Rhode Island. Maintain accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags or other damage is evident.

1.7 EXISTING UTILITIES

- A. Protect existing active sewer, water, gas, electricity, steam and other utility services and structures.
- B. Notify municipal agencies or service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal and discontinuing of services, as affected by this work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide suitable shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.
 - 1. If wood is part of shoring system near existing structures, use pressure preservative treated materials or remove during placement of backfill.

PART 3 - EXECUTION

3.1 SHORING

- A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.
- B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.
- B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to A/E.
- C. Install internal bracing, if required, to prevent spreading or distortion to braced frames.
- D. Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- E. Remove sheeting, shoring and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
- F. Repair or replace, as acceptable to A/E, adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

END OF SECTION 31 4000

SECTION 32 1216 - ASPHALT PAVING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. RIDOT - State of Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, 2010.
- C. City of Providence Standard Technical Specifications for Streets and Roads, Traffic, and Streetscape Construction, current edition.

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt patching.
 - 2. Hot-mix asphalt paving.
- B. Related Requirements:
 - 1. Division 02 "Selective Demolition" for demolition and removal of existing asphalt pavement.
 - 2. Division 31 "Earthwork" for subgrade preparation, fill material, unbound-aggregate subbase and base courses.
 - 3. Division 32 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.
 - 4. Division 32 "Unit Paving" for bituminous setting bed for pavers.
 - 5. Division 32 "Pavement Markings."

1.3 DEFINITIONS

- A. RIDOT - State of Rhode Island Department of Transportation.

1.4 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of RIDOT - State of Rhode Island Department of Transportation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
 - 2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 - 3. Job-Mix Designs: For each job mix proposed for the Work.
- B. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Paving Fabric: 12 by 12 inches (300 by 300 mm) minimum.
- C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international graphics symbol, spaces dedicated to people with disabilities.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and testing agency.
- B. Material Certificates: For each paving material.
- C. Material Test Reports: For each paving material, by a qualified testing agency.
- D. Field quality-control reports.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by RIDOT.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of RIDOT for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- D. Asphalt-Paving Publication: Comply with AIMS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
- E. Flood Testing: At the discretion of the Landscape Architect, the Contractor shall flood test all asphalt pavement for proper drainage by flooding with water in ample quantities to demonstrate the correct shaping of the pavement.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Base Course: Comply with Section "Earthwork" for pavement base material.
- C. Subbase Course: Comply with Section "Earthwork" for pavement subbase material.
- D. Mineral Filler: Comply with RIDOT requirements.
- E. Reclaimed Asphalt Pavement: Comply with RIDOT requirements.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320, Comply with RIDOT requirements.
- B. Prime Coat: Asphalt emulsion prime to comply with RIDOT requirements.
- C. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

- D. Fog Seal: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- E. Water: Potable.
- F. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires asphalt shingles or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.
- B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.
- C. Sand: ASTM D 1073 or AASHTO M 29, Grade No. 2 or No. 3.
- D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- E. Joint Sealant: Comply with RIDOT requirements.

2.4 MIXES

- A. Recycled Content of Hot-Mix Asphalt: Postconsumer recycled content and preconsumer recycled content conforming with Comply with RIDOT requirements.
- B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by RIDOT and designed according to procedures for mix design for asphalt concrete and other hot-mix types; and complying with the following requirements:
 - 1. Provide mixes for pavement course and mixes with a history of satisfactory performance in geographical area where Project is located and comply with RIDOT requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
 - 2. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.
 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Base Course: Plus or minus 1/2 inch (13 mm).
 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 1. Base Course: 1/4 inch (6 mm).
 2. Surface Course: 1/8 inch (3 mm).
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.9 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
 - 1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to RIDOT requirements.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- F. Flood Testing: All asphalt pavements shall be flood tested for proper drainage by flooding with water in ample quantities to demonstrate the correct shaping of the pavement.
 - 1. Landscape Architect must be present to witness the flood tests. The Contractor shall notify the Landscape Architect a minimum of 3 working days prior to the flood testing.
 - 2. Flood test immediately after the asphalt is capable of handling traffic, but within 24 hours. If, after 20 minutes of drying time there are birdbaths evident, pavement with excessive ponding shall be repaired. Areas with ponding which have a water depth of 3/16 inch or more shall be corrected.
 - 3. Repair: Any areas requiring correction by means of remedial overlay shall be prepared by grinding the pertinent areas and placement of fine asphalt concrete patch mix over a tack coat. No cold tar patching, skin patching or sand mix patching will be acceptable.

- G. Replace and compact hot-mix asphalt where core tests were taken.
- H. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 32 1216

SECTION 32 1373 – CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. RIDOT - State of Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, 2010.
- C. City of Providence Standard Technical Specifications for Streets and Roads, Traffic, and Streetscape Construction, current edition.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Expansion and contraction joints within cement concrete pavement.
 - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections include the following:
 - 1. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
 - 2. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. Qualification Data: For Installer and testing agency.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products prior to commencement of the Work.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 for testing indicated, as documented according to ASTM E 548.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 4.4 deg C.
 - 3. When joint substrates are wet or covered with frost.
 - 4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 COLD-APPLIED JOINT SEALANTS

- A. General: Pavement sealants shall be a polyurethane based complying with ASTM C-920, Type S (single component), or Type M (multicomponent), Use group T (traffic) or NT (non-traffic), Class 35 (minimum) and the following. Any sealants used shall be recommended for the specific use by the manufacturer. Sealant and backer-rod materials shall be compatible as noted by the manufacturers submitted.
 - 1. Horizontal joints in areas of vehicular traffic shall comply with: ASTM C-920, Grade P (pourable or self-leveling) Use T. Color Grey.
 - 2. Horizontal joints in areas of pedestrian, or light vehicular traffic shall comply with ASTM C-920, Grade NS (non-sag), use T or NT. Submitted product shall be available in a minimum of 7 standard colors.
 - 3. Vertical Joints: Shall comply with ASTM C-920, Grade NS (non-sag), use T or NT. Submitted product shall be available in a minimum of 7 standard colors.
- B. Typical Manufacturers (non exclusive):
 - 1. BASF.
 - 2. Bostik.
 - 3. Pecora.
 - 4. Sika.
 - 5. Tremco.
 - 6. W. R. Meadows.

2.4 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform

beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for sealants in areas of vehicular traffic per manufacturers recommended recess depth and at locations indicated.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 32 1373

SECTION 32 1613 – CONCRETE CURB

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Precast concrete curbing and accessories.
- B. Excavation, preparation of subgrade, installation, and backfilling.

1.2 RELATED SECTIONS

- A. Section 033001 - Concrete.

1.3 REFERENCES

- A. ASTM C150 - Portland Cement.
- B. ASTM C260 - Air-Entraining Admixtures for Concrete.
- C. ASTM C330 - Lightweight Aggregates for Structural Concrete.
- D. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- E. ASTM C33 - Concrete Aggregates.
- F. State Standards: Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda.
- G. RIDOT Standard Details, July 31, 2009, with latest revisions.

1.4 QUALITY ASSURANCE

- A. Provide one person thoroughly trained and experienced in the skills required, familiar with the design and application of work of this Section, present during progress of the work of this Section and directing work performed under this Section.

1.5 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Indicate unit configuration, reinforcing, and dimensions.

1.6 COORDINATION

- A. Coordinate work under provisions of Section 013100.
- B. Coordinate the work with pavement placement.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products under provisions of Division 01.
- B. Protect concrete curbing materials before, during and after installation and protect the installed work and materials of other trades.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete Curbing: Curbing shall conform to Section 906 the Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda.

2.2 FABRICATION

- A. Form precast concrete curbing in accordance with State Standards.
- B. Forms: Metal, surfaces clean cut, free from blow holes or pitted areas. Do not pour concrete when ambient temperature is below 45 degrees F at the mixing site.
- C. Precast curbing shall be subject to inspection at point of manufacture and on the project, and units showing defects or damage before completion of the project shall be removed and replaced at no additional cost to the Owner.
- D. Cast straight curb in lengths not to exceed 6 feet (1800 mm). Radius curb shall be cast to the radius designated on the Drawings.
- E. Dowel units together with 5/8 inch (16 mm) by 4 inch (100 mm) dowels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify work of other trades is complete to the point where this installation may properly commence.

- B. Verify concrete curbing may be installed in accordance with the Drawings, applicable codes, regulations, and referenced standards.
- C. In the event of discrepancy, immediately notify the Architect.
- D. Do not proceed with installation in areas of discrepancy until discrepancies have been resolved.

3.2 PLACEMENT OF CONCRETE CURBING

- A. Concrete curbing and related backfilling shall be placed in accordance with the RIDOT Standards.
- B. Install units without damage to shape or finish. Replace or repair damaged units.
- C. Install units in alignment with adjacent work.

END OF SECTION 32 1613

SECTION 33 1000 – WATER SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda.

1.2 RELATED SECTIONS

- A. Section 31 1005 - Site Preparation
- B. Section 31 2000 - Earthwork
- C. Section 31 2010 - Earthwork Utilities

1.3 DESCRIPTION OF WORK

- A. The Contractor shall accept the premises as they stand and do everything necessary to complete the work in accordance with this contract. The Contractor shall obtain all permits necessary to complete the work. The work covered under these items includes the furnishing of all labor, equipment, and materials, and in performing all operations in connection with furnishing and installing water pipe, pipe fittings, valves, valve boxes, hydrants, water service connections, fire protection service connections, connections of existing and new piping, miscellaneous metal for strapping piping, underground line markers, accessories, miscellaneous and appurtenant work for providing construction of indicated and/or as directed, complete in place tested, disinfected and accepted, in accordance with the specifications, drawings and the requirements of the City of Providence and RIDEM.
- B. Piping for water mains, water services and appurtenances shall be of the types and materials specified. The pipe, fittings, valves, hydrants, specials, etc., accessories and appurtenances shall be new and unused. The interior of the pipe shall be thoroughly cleaned of all foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved methods. The full length of each section of piping shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells and joints. Any pipe that has the grade or joint disturbed after laying shall be taken up and relayed. Pipe shall not be placed in water, or when trench or weather conditions are unsuitable for the work, except by permission of the A/E. Water shall be kept out of the trench until the joints have been completed, or until caulking is completed. Any section of pipe found to be defective before or after laying shall be replaced by the Contractor with sound pipe, without additional expense to the Owner. All bends, tees and such other locations indicated or as directed shall be firmly blocked with concrete thrust blocks

of sizes and shape indicated and as directed, and strapped where required, to prevent the pipe, pipe fittings and appurtenances from being blown off the lines when under pressure. Where connections are made between new work and existing work the connections shall be made using the specials and fittings specified, as indicated, or as required. All connections between new work and existing work shall only be coordinated and installed in a manner acceptable to the Owner previously reviewed by the A/E. The locations of connection between new and existing work are shown on the drawings. The exact locations of connections of new work to existing work shall be as directed by the A/E. The Contractor shall make the necessary excavations as directed to uncover existing work for the purpose of determining the exact locations for all connections of new work to existing work.

- C. It is intended herein that the Contractor provide a water and fire protection supply distribution system satisfactory in every respect to the Owner and ready for operation.
- D. Refer to Division 33, Section "Utility Earthwork" for excavation and backfill required for water systems.
- E. Water services to the existing structures shall be maintained without interruption during the entire construction period. Coordinate this phase of construction with Plumbing Contractor, Fire Protection Contractor and any Authorities having jurisdiction.

1.4 SERVICE APPLICATION

- A. The Contractor shall be responsible for making and paying for service application for main supply, if required. The Contractor shall pay all fees and charges until completion of the contract.

1.5 SUBMITTALS

- A. Copies of all shop drawings and product data sheets required to establish compliance with those specifications shall be submitted to the A/E.
- B. Coordination drawings showing pipe sizes and valves, and specialty locations and elevations. Include details of underground structures, connections, anchors, and reaction backing. Show other piping and clearances from water system piping. Indicate interface and spatial relationship between piping and proximate structures.
- C. Record drawings at Project closeout of installed water system piping and products according to Division 01 Section 01 7700 "Closeout Procedures".
- D. Test reports specified in "Field Quality Control".

1.6 "DIG-SAFE" DAMAGE PREVENTION SYSTEM

- A. All Contractors or Subcontractors performing drilling, boring, augering, jetting, sheeting or pile installation, soil preloading for consolidation, demolition, excavation or like work shall, prior to commencement of these activities, contact utility companies having responsibility for under-

ground transmission systems for information relative to locations of existing underground utilities and/or an appropriate dig damage prevention and notification agency.

1.7 QUALITY ASSURANCE

- A. Comply with standards of authorities having jurisdiction for fire protection systems. Include materials, installation, and testing.
- B. Comply with standards of authorities having jurisdiction for potable water piping. Include materials, installation, testing, and disinfection.
- C. Comply with NFPA 24 "Standard for Installation of Private Fire Service Mains and Their Appurtenances" for materials, installations, tests, and flushing.
- D. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.
- E. Product Options: Water systems specialties and accessories are based on specific types, manufacturers, and models indicated. Components by other manufacturers will not be considered, unless noted otherwise.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, for shipping as follows:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends, flange faces, and weld ends.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. Storage: Use the following precautions for valves, including fire hydrants, during storage:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect valves from weather. Store valves indoors and maintain temperature than ambient dew point temperature. Support valves off ground or pavement in water tight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use hand wheels or stems as lifting or rigging points.
- D. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.9 PROJECT CONDITIONS

- A. Site Information: Reports on subsurface condition investigations made during the design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

PART 2 - PRODUCTS

2.1 IDENTIFICATION

- A. Underground-Type Line Markers for Metallic Pipelines: Manufacturer's standard permanent, bright colored, continuous-printed polyethylene tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide blue tape with black printing reading "**CAUTION WATER LINE BURIED BELOW**" as manufactured by Seton or equal.

2.2 PIPE AND PIPE FITTINGS

- A. Ductile-Iron Piping: Piping where noted on drawing shall be double cement lined ductile iron push on joint pipe, bitumen coated, Class Thickness No. 52 in accordance with ANSI Standard A21.50, A21.51 and AWWA C-151.
- B. Fittings: Fittings shall be ductile-iron, cement lined, compact, mechanical joint conforming to ANSI 21.10 and AWWA C-153.
 - 1. Cement lining for cast-iron fittings shall be batched and applied in accordance with AWWA specifications C104-64. Cement linings shall be double thickness not less than 1/8" for diameters 4" through 12".
 - 2. Mechanical joint fittings and adapters shall conform to ANSI A21.10 for diameters 4" to 12".
 - 3. The fittings shall be smooth and free from defects of every nature which would make them unfit for the use for which they are intended. No plugging or filling will be allowed.
 - 4. Fittings shall receive an exterior coating of hot bituminous asphalt paint.
- C. Couplings shall be furnished with corrosion-proof vinyl coating on middle ring and followers.
- D. Copper Piping: Service pipe shall be of seamless copper tubes suitable for use as underground water service connections conforming to ASTM Specification B-88-47, Type K and Federal Specification WW-T-799, Type K, including the latest revision thereof. The copper shall be de-oxidized with phosphorous and shall have a purity of at least 99.90 percent as determined by electrolytic assay, silver being counted as copper. Samples for chemical analysis shall consist of

clean drillings or milling taken from tubes selected for testing purposes. The tubes shall be sound and of uniform thickness throughout. They should be free from cracks, seams, slivers, scale and other surface defects. The manufacturer must guarantee to the Owner that the tubes furnished shall be of the best quality of material and of composition within the specified limits, and that each tube has been subjected to the specified hydrostatic pressure before leaving the shop.

1. Fittings: Fittings for service pipe shall be of the cast bronze, compression, flared tube type. Metal shall contain approximately 85% copper, 5% tin, 5% lead and 5% zinc. Threads shall be iron pipe size.

2.3 FLEXIBLE COUPLINGS

- A. Where flexible couplings are called for on the drawings, or use is directed by the A/E, they shall be Dresser, Skinner, Smith Blair or equal for Class 52 Ductile Iron Pipe. Coupling shall be furnished with corrosion-proof vinyl coating on middle ring and followers. Adapters shall conform to the manufacturer’s specifications.

2.4 STRAP RODS

- A. Where called for on the drawings or for purpose of anchoring pipe or fittings shall be 3/4" round steel or wrought iron. Clamps shall be not less than 2" wide and 3/8" round. Clamps and rods are to be protected against corrosion by heavy coat of bituminous asphalt varnish after final assembly. Where pipe or fittings will be exposed under normal conditions, joints shall be sufficiently restrained so as to prevent blow off of pipe or fittings or movement of same during normal use.

2.5 THRUST BLOCKS

- A. Concrete for thrust blocks shall be 4000 psi, in 28 days or higher if so indicated.
- B. Area of Bearing Surface for Concrete Thrust Blocks

Pipe Size in.	90° Bend or 1/4 Bend sq ft	45° Bend or 1/8 Bend sq ft	Tees, Hydrants, Caps, Plugs sq ft
2 - 4	2	2	2
6	5	3	4
8	8	5	6
10	13	7	9
12	18	10	13
14	25	14	18
16	32	18	23

Areas in this table were derived using 225 psi water pressure and 2000 lb/sq. ft. soil resistance. This is typical of sand and gravel with clay. For other soils, multiply the take valves by the following factors:

Soft clay	4	Sand and gravel cemented with clay	0.5
Sand	2	Shale, hardpan	0.4
Sand and gravel	1.3		

2.6 VALVES

- A. Resilient Seat Gate Valves: Gate valves for buried service shall be mechanical joint o-ring stem seals, manufactured in accordance with American Water Works Association Standard Specifications for Gate Valves for Ordinary Water Works Service, AWWA designation C-509 of latest revision, as manufactured by Mueller Co., A-2370-20, U.S. Pipe or approved equal. Gate valves shall be double disc, parallel seats, non-rising stem designed for 175 psi working pressure for valve diameters 12" or smaller.
- B. Tapping Valves: Tapping valves shall be mechanical joint, open right, vertical gate valves meeting the requirements of AWWA C500, as manufactured by Mueller H-667, U.S. Pipe or American Flow Control, or approved equal. The valves shall be double disc, parallel seat wedge design and design rated for 200 psi minimum working pressure. The valves shall be flanged inlet and mechanical joint outlet; inlet flange shall be ASA-125 lb. with protruding aligning lip to register with the counter bore of the tapping sleeve.
- C. Valve Boxes: Valve boxes shall be 5-1/4 - inch minimum diameter two piece, buffalo type, adjustable of the sliding type, round body, heavy pattern, with at least ten inches of overlap of top section over the other and with flanged top section. The castings shall be made of gray cast-iron, true to pattern and free from flaws. They shall be thoroughly coated with an asphaltum varnish, inside and out. The covers shall have the word "WATER" cast in the top. At the completion of the work valve boxes shall be set plumb and flush with the road surface.
- D. Valve Key: The Contractor shall furnish one standard valve operating key, and provide a suitable mounting bracket adjacent to the hydrant wrench in the maintenance room or in a location directed by the Owner.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Cutting Pavement: Excavations made on pavement shall be made in accordance with the details shown on the drawings and as specified in Division 33 – "UTILITIES EARTHWORK" Section.
- B. Trench Excavation: Trenches shall be excavated to lines and grades shown on the drawings and shall be as specified in Division 33 "UTILITY EARTHWORK" Section.

- C. Excavation Support System: The Contractor shall furnish, put in place, maintain and remove, as required and/or necessary for safe and proper construction, all excavation support systems which may be required to support the sides of the excavation, preventing damage to persons, adjacent property and structures.
- D. Pumping and Dewatering: The Contractor shall furnish all pumps, equipment, power and attendance to maintain and operate such pumping and dewatering systems consisting of any means and devices, including spare units in case of breakdown, which accomplish the removal and prompt disposal of all water entering the excavation. The pumping manner, method or both shall be sufficient such that the natural state of the soil is not significantly disturbed and that ground water is controlled at levels which will permit all work to be performed in dry conditions.
- E. Trench Backfill: Trenches and other excavations shall not be backfilled until all required inspections have been satisfactorily performed and until the work as installed conforms to other requirement specified in the several sections covering the installation of the work. Trenches and other excavations shall be backfilled as soon as practical. Backfill to subgrade or finish grade as indicated shall be made using trench excavated materials, unless the Contractor is otherwise directed by the A/E to use bank run gravel. Backfill shall be spread in layers not exceeding 8", each layer shall be dampened, thoroughly compacted by tamping or by other acceptable method to at least 95% of the maximum laboratory dry density determined in accordance with ASTM D 1557, Method D and shall contain no rock, stones or boulders larger than 6" in their greatest dimensions. The material shall be free from frozen material, clods of earth, brush or any other perishable or objectionable matter which would prevent proper consolidation or might cause subsequent settlement.

3.2 IDENTIFICATION MARKERS

- A. Install identification marker two (2) feet above top of pipe or in accordance with requirements of the State of Rhode Island.

3.3 INSPECTION

- A. All pipe, fittings, valves and hydrants shall be carefully inspected for defects immediately prior to placing in the trench.

3.4 INSTALLATION OF PIPE

- A. Each pipe shall be handed into the trench carefully and in a workmanlike manner. The Contractor shall furnish all slings and straps to permit satisfactory support of all parts of pipe when it is being handled. The Contractor shall take all necessary precautions to prevent movement of pipe in the event of the trench flooding. Any length of pipe broken or damaged due to mishandling or negligence on the part of the Contractor shall be replaced at no cost to the Owner.
- B. Ends of pipe shall be thoroughly cleaned before joint is made. The surface of the joint shall be painted with required lubricant applied in accordance with the manufacturer's direction. The lubricant shall be of type recommended by pipe manufacturer. Pipes shall be jointed in strict accordance with pipe manufacturer's directions and work shall be done by skilled workmen.

- C. No pipe or fittings shall be laid in water or on a frozen trench bottom or when, in the opinion of the A/E, the trench conditions or the weather are unsuitable for such work. All joints shall be checked by feeler ring gauge to insure proper positioning of rubber gaskets.
- D. Comply with requirements of NFPA 24 for materials and installation.
- E. Install ductile-iron pipe and ductile-iron fittings according to AWWA C600.
 - 1. Install polyethylene encasement according to AWWA C105 on ductile-iron pipe, ductile-iron fittings, and ferrous couplings where specified.
- F. Install copper tube and wrought-copper fittings according to CDA No. 404/0 "Copper Tube Handbook".

3.5 DUCTILE-IRON FITTINGS

- A. Ductile-iron fittings of the proper type shall be furnished and installed wherever shown on the drawings and as required by the A/E. All ductile-iron fittings shall be double cement lined.
- B. The bells of ductile-iron fittings shall be supported on wood blocks or skids to prevent settlement and resulting shear action to attached pipes. Wood blocks at fittings shall remain in place. At all plugged tees the plug shall be strapped to tee.
- C. Bends and tees shall be installed in the mains where shown on the contract drawings. Vertical bends where shown on the drawings shall be anchored in both directions with pipe-clamps and tie-rods. All other fittings shall be equipped with proper sized thrust blocks poured against undisturbed earth. The Contractor shall provide the necessary tie rods and clamps. Tie rods and clamps shall be as manufactured by the Grinnell Company, Inc. or approved equal.

3.6 PLACEMENT OF THRUST BLOCKS

- A. Thrust blocks shall be sized according to table on detail sheet of construction plans to prevent movement of the pipe and shall in all cases be poured against undisturbed earth. Where thrust blocks are in contact with the pipe, concrete shall be kept clear of pipe joints.
- B. Concrete thrust blocks shall be constructed at all underground ductile-iron fittings that result in a change of direction of pipe line.

3.7 INSTALLATION OF VALVES

- A. Valves shall be installed in the mains approximately where shown on the contract drawings. Each valve shall be equipped with a gate box set vertically with top even with finished grade.

3.8 DEFLECTION

- A. Wherever curves are negotiated by deflecting successive lengths of pipe the deflection of each length of pipe shall not exceed 3 degrees.

3.9 FIELD QUALITY CONTROL

A. Testing:

1. The pipe line shall be tested with potable water, both for strength and tightness as Specified below. The Contractor shall furnish all labor and equipment necessary for tests. Tests shall be made by sections, between main line valves, one section at a time. Water for testing will be available from the existing water system and will be furnished without charge. Water shall not be wasted.
2. Air shall be expelled by filling the main slowly and permitting air to escape at high points. Air bleeder shall be installed in location directed by the A/E.
3. The pipe shall be filled with water and kept full for a period of not less than twenty-four (24) hours preceding the test and until there is no leakage observable which the section under tests is subjected to system's normal static pressure. Normal static pressure shall be an average for the area.
4. Pressure shall be applied and maintained by means of a pressure pump and a by-pass on which a water meter and pressure gauge are mounted. Observations shall be made and metered water readings taken at varying pressures up to 175 lbs. per sq. in. Not less than 150 lbs. pressure shall be maintained for a period of one hour.
5. Any defective joints shall be immediately repaired, and any cracked or otherwise defective pipe shall be replaced by the Contractor and the test repeated. As soon as satisfactory "test for strength" has been obtained, the by-pass with water meter and pressure gage shall be left in service, and the section shall remain under a pressure of not less than 100 lbs. per square inch until the leakage in the entire section does not exceed thirty (30) gallons per day per mile of pipe per inch of nominal pipe diameter. In no case shall leakage tests be for less than four hours. Pipe sections under test shall be isolated from the existing system with plugs and blocking to avoid any cross connection during disinfection and testing.
6. In the event the leakage exceeds the above stated maximum allowable, the Contractor shall take such steps as are required and necessary, or as directed by the A/E, to reduce leakage to below the allowable maximum amount and shall replace any and all defective joints or piping and the test shall be repeated until the leakage requirements are complied with.
7. All visible leaks shall be repaired in any event.
8. The Contractor shall make all necessary arrangements for obtaining supply, furnish all pumps, piping, hose, installing corporation cocks if necessary, etc., and remove same, except corporation cocks, when work is completed. No separate payment will be made by the Owner to the Contractor for testing. All work shall conform to AWWA C600-65 or the latest revision thereof.

B. Flushing of Main:

1. After testing and prior to disinfection the main shall be well flushed through the hydrants.

C. Chlorination of Mains:

1. Before the system is put into service and generally at the time pipe is tested, the pipe and appurtenances shall be sanitized by introducing into the system a quantity of chlorine solu-

tion such as will result in a minimum residual chlorine content of 50 PPM of free chlorine in the water contained in the pipe being sterilized. The main shall be filled with water with chlorine being introduced gradually (care being taken to get all air out of the main), and allowed to stand for at least 24 hours. Just before the system or any part of system is placed in service, it shall be flushed out as may be necessary, until tests show that system or part thereof is reasonably free of objectionable bacteria, or excess chlorine content and suitable for carrying potable drinking water. All work shall conform to AWWA C-601-72 or the latest revision thereof.

2. After sanitizing the system or any part of the system is completed, an approved laboratory will take samples of water from the sterilized main and if tests of such samples are satisfactory main will be approved for use. In the event that such tests are not satisfactory, the main shall be re-sterilized to the extent that tests are approved. The cost of all tests required for approval shall be borne by the installation contractor.

END OF SECTION 33 1000

Section 33 3000 - SANITARY SEWERAGE SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda.

1.2 RELATED SECTIONS

- A. Section 31 2000 – Earthwork
- B. Section 31 1005 – Site Preparation
- C. Section 31 4000 – Shoring and Bracing
- D. Section 31 2010 – Earthwork Utilities

1.3 DESCRIPTION OF WORK

- A. The Contractor shall furnish all plant, labor, equipment, appliances and materials, and perform all operations in connection with construction of sanitary sewerage system at the locations and to the lines and grades indicated on contract drawings and/or as directed. The work includes pipe, pipe fittings and accessories, connections to structures, testing of piping, material tests, jointing and jointing materials, by-pass sewage handling, services of manufacturer's representatives, and all other related and appurtenant work, complete in place in accordance with contract drawings and specification, and/or as directed.
- B. Refer to Section 330000 "Earthwork Utilities" for the requirements for excavation, backfill, bedding, etc.

1.4 QUALITY ASSURANCE

- A. Installers Qualifications: Installer shall be a licensed drain layer with the State of Rhode Island and with at least 3 years of successful installation experience on projects with sanitary sewerage work similar to that required for project.

1.5 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for sanitary sewerage systems, showing the layout and dimensions in accordance with specifications.
- B. Record Drawings: At project closeout, submit record drawings of installed sanitary sewerage piping and products, in accordance with requirement of Division 1.

1.6 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall arrange for the delivery of the products at approved locations in the vicinity of that portion of the project in which the products are to be installed. To this end, he shall do such work as is necessary for access and for delivery of the products. All products shall be stored in an approved, orderly manner so that there will be a minimum of re-handling from the storage area to the final position in the trench and so that there is a minimum of obstruction and inconvenience to any kind of traffic. Deliveries shall be scheduled so that the progress of the work is at no time delayed and also so that large quantities of products shall not be stored for excessive lengths of time in crowded locations or in locations where large storage areas might be considered objectionable. Storage of products will be restricted to approved or permitted areas.
- B. Products shall not be stored on areas over the newly laid pipeline or other pipe lines which might be damaged by the superimposed load. Products may not be stored on private property unless permission to do so has been granted by the property Owner.

PART 2 - PRODUCTS

2.1 IDENTIFICATION

- A. Underground-Type Line Markers for Non-Metallic Pipelines: Manufacturer's standard permanent detection tape, bright-colored, continuous-printed polyethylene tape with a metallic core for easy detection of non-metallic underground installations, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green detection tape with black printing reading "CAUTION SEWER LINE BURIED BELOW" as manufactured by Seton or equal.

2.2 PIPE

- A. Polyvinyl Chloride Pipe (6"-15") and Fittings: Polyvinyl chloride (PVC) sewer pipe and fittings shall be in accordance with the latest issue of ASTM Specification 3044, SDR-35 and applicable documents. The PVC sewer pipe and fittings shall be composed of clean, virgin class 12454-B compounds and shall be bell and spigot with rubber ring joints. The bell shall consist of an integral wall section with a solid cross section rubber ring securely locked in place to prevent dislocation of the ring. Standard lengths shall be twenty (20) feet and 12.5 feet, plus or minus 1 inch. Minimum "pipe stiffness" at 5% deflection shall be 46 for all sizes when tested in accordance with ASTM Designation D 2412, external loading properties of plastic pipe by parallel-plate loading. All fittings and accessories shall be manufactured and furnished by the pipe

supplier and have bell and/or spigot configurations compatible with that of the pipe fittings and shall be of the same strength and quality as the pipe.

2.3 MANHOLES

- A. Precast Concrete Manholes: Manholes barrels, cone sections, bases and entrance slabs shall consist of precast reinforced concrete manufactured in accordance with ASTM Standard Specifications for "Reinforced Concrete Manhole Risers and Tops", Designation C 478 latest revision. The horizontal joints between sections shall be sealed using a flexible butyl resin sealant and shall conform to Federal Specifications SS-S-210A and AASHTO M-198B. In addition the horizontal joints on the inside and outside of manhole shall be sealed with a "Quick Plug" as manufactured by Parson or equal.
- B. Drop Manholes: Drop piping shall be in accordance with details shown on contract drawings. The concrete encasement for the drop piping shall be 3000 psi. Forms shall be used for the concrete encasement. The manhole shall be as specified for either cast-in-place or precast concrete manholes.
- C. Pipe Connectors: Resilient complying with ASTM C 923. For pipes, the pipe connectors shall be Kor-N-Seal.
- D. Manhole Steps: Manhole steps shall be of safety type and shall be cast into the units during process of manufacture. Steps shall be polypropylene or aluminum forgings alloy 6016, Temper T-6 and those parts which are embedded in the concrete shall be thoroughly cleaned and given a heavy coating of zinc chromate or other approved paint.
- E. Frame and Covers: Manhole frames and covers shall be of tough gray cast iron, true to pattern and free from flaws. The bearing surfaces of the covers and frames shall be machined so as to give continuous contact throughout their circumference. The design on the cover top shall be the diamond with "sewer" lettering and the year of installation cast into the top surface. Before delivery, the frames and covers shall be thoroughly cleaned and coated with hot coal tar.
- F. Brick: Brick shall be Grade SS, ASTM Designation C 32. All brick shall be uniform and regular in shape and size.
- G. Mortar: Type II cement shall be used, unless otherwise authorized in writing. Sand shall be well graded and with no grain larger than will pass a No. 8 sieve. Hydrated lime shall be Type S conforming to the ASTM Standard Specification for Hydrated Lime for Masonry Purposes, Designation C207-79. The mortar shall be composed of Portland Cement, hydrated lime, sand and water in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The portions of cement and lime may vary from 1:1/4 for dense hard burned brick to 1:3/4 for softer brick. In general, mortar for Grade SS brick shall be mixed in the proportions of 1:1/2:4 1/2.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

- A. Dig-Safe Damage Prevention System: All Contractors or Subcontractors performing drilling, boring, augering, jetting, sheeting or pile installation, demolition, excavation or like work shall, prior to commencement of these activities, contact utility companies having responsibility for underground transmission systems for information relative to locations of existing underground utilities and/or an appropriate dig safe damage prevention and notification agency.
- B. Protection of Water and Drain Lines:
 - 1. Horizontal Separations: If during construction of the sanitary sewer line the existing or proposed water main line is exposed in the sewer trench and the sewer line is closer than 10 feet from the water main, the sewer line shall be sleeved.
 - 2. Vertical Separation: Whenever the sewers cross under the water mains, the vertical separation of the top of the sewer shall be at least 18 inches below the bottom of the water main. When this vertical separation does not exist, the sewer line shall either be encased in concrete, constructed of Class 52 ductile iron mechanical joint pipe or be sleeved for a distance of 10 feet on each side of water main.

3.2 IDENTIFICATION MARKERS

- A. The line markers shall be installed two feet above the top of the buried pipeline.

3.3 INSPECTION

- A. All sanitary sewerage system products shall be subject to inspection and approval by the Engineer at the place of manufacture and/or at the site after delivery. The products shall be subject to rejection at any time due to failure to conform to the specifications. Rejected products shall be removed from the site immediately. All the products shall be carefully examined for defects, and if any are found to be broken or defective, prior to or after being placed, they shall be removed and replaced by the Contractor without any further compensation.

3.4 PRODUCT HANDLING

- A. Each product shall be handled into its position in the trench in such a manner and by such means as the manufacturer recommends as satisfactory, and these operations will be restricted to those considered safe for the workmen and such as to cause no injury to the product or any property.
- B. The Contractor will be required to furnish slings, straps and/or other devices to provide satisfactory support of the pipe when it is lifted. Transportation from delivery areas to the trench shall be restricted to operations which can cause no injury to the product. The products shall not be dropped from trucks or into the trench.

- C. The Contractor shall have on the job-site with each crew, all the proper tools to handle the products being installed. The use of hammer and chisel, or any other method which results in rough edges, chips and damages, shall be prohibited.

3.5 CONTROL OF ALIGNMENT AND GRADE

- A. All work shall be constructed in strict accordance with the lines and grades shown on the contract drawings and the Contractor shall be held fully responsible for keeping correct alignment and grade.
- B. All lines, grades, measurements, layout staking and reference staking necessary for the proper location and satisfactory completion of the pipeline, appurtenances and other construction, shall be the responsibility of the Contractor.
- C. All stakes, references and batter boards including original, additional or replacement which may be required for the construction operations, shall be furnished, set and properly referenced by the Contractor. The Contractor shall be solely and completely responsible for the accuracy of the line and grade of all features of the work. Any errors or apparent discrepancies found in previous surveys, plans, specifications or special provisions shall be called to the Engineer's attention by the Contractor for correction or interpretation prior to proceeding with the work.
- D. Upon request of the Engineer, the Contractor shall furnish copies of all data used in setting and referencing all stakes and other layouts markings used by the Contractor.
- E. All staking shall be performed by qualified engineering or surveying personnel who are trained, experienced and skilled in construction layout and staking of the type required under the contract and who are acceptable to the Engineer. The personnel shall perform this staking under the direct supervision of a land surveyor registered with the State of Rhode Island.
- F. The Contractor shall use a laser beam to assist in setting the pipe, provided he can demonstrate satisfactory skill in its use.
- G. The use of string levels, hand levels, carpenters' levels or relatively crude devices for transferring grade or setting pipe will not be permitted.
- H. During construction, the Contractor shall provide the Engineer, at his request, all reasonable and necessary materials, opportunities and assistance for checking the control of the work, as established by the Contractor. The Contractor will be informed of the results of these checks, but the Engineer by so doing, in no way relieves the Contractor of his responsibility for the accuracy of the layout work. The Contractor shall, at his expense, correct or replace as required, any deficient layout and construction work which may be the result of inaccuracies in his staking operations or of his failure to report inaccuracies found in work done by the Engineer or by others. If, as a result of these accuracies, the Engineer is required to make further studies, redesign, or both, all expenses incurred by the Engineer due to such inaccuracies will be deducted from any monies due to the Contractor.

- I. The Contractor's field survey notes shall be kept neat, orderly and in conformance with accepted practice. Copies of all field survey books and notes shall be made available to the Engineer upon request.
- J. The Contractor shall carefully preserve bench marks, reference points and stakes, and in case of willful or careless destruction, by his own men, he will be charged with the resulting expense and shall be responsible for any mistakes or delay that may be caused by their unnecessary loss or disturbance.

3.6 INSTALLATION OF PIPE

- A. Each pipe length shall be inspected for cracks, defects in coating or lining, and any other evidences of unsuitability. Before lowering in place, the pipe shall be struck with a suitable tool to verify its soundness.
- B. Pipe shall be laid in the dry and at no time shall water in the trench be permitted to flow into the sewer.
- C. The pipe shall then be laid on the trench bedding as shown on the standard trench section, and the spigot pushed home. Jointing shall be in accordance with the manufacturer's instructions and appropriate ASTM standards, and the Contractor shall have on hand for each pipe-laying crew, the necessary tools, gauges, pipe cutters, etc., necessary to install the pipe in a workmanlike manner. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow.
- D. Blocking under the pipe will not be permitted except where a concrete cradle is proposed, in which case precast concrete blocks shall be used.
- E. After the pipe has been set to grade, additional bedding material shall be placed in 6-inch layers up to the spring line of the pipe. Tamping bars shall be carefully employed to assure compaction of the bedding under the lower quadrants of the pipe for the full width of trench excavation.
- F. After this, the gravel borrow shall be carefully placed in maximum 6-inch layers to a depth of 6 inches over the crown of the pipe. Each layer shall be thoroughly compacted with mechanical equipment. Extra care shall be taken that the equipment does not damage the pipe.
- G. At this point, the pipe shall be checked for line and grade and any debris, tools, etc., shall be removed.
- H. If inspection of the pipe is satisfactory, the Contractor may then refill or backfill the remainder of the trench in accordance with Section 330000 "Earthwork Utilities", and in accordance with the details shown on the drawings.
- I. If a trench box is being used and the trench box is below the spring line of the pipe, the trench box shall be lifted vertically and the stone bedding shall be thoroughly compacted to the trench wall. The trench box shall not be pulled horizontally along the trench.

- J. At any time that work is not in progress, the end of the pipe shall be suitably closed to prevent the entry of animals, earth, etc.
- K. At the end of each day's work or at intervals of no more than 200 feet of pipe, the Engineer, with the Contractor, will inspect the pipe for alignment. Unsatisfactory work shall be dug up and re-installed to the satisfaction of the Engineer.

3.7 EXISTING MANHOLE CONNECTIONS

- A. Where required for connections, openings shall be cut in the manholes at the proper location and shall be sealed watertight.
- B. The inverts of all newly connected manholes shall be reconstructed of brick and mortar and formed to accommodate the new sewer connections.
- C. Bricks shall be laid in a workmanlike manner, true to line and the joints shall be carefully struck and pointed on the inside. Bricks shall be thoroughly wet when laid and each brick shall be laid in mortar so as to form full bed, end and side joints in one operation. The outside of the brickwork shall be neatly plastered with 1/2" layer of cement mortar as the work progresses. The brickwork shall be satisfactorily bonded to the concrete. No brick masonry shall be laid in water, or any water allowed to rise on the brickwork until the masonry has set.

3.8 BY-PASS SEWAGE HANDLING

- A. As the construction of the new sewer progresses and it becomes necessary to interrupt live sewage flow in the existing sanitary sewer, the Contractor shall be required to divert such flows around the area of interruption at no additional cost.
- B. The existing sewage flow rate shall be continually maintained and no loss of sewer service up or downstream of the interruption shall occur. The Contractor shall utilize quality materials and equipment in good repair in meeting the requirements of this special provision and all damages resulting from interruptions in the functioning of the by-pass sewage handling system shall be borne totally by the Contractor. The Contractor shall complete the adjacent construction in a timely fashion to minimize the duration of by-pass sewage handling required. Existing sewage flows shall be diverted and maintained until the new sewer construction is leakage tested and accepted for service by the Engineer.

3.9 TESTING GRAVITY SEWERS

- A. General: Acceptance of the testing method will be made by the Engineer with due consideration for surface conditions, size and type of pipe. The Contractor shall have the proper plugs, weirs, and other equipment required to perform all tests as required by the Engineer. Testing of each section of sewer installed shall include the portions of service connections that are to be installed under the contract. The Contractor shall test

each section of pipeline as soon as possible, and there shall not be more than 500 feet of untested pipeline in the ground.

- B. Joint Testing: The Contractor shall test each pipe joint with low pressure air with approved apparatus. The pressure shall be maintained at 3.5 psi for a period of 30 seconds with no drop of pressure. If the pressure drops the Contractor shall make the necessary repairs as approved by the Engineer and retest the joint at no additional compensation.
- C. Low Pressure Air Test:
1. After completing backfill of the pipeline, the Contractor shall, at his expense, conduct a line acceptance test using low pressure air. The test shall be performed according to stated procedures and in the presence of the Engineer. The line shall be flushed and cleaned prior to testing.
 2. All pneumatic plugs shall be seal tested before being used in the actual test installation. One (1) length of pipe shall be laid on ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
 3. After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.
 4. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "acceptable". If the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that may be over the pipe) shall not be less than 4 minutes.
 5. If the installation fails the air test, the Contractor shall, at his expense, determine the source of leakage. He shall then repair or replace all defective materials and/or workmanship to Engineers satisfaction and the pipeline shall be retested, all performed at no additional compensation to the Contractor.

3.10 TESTING OF MANHOLES

- A. General: Tests shall be made, and observed by the Engineer on each manhole, at the option of the Engineer and/or field conditions the manhole test shall either be an infiltration test or a vacuum test.
- B. Infiltration Test Before or After Backfilling: If the groundwater table is above the highest joint in the manhole, and if there is no visible leakage into the manhole, the manhole may be considered as watertight. If there is leakage the Contractor shall make the necessary repairs to the satisfaction of Engineer and retested all at no additional compensation. If repairs cannot be made, the Contractor shall remove the manhole and install a new manhole and retest at no additional compensation.

- C. Vacuum Test Before Backfilling: Install vacuum tester and inflate compression band to effect a seal between the vacuum base and the manhole, connect vacuum pump to the outlet part with the valve open, draw a vacuum of 10 inches of mercury (HG), and close the valve. The manhole shall pass the test if the vacuum remains at 10 inches of HG or drops to 9 inch of HG in a time greater than 60 seconds for a 48-inch diameter manhole. If the manhole fails the initial test, the Contractor shall make proper repairs or replace the manhole and retest at no additional compensation.

END OF SECTION 33 3000

SECTION 33 3010 – SEPTIC SYSTEMS/ONSITE WASTEWATER TREATMENT SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 01 – General Requirements, apply to this Section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, 2004 Edition with latest addenda.
- C. Rhode Island Department of Environmental Management - *Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment Systems*, (250-RICR-150-10-6).

1.2 RELATED SECTIONS

- A. Division 01 – General Requirements.
- B. Section 31 1005 - Site Preparation
- C. Section 31 2000 - Earthwork
- D. Section 31 2010 – Earthwork Utilities
- E. Section 31 2319 – Dewatering
- F. Section 31 4000 – Shoring and Bracing
- G. Section 33 3000 - Sanitary Sewerage Systems / Appendix A

1.3 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with storm drainage work similar to that required for project and be a licensed Onsite Wastewater Treatment System Installer with the State of Rhode Island, Department of Environmental Management.
- B. Codes and Standards:
 - 1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm drainage system's materials and products.

2. Environmental Compliance: Comply with applicable portions of RIDEM regulations pertaining to sanitary sewer and storm drainage systems.
3. Department of Environmental Management, Office of Water Resources Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment Systems, (250-RICR-150-10-6).

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for septic systems materials and products.
- B. Record Drawings: At project closeout, submit record drawings of installed sewage system and products, in accordance with requirements of Division 01.

PART 2 - PRODUCTS

2.1 IDENTIFICATION

- A. Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "**CAUTION DRAINAGE LINE BURIED BELOW**".
 1. Manufacturer: Subject to compliance with requirements, provide identification markers of one of the following:
 - a. Allen Systems Inc.
 - b. Emed Co., Inc.
 - c. Seton Name Plate Corp.

2.2 PRODUCTS

- A. Sewer pipe fittings:
 1. PVC Sewer Pipe and Fittings as specified on the Drawings.
- B. Precast Concrete Tanks and Structures:
 1. Precast reinforced concrete with bituminous waterproof coating as specified on the Drawings. Tanks to be designed for vehicular H₂O loading and to be of sufficient weight to prevent floating when groundwater is present.
 2. Manufacturer to supply certification of water tightness with precast product and Vendor to supply Engineer with certification.

C. Filter:

1. Zabel A300 12X28 or approved equal.

D. Sand, Bottomless Sand Filter Media and Septic Gravel

1. All imported granular fill as specified on the Drawings shall comply with Section 312000 Earthwork and/or as required by RIDEM Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment Systems.
2. Vendor to coordinate sample delivery and testing of all fill materials prior to delivery and installation. Engineer reserve the right to obtain a sample of fill material upon installation for testing. Fill material will need to be removed and replaced if testing results indicate non compliance with RIDEM Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment Systems.
3. All Bottomless Sand Filter Media must conform to specifications indicated on the plans.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions, RIDEM Regulations, RIDEM approved plans and approval submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.
- B. Test systems for proper operation and adjust precast concrete structures, treatment components, pumps, piping and other components as may be required. Prior to final acceptance, clean out systems and protect work from damage.
- C. Coordinate all phases of the onsite wastewater treatment system with design engineer, RIDEM and treatment system manufacturer.

END OF SECTION 33 3010

SECTION 33 4100 - STORM DRAINAGE SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 01 – General Requirements, apply to this Section.
- B. Rhode Island Department of Transportation – *Standard Specifications for Road and Bridge Construction*, Latest Edition with latest addenda.

1.2 RELATED SECTIONS

- A. Extent of storm drainage system work is indicated on the contract drawings, and by the requirements of this section.

1.3 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with storm drainage work similar to that required for project and be a licensed drain layer with the State of Rhode Island.

PART 2 - PRODUCTS

2.1 PIPES AND PIPE FITTINGS

- A. General: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.
- B. Reinforced Concrete Pipe: ASTM C 76, Class III unless otherwise indicated.
 - 1. Fittings: Reinforced concrete, same strength as adjoining pipe, tongue-and-groove gasketed joints complying with ASTM C 443.
- C. High Density Polyethylene Pipe (HDPE): AASHTO M252/M294 Type S.
 - 1. Fittings: HDPE, AASHTO M252/M294 Type S.
 - 2. Couplers: Join pipe with couplers to provide soil-tight joints, and where necessary, provide gaskets in fine sand or silt conditions.

2.2 FILTER FABRIC

- A. Filter Fabric shall be Mirafi S800 or RS380i as indicated on the plans.

2.3 FILTER STONE

- A. Filter Stone shall conform to the requirements of RIDOT Standard M.01.07.
- B. Filter Stone shall be washed at least twice and contain little to no fines.

PART 3 - EXECUTION

3.1 INSTALLATION OF IDENTIFICATION

- A. General: During back-filling/top-soiling of storm drainage systems, install continuous underground-type plastic line marker, located directly over buried line at 24" above top of pipe.

3.2 INSTALLATION OF PIPE AND PIPE FITTINGS

- A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.
 - 1. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.
 - 2. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.
 - 3. Place bell ends or groove ends of piping facing upstream.
 - 4. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.
 - 5. Concrete Pipe: Install in accordance with applicable provisions of ACPA "Concrete Pipe Installation Manual".
 - 6. HDPE Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D2321.

3.3 PRECAST CONCRETE MANHOLES

- A. General: Place precast concrete sections as indicated. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.
- B. Install in accordance with ASTM C891.
- C. Provide rubber joint gasket complying with ASTM C443 at joints of sections.
- D. Apply bituminous mastic coating at joints of sections.

3.4 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures, so that finished work will conform as nearly as practicable to requirements specified for new work.

3.5 DRAINAGE AGGREGATE

- A. Install the drainage aggregate to the line, grades and sections shown on the project construction plans.
- B. Place the drainage aggregate to a minimum finished thickness and widths shown on the details herein or as directed by the Engineer.
- C. Filter Fabric shall be installed prior to aggregate placement in accordance with the details provided on the drawings.

3.6 BACKFILLING

- A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

3.7 FIELD QUALITY CONTROL

- A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

END OF SECTION 33 4100

Appendix A

Additional OWTS Materials / RIDEM Permit Applications and Approvals



1150 Pawtucket Avenue
Rumford, RI 02916-1897
(401) 434-8880 Office
(401) 434-1615 Fax

www.cwltd.net

“Bathhouses and Onsite Wastewater Treatment System Replacement”

For

Rhode Island Department of Environmental Management
Burlingame State Park and Campground

Burlingame Park Road
Charlestown, Rhode Island

Assessors Map 15 – Lot 10
Area: 847 Acres±

July 2022

Rev.: January - March 2023

Prepared by

Caputo & Wick Ltd.
1150 Pawtucket Avenue
Rumford, Rhode Island 02916-1897
401-434-8880



“Mills Camp Bathhouse and Onsite Wastewater Treatment System Replacement”

For

Rhode Island Department of Environmental Management
Burlingame State Park and Campground

Burlingame Park Road
Charlestown, Rhode Island

Assessors Map 15 – Lot 10
Area: 847 Acres±

July 2022
Rev.: January 2023

Prepared by

Caputo & Wick Ltd.
1150 Pawtucket Avenue
Rumford, Rhode Island 02916-1897
401-434-8880



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**

www.dem.ri.gov/septic



FOR RIDEM USE ONLY

APPLICATION No. _____ DATE RECEIVED ____/____/____ AMOUNT RECEIVED \$ _____ CHECK # _____ NOTE _____

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- | | |
|--|---|
| <input type="checkbox"/> NEW BUILDING CONSTRUCTION | <input checked="" type="checkbox"/> A/E TECHNOLOGY TYPE _____ |
| <input type="checkbox"/> ALTERATION | <input type="checkbox"/> VARIANCE |
| <input type="checkbox"/> REPAIR | <input type="checkbox"/> REDESIGN |
| <input type="checkbox"/> TRANSFER | <input type="checkbox"/> JOINT OWTS / WETLANDS PD |

CERTIFICATION

I, KEVIN HARROP (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

Designer's Signature Kevin Harrop License # D 3155

Designer's Email kharpop@cwlltd.net Phone # 401-434-8880

Business/Company Name CAPUTO and WICK LTD

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

Owner's Phone Number (401) 222-4700 ext 2774307

Owner's Email MEGAN.DIPRETE@DEM.RI.GOV

Owner(s) Signature _____

SITE INFORMATION

BURLINGAME STATE PARK AND CAMPGROUND (MILLS CAMP)
1-100 BURLINGAME PARK ROAD, CHARLESTOWN

NO. STREET _____ CITY/TOWN _____ POLE # _____

PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.

LOT SIZE 841 -SFIACRES

SUBDIVISION NAME N.A.

SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

OWNER INFORMATION

STATE OF RI DEM

LAST NAME _____ FIRST NAME _____ M.I. _____

235 PROMENADE ST. PROVIDENCE 02908

NO. STREET _____ CITY/TOWN _____ ZIP CODE _____

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1140

DEPTH TO APPROVED WATER TABLE 48" HOW DETERMINED SOIL EVALUATION

TEST HOLE # 7B DATE EXCAVATED 12/23/21 WETLANDS within 200' OF OWTS YES NO

WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE ____/____/____

LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial _____

Other BATHHOUSE

WATER SUPPLY: public water public well private well

OF DESIGN UNITS 150

UNIT DESIGN FLOW 50 gallons per SITE (unit) TOTAL DAILY FLOW 7,500 gallons

TANK SIZE 15,000 gallons DESIGN LOADING RATE 3.5 gpd/sf

MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet

LEACHFIELD TYPE GRAVEL SAND TREATMENT (GST)

TOTAL AREA OF LEACHFIELD PROVIDED 4,900 square feet

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other _____

Signature of RIDEM Official _____ Date of Approval _____ Date of Expiration _____



RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
235 Promenade Street, Providence, Rhode Island 02908

February 2, 2023

State of Rhode Island
Rhode Island Department of Environmental Management Division of Planning and Development
235 Promenade Street
Providence, RI 02908

RE: Mills Camp Bathhouse
Burlingame State Park and Campground
Charlestown, RI
OWTS Application No. 2205-1140

Dear Applicant:

Attached herewith are revised monitoring and reporting requirements applicable to the above listed permit. As you are aware the above listed Onsite Wastewater Treatment System (OWTS) permit is granted based on a maximum daily design flow of **7,500** gallons per day and includes 1 - 15,000 gallon septic tank, 1 - 7,500 gallon anoxic tank, 1 - 6,000 gallon recirculation tank, 2 - Advantex AX 100 filter pods followed by a 6 x 6 pump chamber to a Gravel Sand Treatment (GST) type of leaching system.

Advanced treatment systems are utilized to mitigate against possible adverse impacts of residual onsite wastewater pollutants on groundwater quality and surface water quality. Owners of advanced OWTSs with design flows $\geq 2,000$ gallons per day are subject to regular monitoring and reporting. The following stipulations now apply to your permit:

1. The following discharge limits as measured at the 6 x 6 pump chamber shall apply:

<u>Orengo Systems, Inc. AdvanTex AX-100 – Mode 1</u>	
Biochemical Oxygen Demand (5 Day)	≤ 20 mg/L
Total Suspended Solids	≤ 20 mg/L
Oil & Grease	≤ 5 mg/L

2. Wastewater flow shall not exceed a maximum daily flow of **7,500** gallons per day. Wastewater flow shall be monitored and recorded to ensure compliance with this stipulation.
3. Sampling and testing shall be conducted quarterly at the compliance point specified in Item 1 above. Sampling and measurements shall be representative of the monitored activity. The Permittee shall sample and test the wastewater in each system as follows:

Dissolved Oxygen (mg/L) – *Field Test*
Effluent Temperature (°F) – *Field Test*
pH (s.u.) – *Field Test*
Biochemical Oxygen Demand (5-Day) (mg/L)
Total Suspended Solids (mg/L)
Oil and Grease (mg/L)
Alkalinity (mg/L)

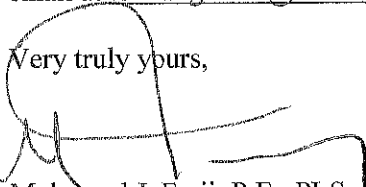
4. Corrective Action – Corrective action must be taken as soon as practicable following receipt of monitoring results which indicate that system modifications or maintenance is required. The system must be resampled no sooner than seven (7) days after any adjustment is made to the system and within thirty (30) days of the routine quarterly sample date. Samples must be analyzed for each of the parameters listed in Item 3 for any post corrective action sampling events.
5. Annual Report – All monitoring results including wastewater flow data shall be submitted to the DEM in the form of an annual report. The annual report is due **February 15th** of each year. The annual report must summarize all monitoring results and corrective actions implemented during the previous calendar year. A clear determination regarding the compliance status of the OWTS must be made as part of the annual report. The annual report must include a copy of the most recent Operation and Maintenance Contract as proof of compliance with this requirement.
6. The Permittee shall properly operate and maintain all facilities and equipment associated with the OWTS in accordance with the most recent operation and maintenance (O&M) plan. The O&M plan specifies procedures for operation, process control, record keeping, monitoring, weekly maintenance checks, other routine and periodic maintenance, safety and security. Also, the O&M plan includes a contingency plan to address emergency actions and procedures in the event of equipment failure and power loss.
7. Your permit approval is for the discharge of sanitary waste only. No toxic, hazardous or industrial processing waste may be discharged into the system.
8. All septage, sludges, screenings or other pollutants removed from the system shall be disposed in accordance with all applicable state and federal laws.
9. The permit may be automatically transferred by the Permittee to a new owner provided:
 - a. The current Permittee notifies the DEM by certified mail at least thirty (30) days in advance of the proposed transfer date;
 - b. The notice includes the name and address of the new Permittee and a written agreement between the existing and new Permittee containing a specific date for the transfer of permit responsibility, surety and liability between them and;
 - c. The DEM does not notify the existing Permittee and the proposed new Permittee of its intent to modify or reissue the permit.
10. The operator or person in responsible charge of the OWTS shall have at a minimum a Rhode Island Class 1 Wastewater Treatment Plant Operator Certification or an equivalent certification from another jurisdiction acceptable to the DEM. If the operator is not employed directly by the Permittee, a service agreement with the operator shall be entered into and continuously maintained, and a copy of the active service agreement shall be submitted to the DEM as part of the annual report.
11. The permit may be modified, suspended, or revoked for cause. The DEM reserves the right to revise the permit to ensure compliance with applicable state and federal regulations. Failure to comply with the conditions of this permit approval letter may result in an enforcement action.

12. The Permittee shall allow the DEM or their authorized representative to access the OWTS and work areas to inspect equipment, practices, records pertinent to this permit and stipulated compliance requirements, and to sample and monitor the wastewater for the purposes of determining compliance.
13. In the event of treatment interruption, bypass or sewage overflow, the Permittee shall notify the DEM verbally within twenty-four (24) hours. Such incident shall be reported in writing within five (5) days after it becomes known to the Permittee, the report shall include the date and time(s) of the incident, the duration of the incident, and actions taken to correct the problem and prevent a reoccurrence.
14. For purposes of notification, monitoring, compliance or inquiries pursuant to this permit, all correspondence, telephone calls and other contacts must reference the OWTS permit number and shall be directed to:

The Rhode Island Department of Environmental Management
Onsite Wastewater Treatment Systems Program
235 Promenade Street
Providence, RI 02908
Telephone: (401) 222-3961
www.dem.ri.gov/septic

Should you have any questions concerning these permit requirements, please contact Tom Angelone by email at tom.angelone@dem.ri.gov or by phone at 401-222-3961, extension 2777607.

Very truly yours,



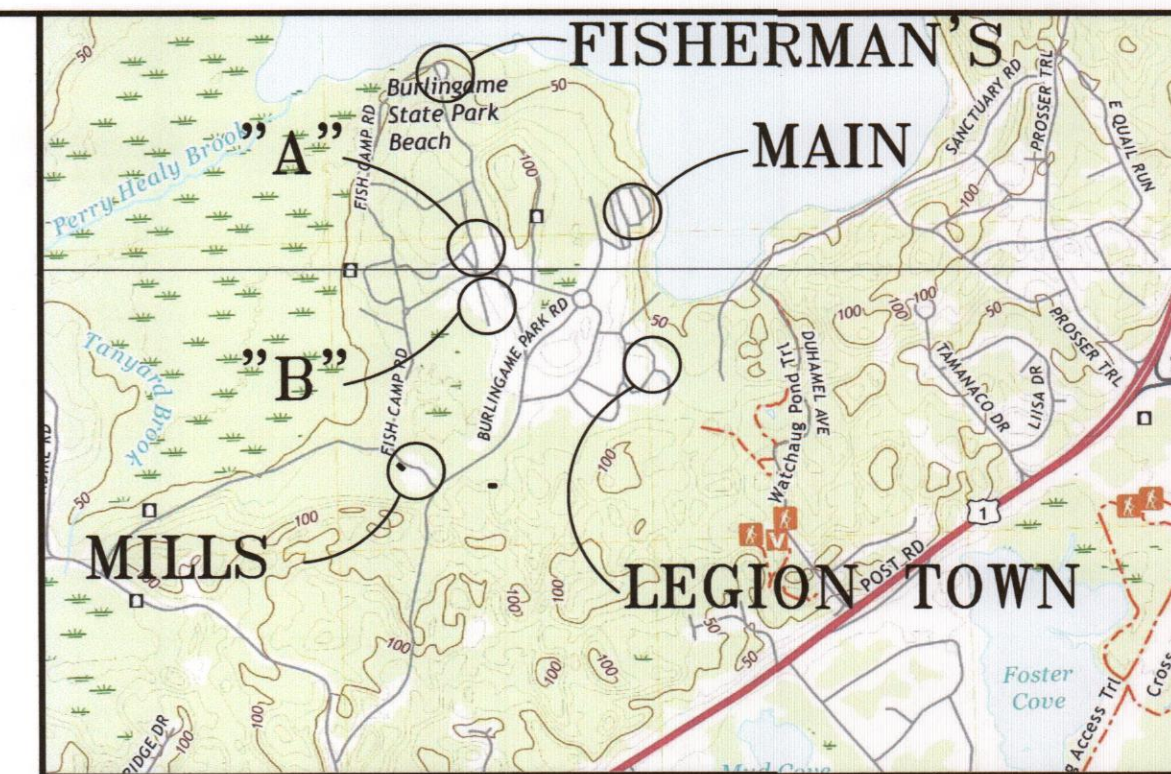
Mohamed J. Freij, P.E., PLS
Supervising Sanitary Engineer

2-2-2023

KF

Enclosure(s)

cc: Joseph L. Warner Jr., Charlestown Building Official



LOCUS MAP

- NOTES: 1. ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT... 2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL... 3. EXISTING ON-SITE WASTEWATER TREATMENT SYSTEM (OWTS) PRECAST STRUCTURES ARE TO BE PUMPED OUT...

TH-7A - GROUND ELEV: 61.3 - DECEMBER 23, 2021. Table with columns: HORIZON, DEPTH, HORIZON BOUNDARIES, SOIL COLORS, RE-DOX, TEXTURE, STRUCTURE, CONSISTENCE, SOIL CATEGORY.

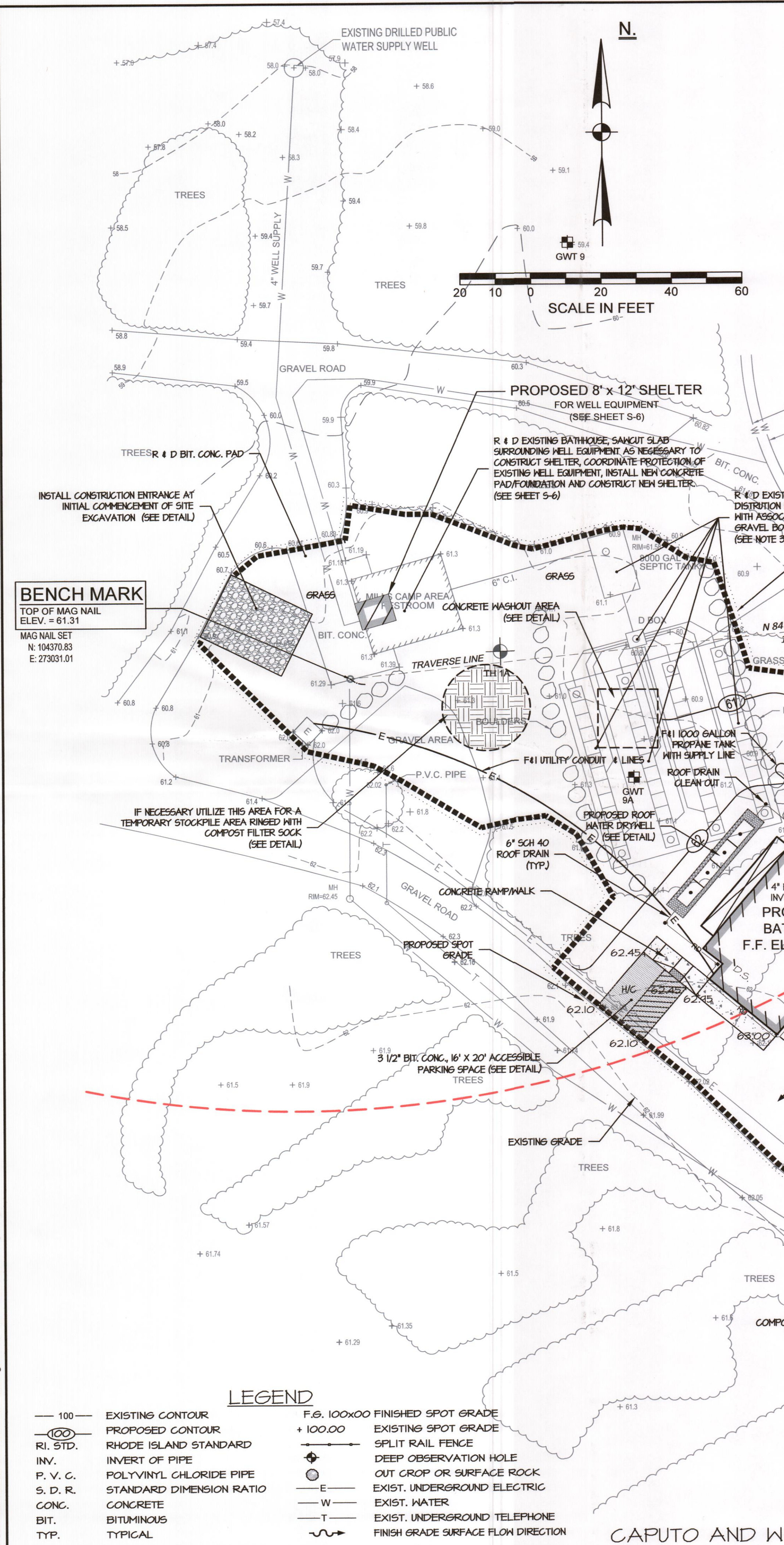
TH-1A - GROUND ELEV: 61.2 - AUGUST 17, 2021. Table with columns: HORIZON, DEPTH, HORIZON BOUNDARIES, SOIL COLORS, RE-DOX, TEXTURE, STRUCTURE, CONSISTENCE, SOIL CATEGORY.

TH-1B - GROUND ELEV: 61.5 - AUGUST 17, 2021. Table with columns: HORIZON, DEPTH, HORIZON BOUNDARIES, SOIL COLORS, RE-DOX, TEXTURE, STRUCTURE, CONSISTENCE, SOIL CATEGORY.

TH-7B - GROUND ELEV: 61.9 - DECEMBER 23, 2021. Table with columns: HORIZON, DEPTH, HORIZON BOUNDARIES, SOIL COLORS, RE-DOX, TEXTURE, STRUCTURE, CONSISTENCE, SOIL CATEGORY.

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT OFFICE OF WATER RESOURCES OWTS PROGRAM PLAN 2025-1140 DATE 2/2/23 APPROVED Kyle Jennings

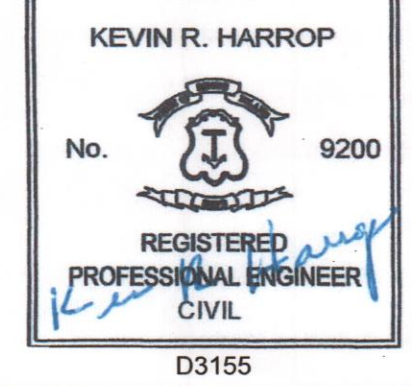
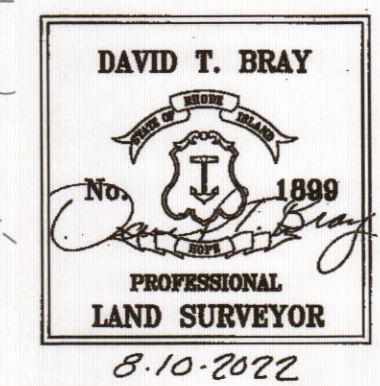
Copy of permit and operation. Maintenance contract must be in hand evidence required prior to construction.



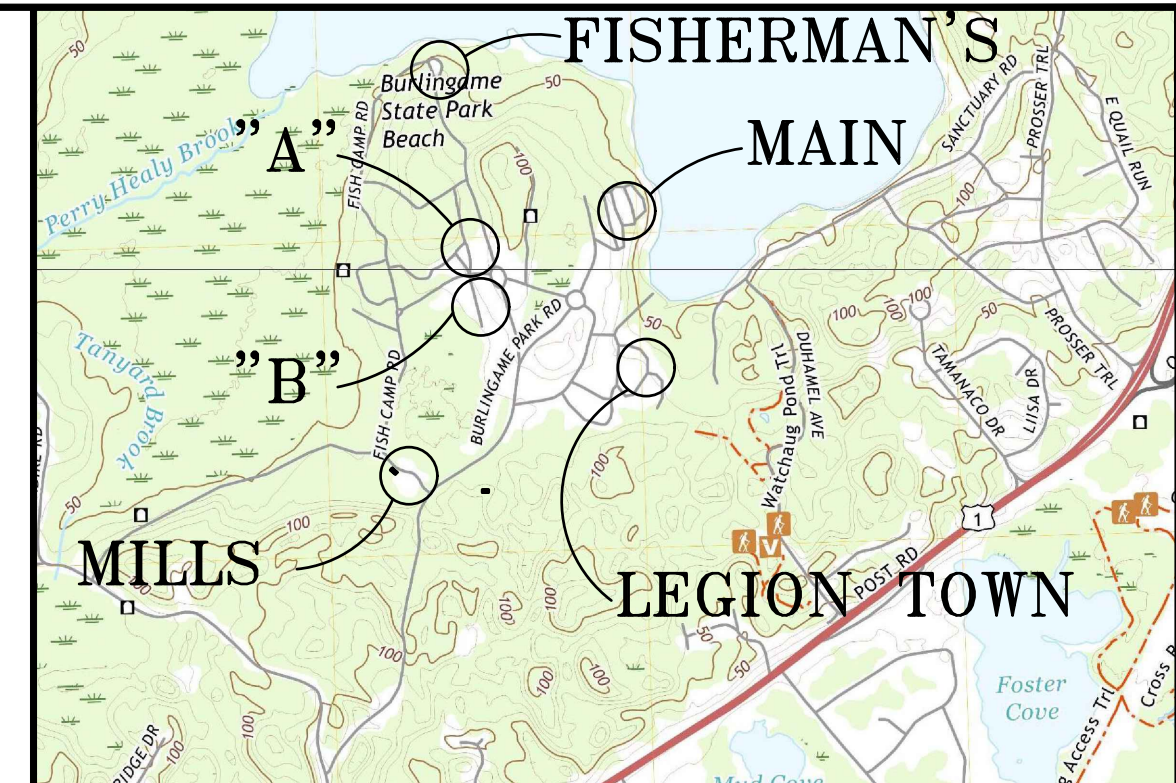
LEGEND: 100 - EXISTING CONTOUR, 100.00 - EXISTING SPOT GRADE, RHODE ISLAND STANDARD, SPLIT RAIL FENCE, INVERT OF PIPE, DEEP OBSERVATION HOLE, P.V.C. POLYVINYL CHLORIDE PIPE, OUT CROP OR SURFACE ROCK, S.D.R. STANDARD DIMENSION RATIO, CONCRETE, EXIST. UNDERGROUND ELECTRIC, BIT. BITUMINOUS, EXIST. WATER, TYP. TYPICAL, FINISH GRADE SURFACE FLOW DIRECTION

CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

CERTIFICATION: THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 8 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 23, 2010, AS FOLLOWS: TYPE OF BOUNDARY SURVEY: NOT A BOUNDARY SURVEY MEASUREMENT SPECIFICATION: CLASS II T2 (IMMEDIATE AREA AROUND DWELLING AND OWTS AS IDENTIFIED) OTHER TYPE OF SURVEY: DATA ACQUISITION SURVEY (LOCATIONS) TOPOGRAPHIC SURVEY ACCURACY



STATE OF RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT DIVISION OF PLANNING AND DEVELOPMENT. DEMOLITION AND REBUILD OF BATHHOUSES BURLINGAME STATE PARK AND CAMPGROUND CHARLESTOWN, RHODE ISLAND. MILLS CAMP BATHHOUSE - SITE PLAN. Dwg: Contract No. x Scale: 1" = 20' Date: JANUARY, 2023 C-1.1



LOCUS MAP

- NOTES: 1. ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT... 2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL... 3. EXISTING ON-SITE WASTEWATER TREATMENT SYSTEM (OWTS) PRECAST STRUCTURES ARE TO BE PUMPED OUT...

Table with 10 columns: HORIZON, DEPTH, HORIZON BOUNDARIES, SOIL COLORS, RE-DOX, TEXTURE, STRUCTURE, CONSISTENCE, SOIL CATEGORY. Includes data for TH-7A - GROUND ELEV: 61.3 - DECEMBER 23, 2011.

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEeping GROUNDWATER - NA ESTIMATED SEASONAL HIGH WATER TABLE - 58' (ELEV: 56.5) PERFORMED BY: KAMAL HINGORANY

Table with 10 columns: HORIZON, DEPTH, HORIZON BOUNDARIES, SOIL COLORS, RE-DOX, TEXTURE, STRUCTURE, CONSISTENCE, SOIL CATEGORY. Includes data for TH-7B - GROUND ELEV: 61.9 - DECEMBER 23, 2011.

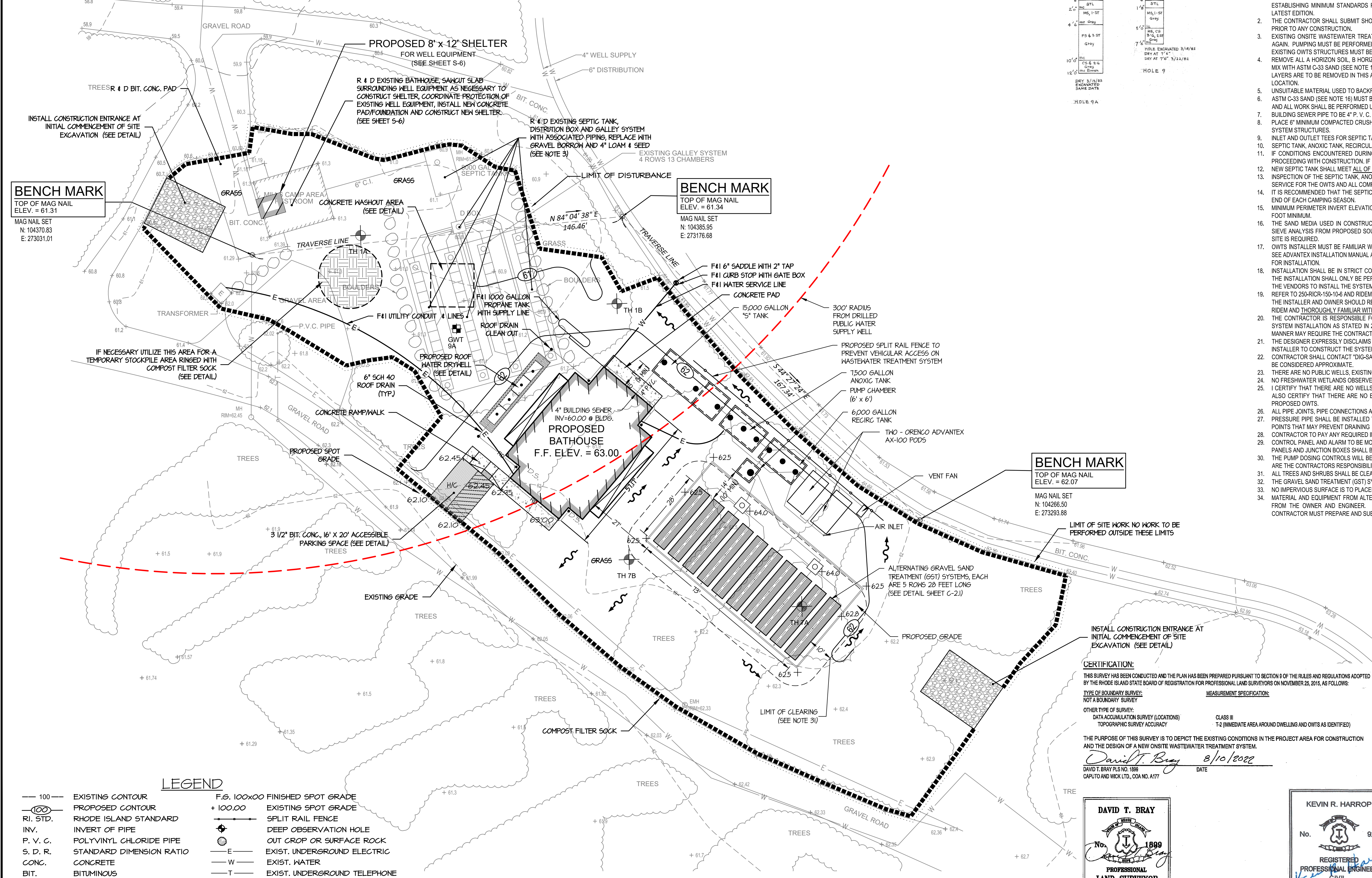
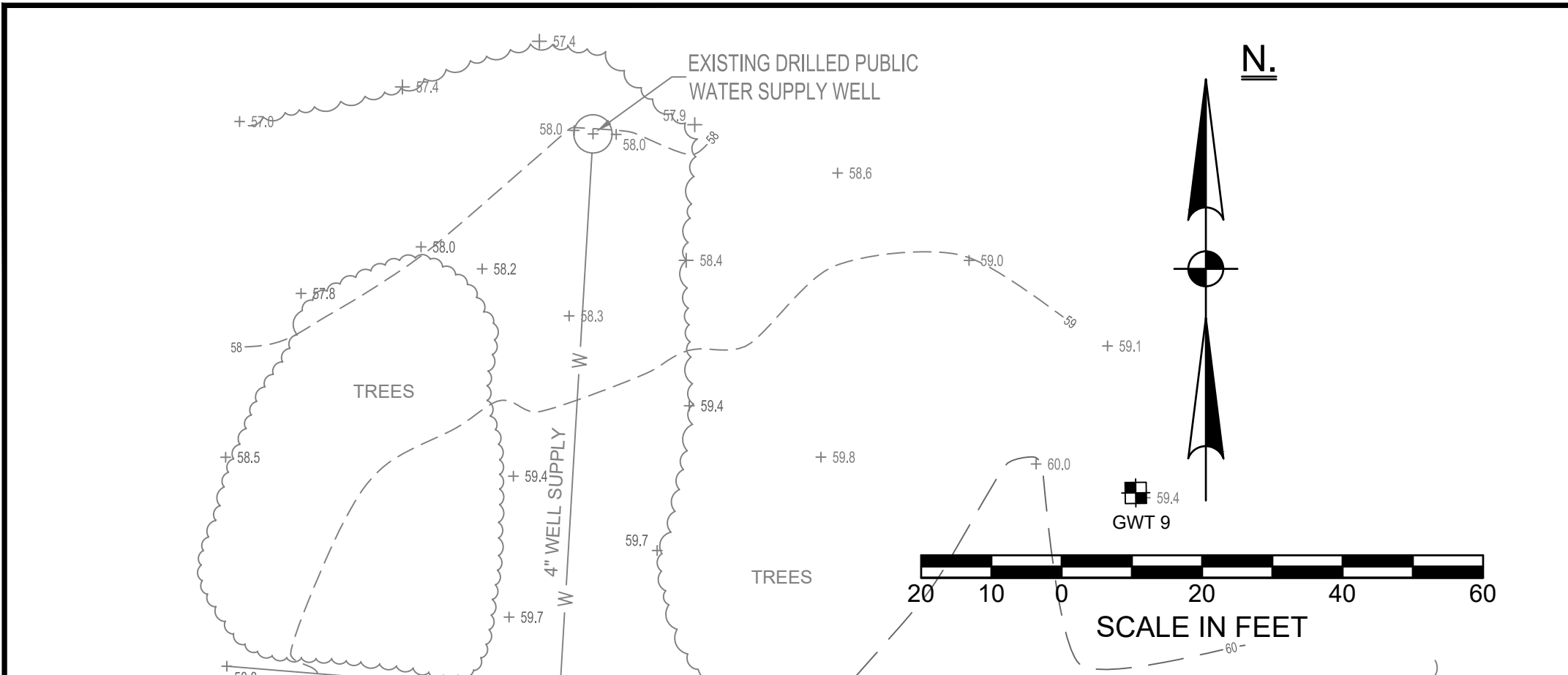
SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEeping GROUNDWATER - NA ESTIMATED SEASONAL HIGH WATER TABLE - 48' (ELEV: 57.9) PERFORMED BY: KAMAL HINGORANY

Table with 10 columns: HORIZON, DEPTH, HORIZON BOUNDARIES, SOIL COLORS, RE-DOX, TEXTURE, STRUCTURE, CONSISTENCE, SOIL CATEGORY. Includes data for TH-1A - GROUND ELEV: 61.2 - AUGUST 17, 2011.

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEeping GROUNDWATER - NA ESTIMATED SEASONAL HIGH WATER TABLE - 49' (ELEV: 57.1) PERFORMED BY: KAMAL HINGORANY

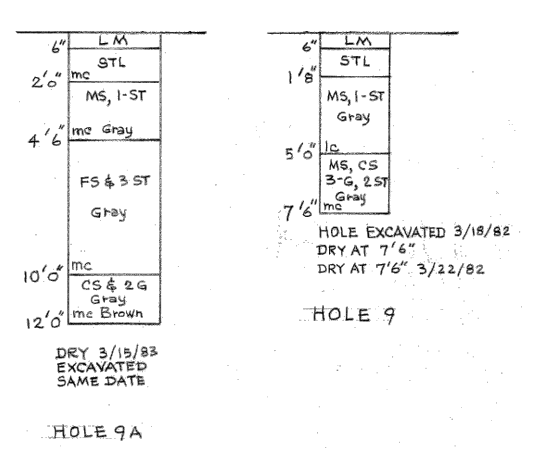
Table with 10 columns: HORIZON, DEPTH, HORIZON BOUNDARIES, SOIL COLORS, RE-DOX, TEXTURE, STRUCTURE, CONSISTENCE, SOIL CATEGORY. Includes data for TH-1B - GROUND ELEV: 61.5 - AUGUST 17, 2011.

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEeping GROUNDWATER - NA ESTIMATED SEASONAL HIGH WATER TABLE - 60' (ELEV: 56.5) PERFORMED BY: KAMAL HINGORANY



LEGEND table with two columns: Symbol and Description. Includes symbols for existing contours, proposed contours, invert of pipe, and various utility lines.

CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916



BENCH MARK TOP OF MAG NAIL ELEV. = 62.07 MAG NAIL SET N: 104266.50 E: 273293.88

BENCH MARK TOP OF MAG NAIL ELEV. = 61.34 MAG NAIL SET N: 104385.95 E: 273176.68

BENCH MARK TOP OF MAG NAIL ELEV. = 61.31 MAG NAIL SET N: 104370.83 E: 273031.01

CERTIFICATION: THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 8 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 28, 2015, AS FOLLOWS: TYPE OF BOUNDARY SURVEY: NOT A BOUNDARY SURVEY MEASUREMENT SPECIFICATION: CLASS III T-2 (IMMEDIATE AREA AROUND DWELLING AND OWTS AS IDENTIFIED) DATE: 8/10/2012

DAVID T. BRAY PROFESSIONAL LAND SURVEYOR 8-10-2012

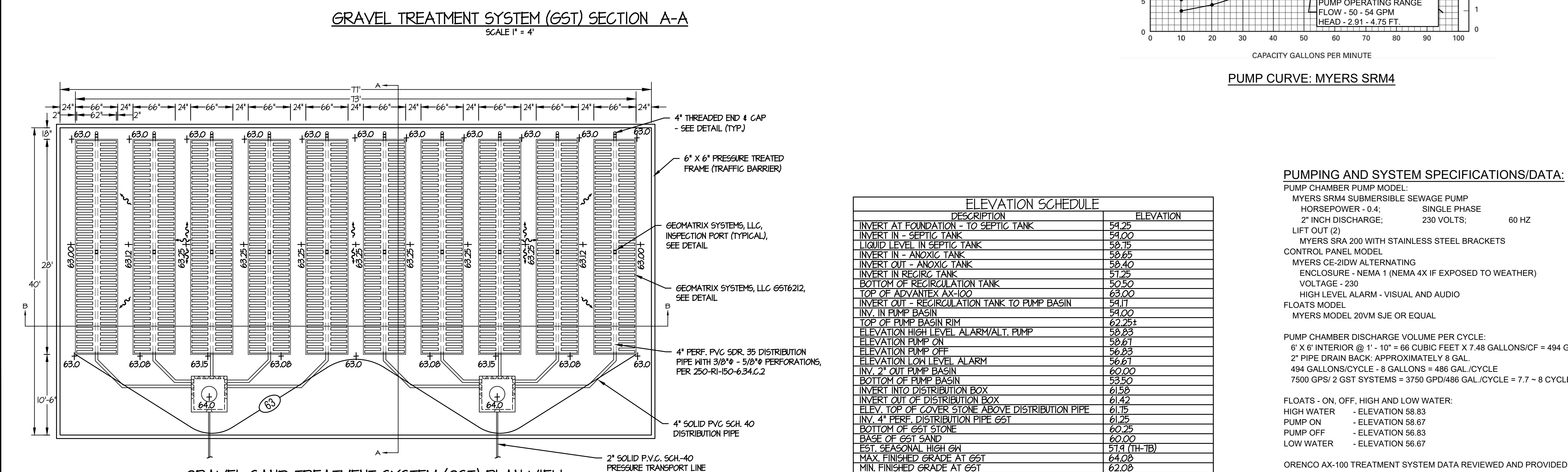
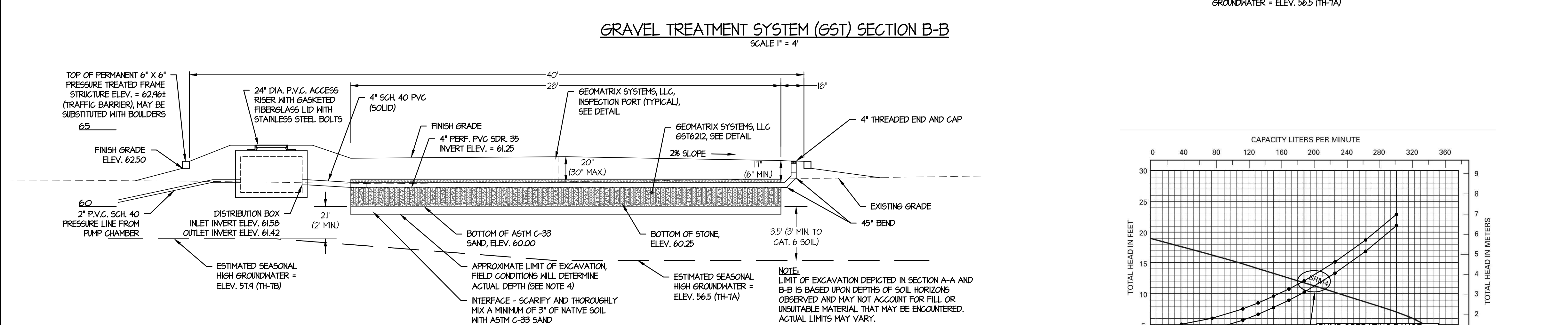
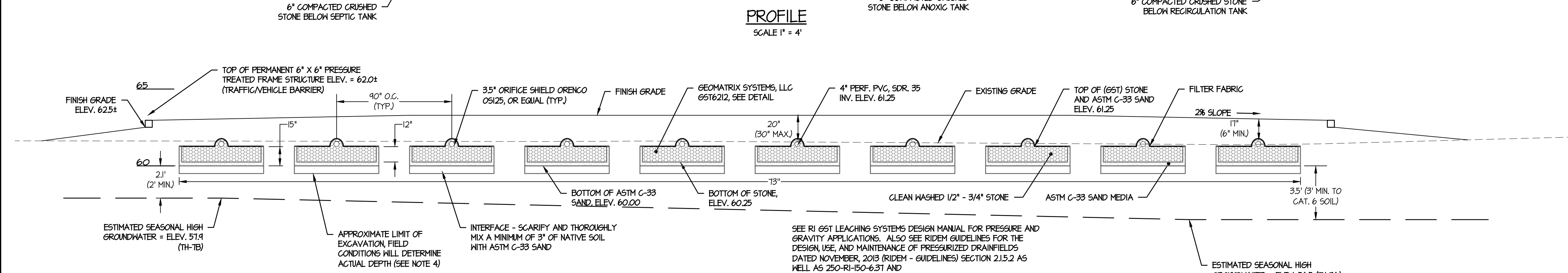
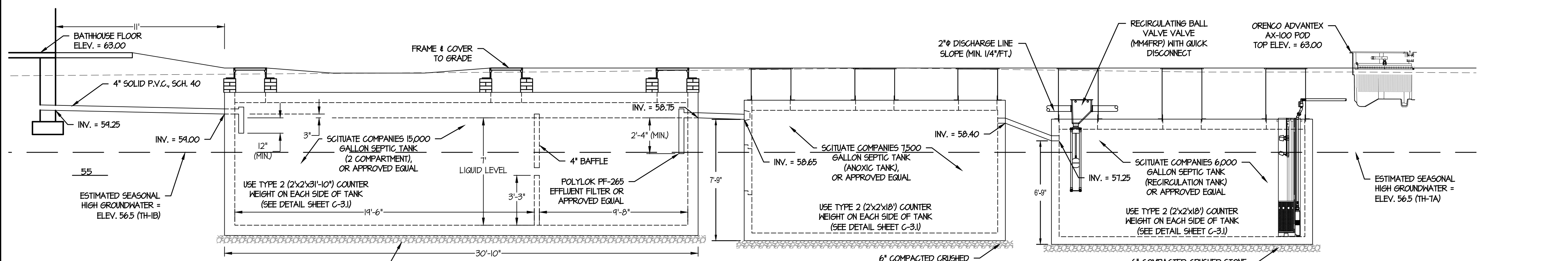
KEVIN R. HARROP REGISTERED PROFESSIONAL ENGINEER CIVIL D3155

STATE OF RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT DIVISION OF PLANNING AND DEVELOPMENT

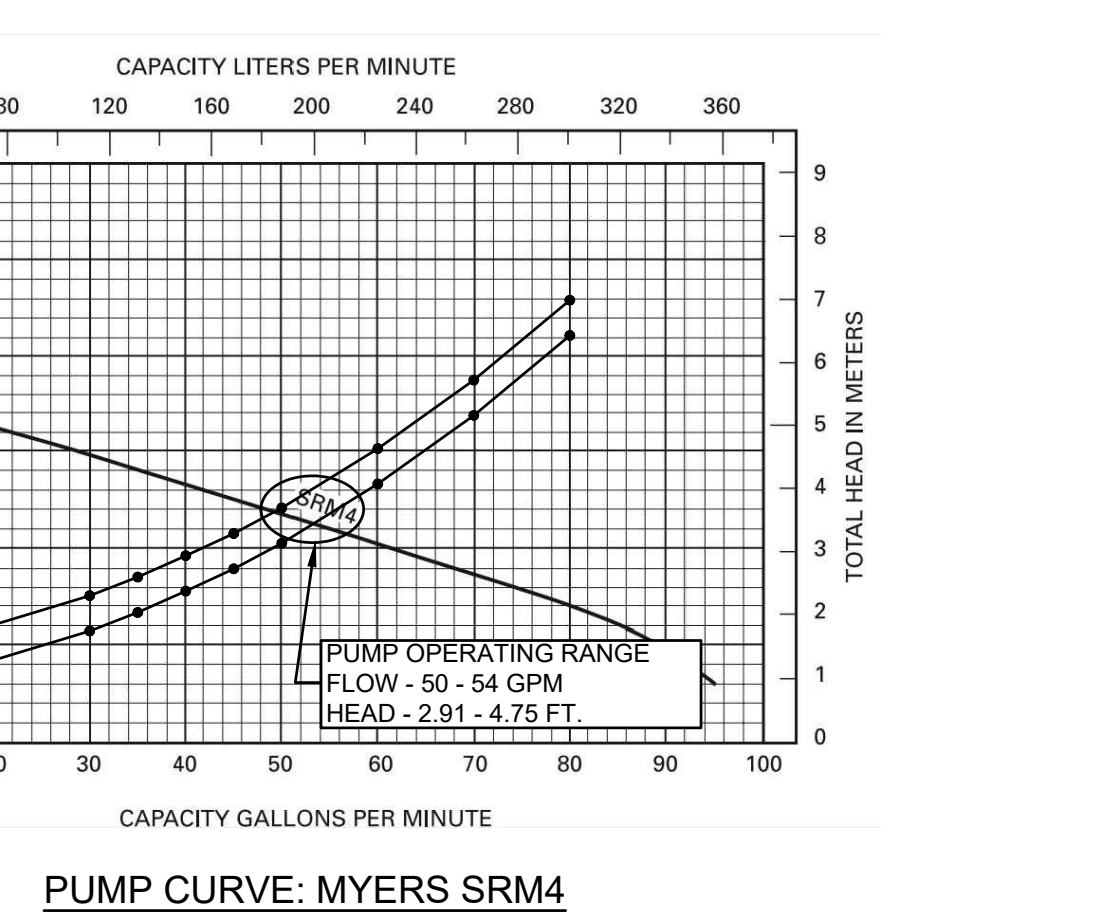
DEMOLITION AND REBUILD OF BATHHOUSES BURLINGAME STATE PARK AND CAMPGROUND CHARLESTOWN, RHODE ISLAND

MILLS CAMP BATHHOUSE - SITE PLAN

Dwg: Scale: 1" = 20' Contract No. x Date: JANUARY, 2013 C-1.1



DESCRIPTION	ELEVATION
INVERT AT FOUNDATION - TO SEPTIC TANK	54.25
INVERT IN - SEPTIC TANK	54.00
LIQUID LEVEL - IN SEPTIC TANK	58.75
INVERT IN - ANOXIC TANK	58.40
INVERT OUT - ANOXIC TANK	58.40
INVERT IN RECIRC. TANK	51.25
BOTTOM OF RECIRCULATION TANK	50.50
TOP OF ADVANTEK AX-100	63.00
INVERT OUT - RECIRCULATION TANK TO PUMP BASIN	54.11
INV. IN PUMP BASIN	54.00
TOP OF PUMP BASIN RIM	62.25
ELEVATION HIGH LEVEL ALARM/ALT. PUMP	58.83
ELEVATION PUMP ON	58.67
ELEVATION PUMP OFF	56.83
ELEVATION LOW LEVEL ALARM	56.67
INV. 2" OUT PUMP BASIN	60.00
BOTTOM OF PUMP BASIN	53.50
INVERT INTO DISTRIBUTION BOX	61.50
INVERT OUT OF DISTRIBUTION BOX	61.42
ELEV. TOP OF COVER STONE ABOVE DISTRIBUTION PIPE	61.15
INV. 4" PERF. DISTRIBUTION PIPE GST	61.25
BOTTOM OF GST STONE	60.25
BASE OF GST SAND	60.00
EST. SEASONAL HIGH GW	57.4 (TH-TB)
MAX FINISHED GRADE AT GST	64.00
MIN FINISHED GRADE AT GST	62.00



PUMPING AND SYSTEM SPECIFICATIONS/DATA:

PUMP CHAMBER PUMP MODEL:
MYERS SRM4 SUBMERSIBLE SEWAGE PUMP
HORSEPOWER - 0.4;
SINGLE PHASE
2" INCH DISCHARGE;
230 VOLTS;
60 HZ
6 AMPS
LIFT OUT (2)

CONTROL PANEL MODEL:
MYERS SRA 200 WITH STAINLESS STEEL BRACKETS

PUMP CHAMBER DISCHARGE VOLUME PER CYCLE:
6" X 6" INTERIOR @ 1' - 10" = 66 CUBIC FEET X 7.48 GALLONS/CF = 494 GAL./CYCLE
2" PIPE DRAIN BACK: APPROXIMATELY 8 GAL.
494 GALLONS/CYCLE - 8 GALLONS = 486 GAL./CYCLE
7500 GPD/2 GST SYSTEMS = 3750 GPD/486 GAL./CYCLE = 7.7 - 8 CYCLES/DAY/GST

FLOATE - 230
HIGH LEVEL ALARM - VISUAL AND AUDIO

FLOATES - ON, OFF, HIGH AND LOW WATER:
HIGH WATER - ELEVATION 58.83
PUMP ON - ELEVATION 58.67
PUMP OFF - ELEVATION 56.83
LOW WATER - ELEVATION 56.67

ORENKO AX-100 TREATMENT SYSTEM DATA REVIEWED AND PROVIDED BY ATLANTIC SOLUTIONS (CONTROL PANEL - TIME DOSED)

GRAVEL SAND TREATMENT (GST) SYSTEM DATA REVIEWED BY GEOMATRIX SYSTEMS LLC.

VOLUMES

SEPTIC TANK TOP VIEW
TOP SLAB: 11.83' WIDE X 30.83' LONG X 0.61" THICK = 252.46 C.F. (CUBIC FOOT)
SIDES: 2 SIDES X 10.00' LONG X 8.00' HIGH X 0.61" THICK = 106.61 C.F.
BOTTOM: 11.83' WIDE X 30.83' LONG X 0.61" THICK = 252.46 C.F.
Baffle: 12.00' LONG X 1.25' HIGH X 0.28' THICK = 28.82 C.F.
TOTAL VOLUME OF CONCRETE FOR TANK = 425.40 C.F.
EARTH: 11.83' WIDE X 30.83' LONG X 1.50' THICK = 524.16 C.F.

SEPTIC TANK SIDE VIEW
CONCRETE: 100 POUNDS/C.F.
EARTH: 62.4 POUNDS/C.F.
COUNTER HEIGHT: 22,306.9 POUNDS (TYPE 2 - SEE SCHEDULE SHEET C-3)

HEIGHT OF TANK IN PLACE
CONCRETE: 125.40 C.F. X 150 POUNDS/C.F. = 18,810 POUNDS (EMPTY TANK)
COUNTER HEIGHT: = 22,307 POUNDS
EARTH: 324.16 C.F. X 100 POUNDS/C.F. = 32,416 POUNDS (EARTH COVER)
TOTAL HEIGHT OF TANK SET IN PLACE = 21,553 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL
BOTTOM SLAB AREA: 11.83' WIDE X 30.83' LONG = 364.44 S.F. (SQUARE FEET)
TANK: 364.44 S.F. X BP X 62.4 POUNDS/C.F. = 18,810 POUNDS (EMPTY TANK)
BP = 18,810 POUNDS ÷ 62.4 POUNDS/C.F. = 301.44 S.F.
BP = 6.31' - 6'-4" (ELEV. 57.45 - EMPTY TANK IS BUOYANT)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE
BP = 21,553 POUNDS ÷ 62.4 POUNDS/C.F. = 345.44 S.F.
BP = 6.91' - 6'-10" (ELEV. 60.91)

BUOYANCY CALCULATIONS FOR 15,000 GALLON SEPTIC TANK
MUST SET IN DRY CONDITIONS

VOLUMES

TANK TOP VIEW
TOP SLAB: 10.00' WIDE X 17.00' LONG X 0.61" THICK = 118.33 C.F. (CUBIC FOOT)
SIDES: 2 SIDES X 17.00' LONG X 8.00' HIGH X 0.50" THICK = 186.00 C.F.
BOTTOM: 10.00' WIDE X 17.00' LONG X 0.50" THICK = 85.00 C.F.
TOTAL VOLUME OF CONCRETE FOR TANK = 469.33 C.F.
EARTH: 10.00' WIDE X 17.00' LONG X 1.92' THICK = 326.40 C.F.

TANK SIDE VIEW
CONCRETE: 150 POUNDS/C.F.
EARTH: 100 POUNDS/C.F.
WATER: 62.4 POUNDS/C.F.
COUNTER HEIGHT: 12,614.4 POUNDS (TYPE 2 - SEE SCHEDULE SHEET C-3)

HEIGHT OF TANK
CONCRETE: 406.33 C.F. X 150 POUNDS/C.F. = 60,950 POUNDS (EMPTY TANK)
COUNTER HEIGHT: = 12,614 POUNDS
EARTH: 326.40 C.F. X 100 POUNDS/C.F. = 32,640 POUNDS (EARTH COVER)
TOTAL HEIGHT OF TANK SET IN PLACE = 106,204 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL
BOTTOM SLAB AREA: 10.00' WIDE X 17.00' LONG = 170.00 S.F. (SQUARE FEET)
TANK: 170.00 S.F. X BP X 62.4 POUNDS/C.F. = 60,950 POUNDS (EMPTY TANK)
BP = 60,950 POUNDS ÷ 62.4 POUNDS/C.F. = 976.76 S.F.
BP = 5.75' - 5'-9" (ELEV. 56.65 - EMPTY TANK IS BUOYANT)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE
BP = 106,204 POUNDS ÷ 62.4 POUNDS/C.F. = 1702.00 S.F.
BP = 10.01' - 10'-0" (ELEV. 60.80)

BUOYANCY CALCULATIONS FOR 7,500 ANOXIC TANK
MUST SET IN DRY CONDITIONS

VOLUMES

TANK TOP VIEW
TOP SLAB: 10.00' WIDE X 17.00' LONG X 0.61" THICK = 118.33 C.F. (CUBIC FOOT)
SIDES: 2 SIDES X 4.00' LONG X 1.00' HIGH X 0.50" THICK = 63.00 C.F.
2 SIDES X 17.00' LONG X 1.00' HIGH X 0.50" THICK = 118.00 C.F.
BOTTOM: 10.00' WIDE X 17.00' LONG X 0.50" THICK = 85.00 C.F.
TOTAL VOLUME OF CONCRETE FOR TANK = 264.33 C.F.
EARTH: 10.00' WIDE X 17.00' LONG X 3.33' THICK = 566.40 C.F.

TANK SIDE VIEW
CONCRETE: 150 POUNDS/C.F.
EARTH: 100 POUNDS/C.F.
WATER: 62.4 POUNDS/C.F.
COUNTER HEIGHT: 12,614.4 POUNDS (TYPE 2 - SEE SCHEDULE SHEET C-3)

HEIGHT OF TANK AND EARTH COVER
CONCRETE: 500.33 C.F. X 150 POUNDS/C.F. = 75,050 POUNDS (EMPTY TANK)
COUNTER HEIGHT: = 12,614 POUNDS
EARTH: 566.40 C.F. X 100 POUNDS/C.F. = 56,640 POUNDS (EARTH COVER)
TOTAL HEIGHT OF TANK SET IN PLACE = 126,274 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL
BOTTOM SLAB AREA: 10.00' WIDE X 17.00' LONG = 170.00 S.F. (SQUARE FEET)
TANK: 170.00 S.F. X BP X 62.4 POUNDS/C.F. = 75,050 POUNDS (EMPTY TANK)
BP = 75,050 POUNDS ÷ 62.4 POUNDS/C.F. = 1202.72 S.F.
BP = 5.31' - 5'-3" (ELEV. 55.81 - EMPTY TANK IS BUOYANT)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE
BP = 126,274 POUNDS ÷ 62.4 POUNDS/C.F. = 2023.62 S.F.
BP = 11.80' - 11'-1" (ELEV. 62.40)

BUOYANCY CALCULATIONS FOR 6,000 RECIRCULATION TANK
MUST SET IN DRY CONDITIONS

AREAS

TANK TOP VIEW
TOP: 7'-0" X 7'-0" = 49 S.F. - (7' X 12.5" = 4.91 S.F.) = 44.09 S.F. (SQUARE FEET)
VOLUMES
TOP SLAB: 44.09 S.F. X 0.50" THICK = 22.05 C.F. (CUBIC FOOT)
SIDES: 2 SIDES X 7'-0" LONG X 7'-0" HIGH X 0.50" THICK = 49.00 C.F.
BOTTOM: 7'-0" WIDE X 7'-0" LONG X 0.50" THICK = 24.50 C.F.
TOTAL VOLUME OF CONCRETE FOR TANK = 95.55 C.F.
EARTH: 44.09 S.F. X 0.75' THICK = 33.07 C.F.

TANK SIDE VIEW
CONCRETE: 150 POUNDS/C.F.
EARTH: 100 POUNDS/C.F.
WATER: 62.4 POUNDS/C.F.
COUNTER HEIGHT: 12,614.4 POUNDS (TYPE 2 - SEE SCHEDULE SHEET C-3)

HEIGHT OF TANK AND EARTH COVER
CONCRETE: 151.55 C.F. X 150 POUNDS/C.F. = 22,733 POUNDS (EMPTY TANK)
EARTH: 33.07 C.F. X 100 POUNDS/C.F. = 3,307 POUNDS (EARTH COVER)
TOTAL HEIGHT OF TANK SET IN PLACE = 26,040 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL
BOTTOM SLAB AREA: 44.09 S.F. X BP X 62.4 POUNDS/C.F. = 20,633 POUNDS (EMPTY TANK)
BP = 20,633 POUNDS ÷ 62.4 POUNDS/C.F. = 330.82 S.F.
BP = 6.19' - 6'-1" (ELEV. 60.25 - MUST BE SET IN DRY CONDITIONS)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE
BP = 26,040 POUNDS ÷ 62.4 POUNDS/C.F. = 417.31 S.F.
BP = 7.83' - 7'-10" (ELEV. 61.33)

BUOYANCY CALCULATIONS FOR PUMP CHAMBER
MUST SET IN DRY CONDITIONS

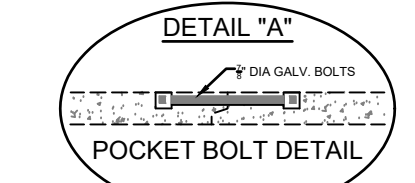
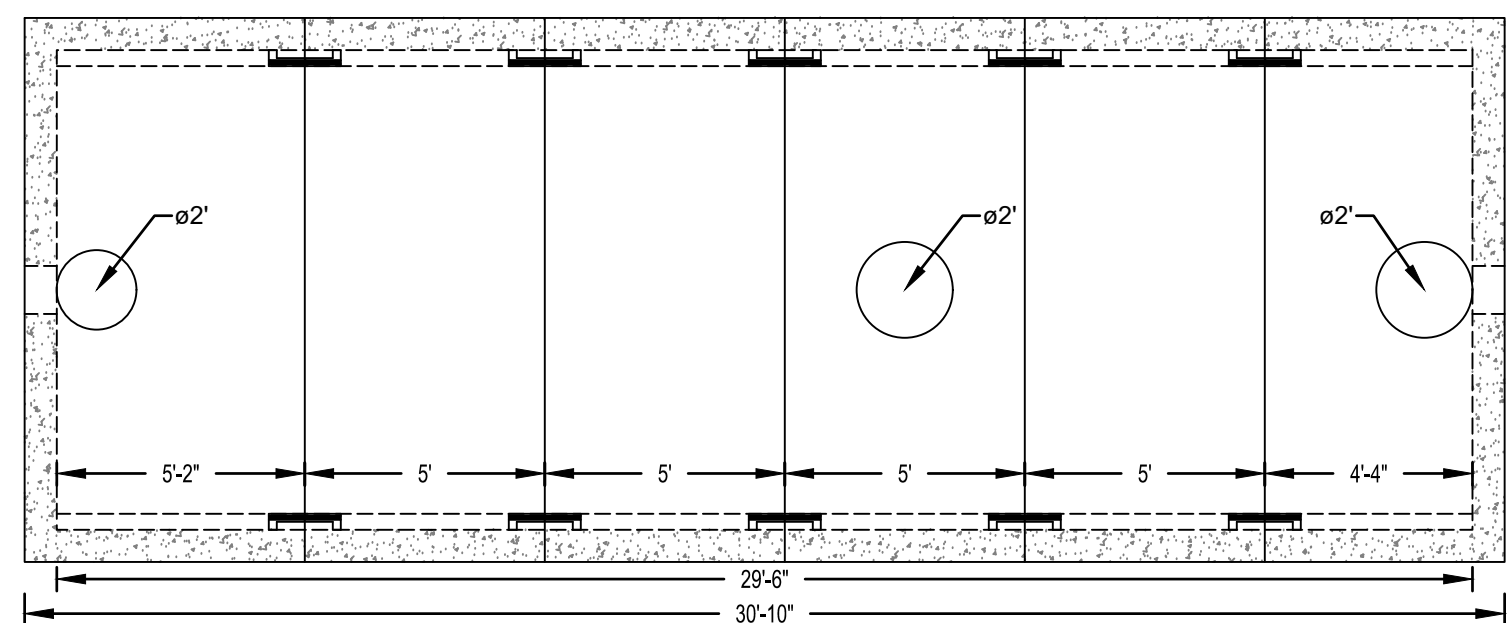
STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

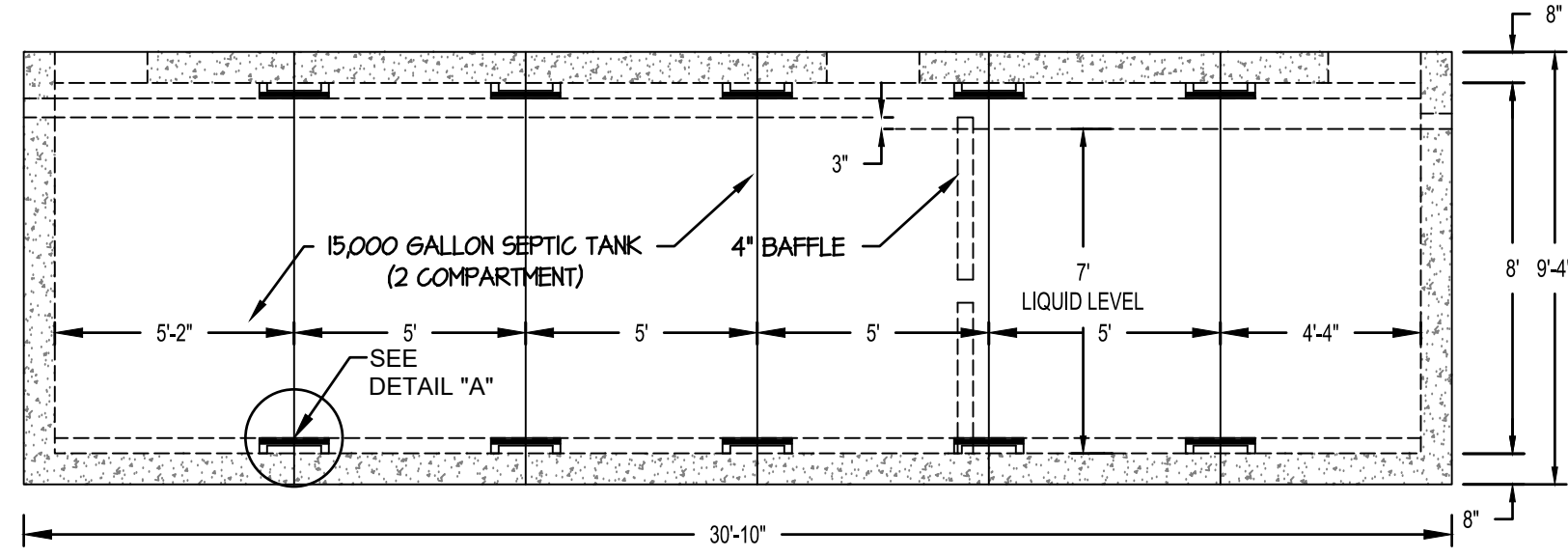
MILLS CAMP BATHHOUSE - OWTS DETAILS

Dwg: _____ Scale: 1" = 20'
Contract No. x _____ Date: JANUARY, 2023

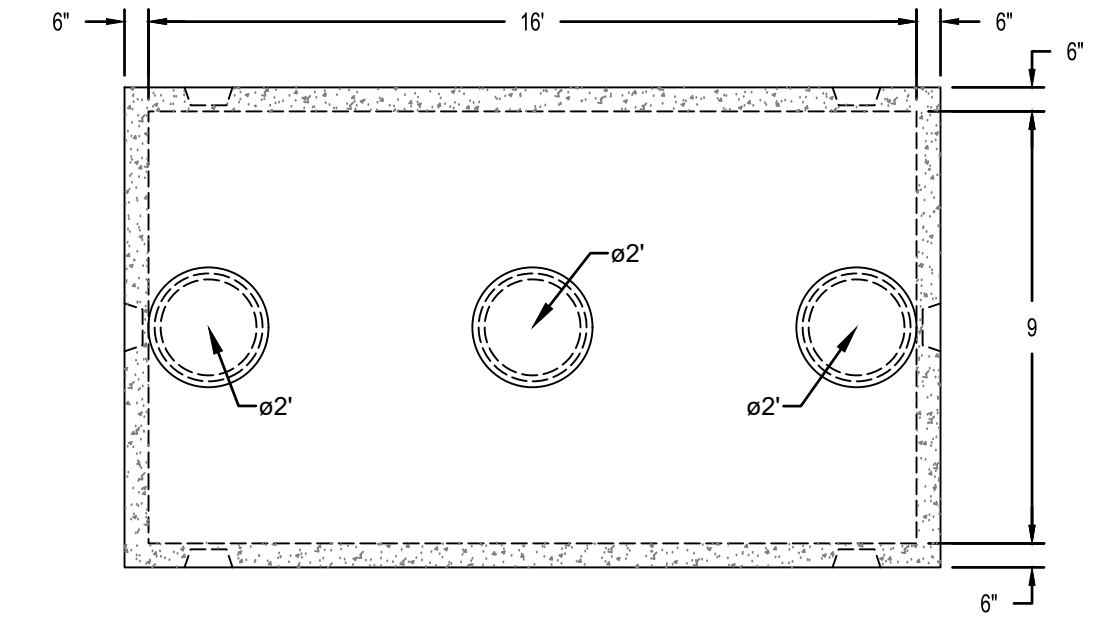
C-2.1
15



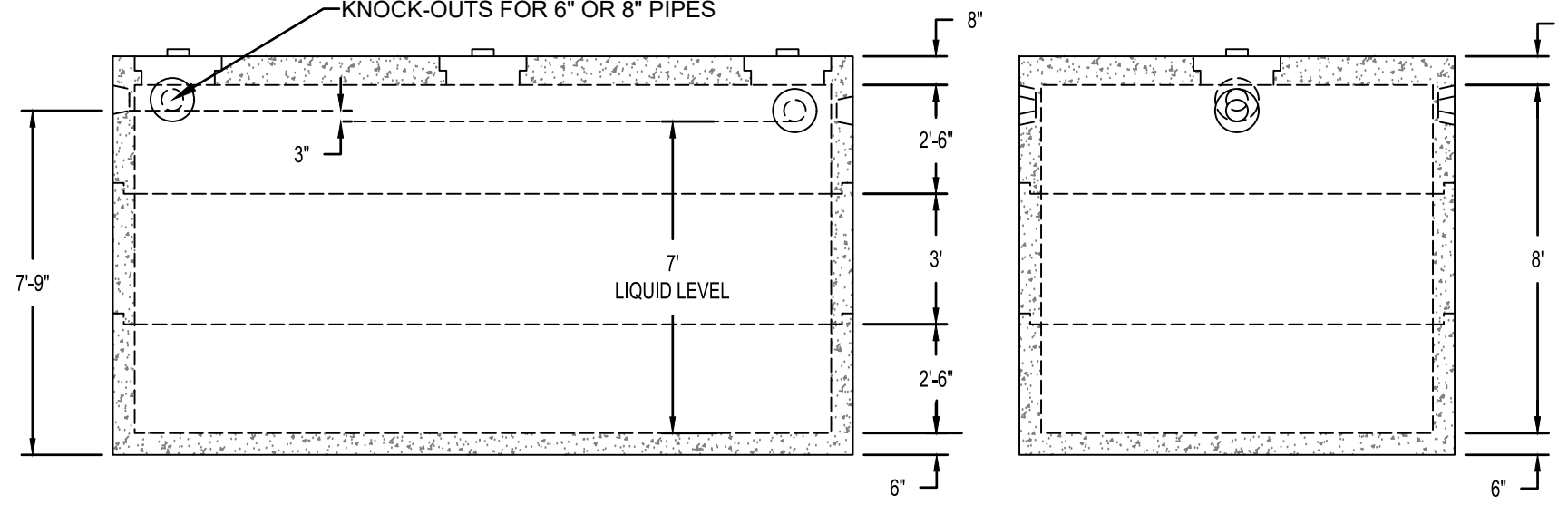
- DESIGN NOTES:**
1. CONCRETE 5,000 PSI. @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.



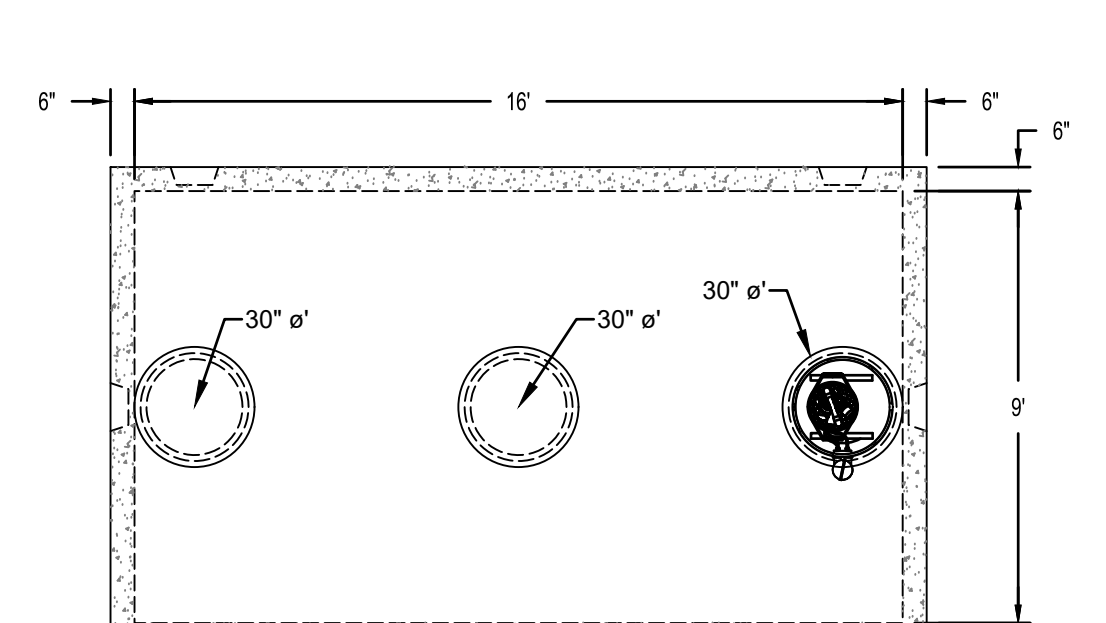
15,000 GALLON TWO COMPARTMENT SEPTIC TANK
SCALE 1" = 4"



- DESIGN NOTES:**
1. CONCRETE 5,000 PSI. @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

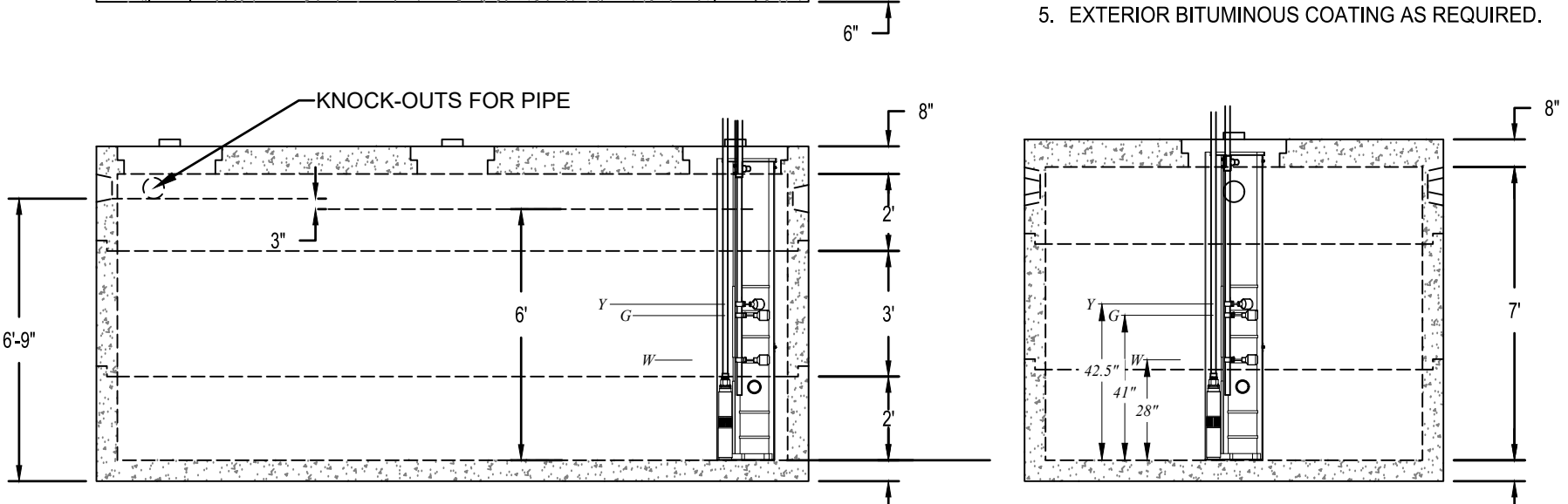


7,500 GALLON ANOXIC TANK
SCALE 1" = 4"



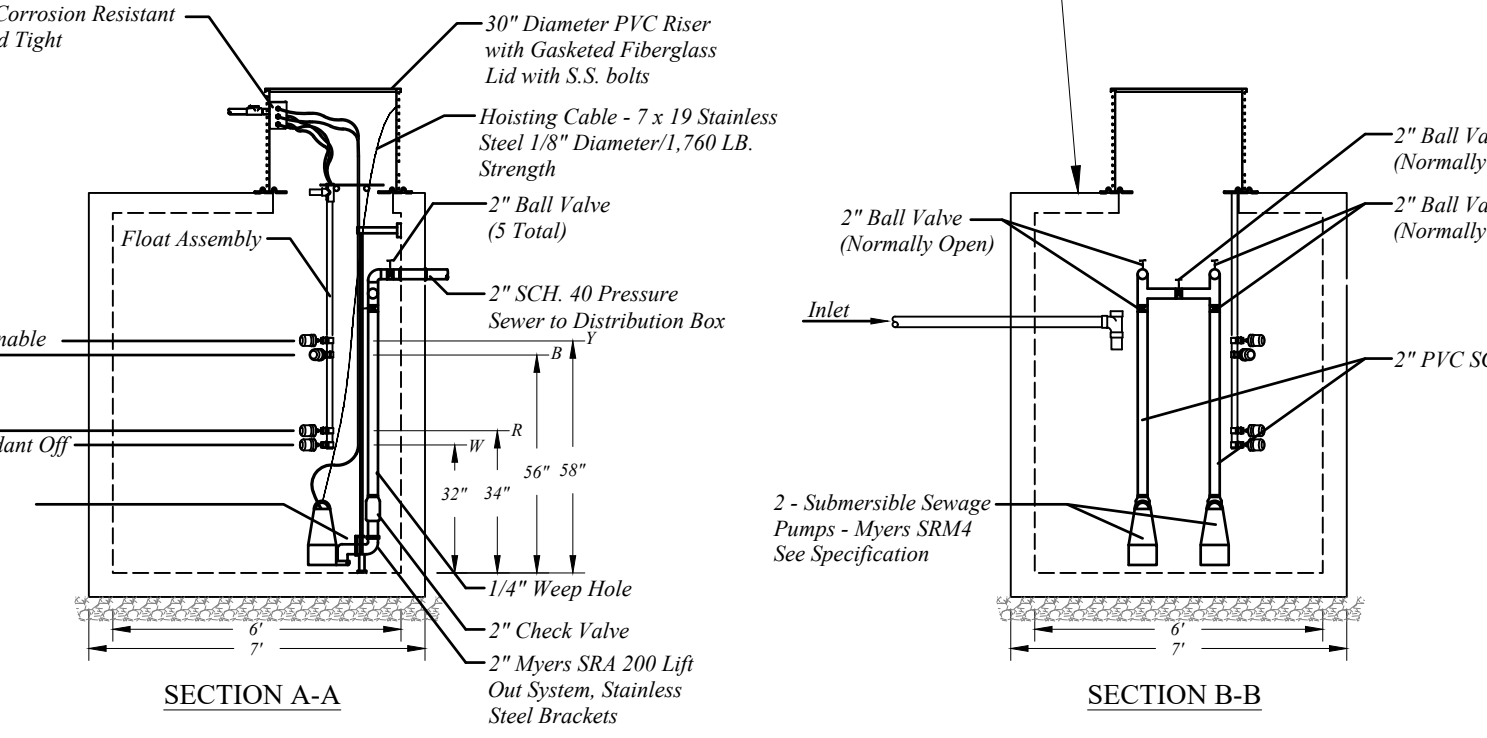
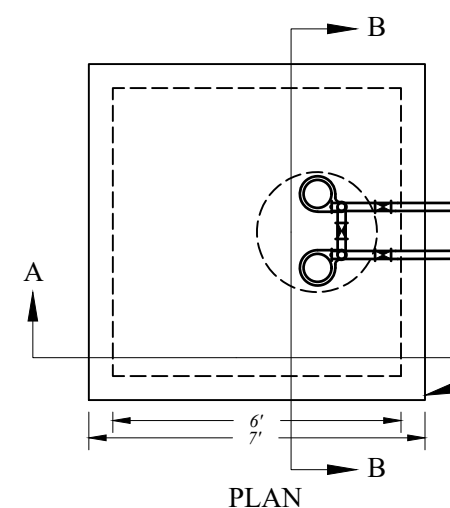
Float Functions	
Y	High Level Alarm & Alternate Pump On
G	Overload Timer ON/OFF
W	LL/HR

- DESIGN NOTES:**
1. CONCRETE 5,000 PSI. @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

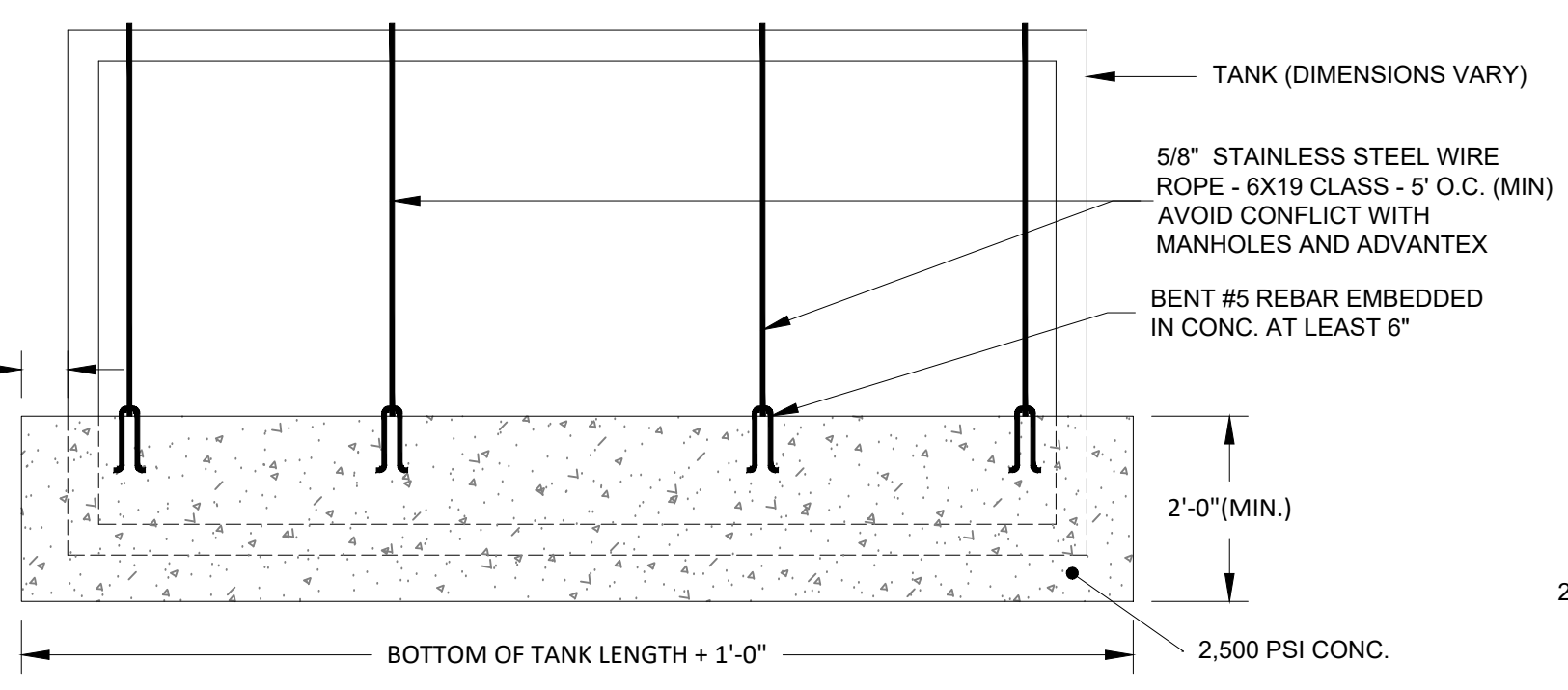


6,000 GALLON RECIRCULATION TANK
SCALE 1" = 4"

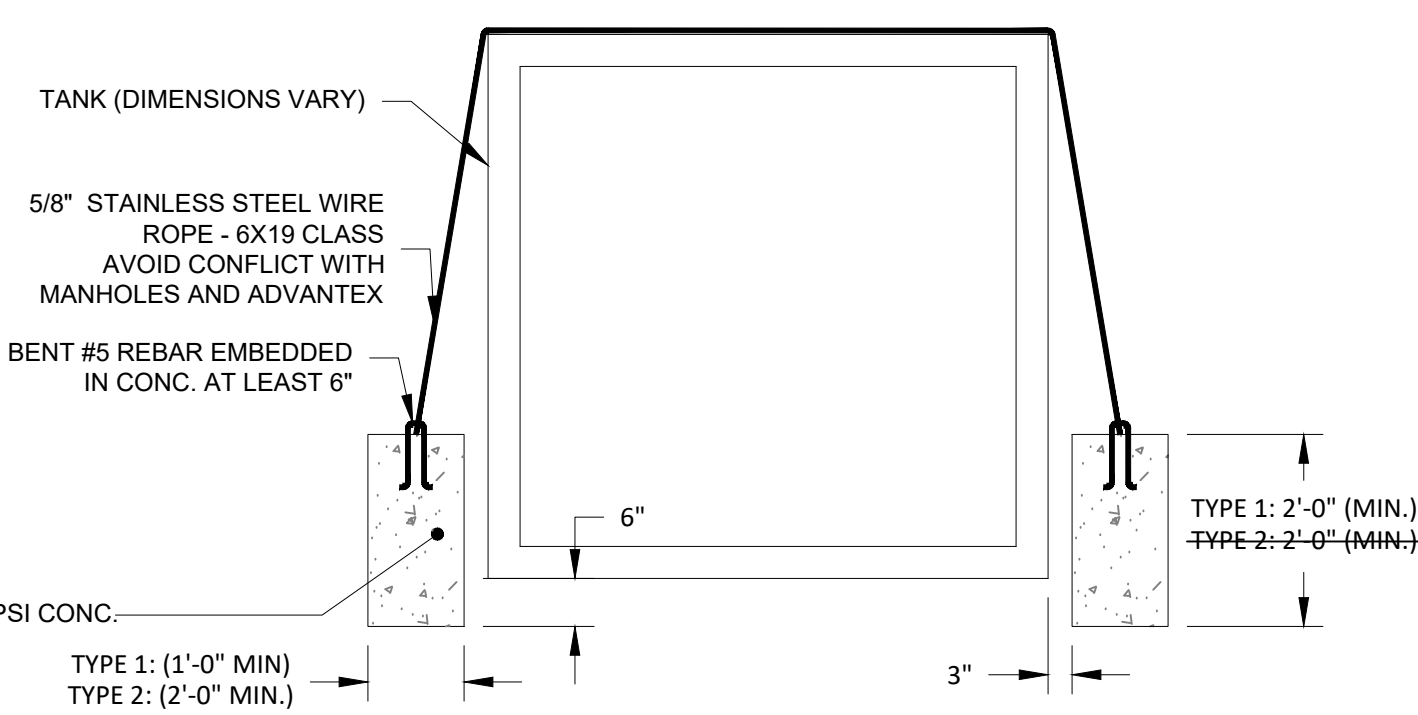
- PUMPING NOTES:**
1. EQUIPMENT FROM OTHER MANUFACTURERS MAY BE USED IF EQUAL APPROVAL FOR ALTERNATE EQUIPMENT REQUIRED FROM ENGINEER PRIOR TO CONSTRUCTION. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY CONTRACTOR.
 2. CONTROL PANEL AND ALARM TO BE MOUNTED IN A CONSPICUOUS LOCATION.
 3. JUNCTION BOX IN PUMP CHAMBER TO HAVE SHUT-OFF SWITCH.
 4. FLOATS ARE TO BE SET TO SPECIFIED ELEVATIONS AND FIELD VERIFIED.
 5. THE PUMP CHAMBER DOSING CONTROLS SHALL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
 6. ELECTRICAL CONNECTIONS MAY BE INSTALLED OUTSIDE PUMP CHAMBER IN SEPARATE HAND HOLE WITH ACCESS FRAME AND COVER TO GRADE MEETING H-20-44 LOADING REQUIREMENTS.



PUMP CHAMBER DETAIL
SCALE 1" = 4"



COUNTER WEIGHT: TANK ANTI-FLOATATION SECTIONS
SCALE 1" = 2"



ANTI-FLOATATION AREA

15,000 GALLON TANK (TYPE 1) - 2 SIDES x 31' 8" LONG x 1' 0" WIDE	= 65.66 S.F.
15,000 GALLON TANK (TYPE 2) - 2 SIDES x 31' 8" LONG x 1' 0" WIDE	= 65.66 S.F.
15,000 GALLON TANK (TYPE 2) - 2 SIDES x 31' 8" LONG x 2' 0" WIDE	= 127.32 S.F.
8,000 GALLON TANK (TYPE 1) - 2 SIDES x 19' 0" LONG x 1' 0" WIDE	= 38.6 S.F.
8,000 GALLON TANK (TYPE 2) - 2 SIDES x 19' 0" LONG x 1' 0" WIDE	= 38.6 S.F.
8,000 GALLON TANK (TYPE 2) - 2 SIDES x 19' 0" LONG x 2' 0" WIDE	= 76.6 S.F.
7,500 GALLON TANK (TYPE 1) - 2 SIDES x 18' 0" LONG x 1' 0" WIDE	= 36.6 S.F.
7,500 GALLON TANK (TYPE 2) - 2 SIDES x 18' 0" LONG x 1' 0" WIDE	= 36.6 S.F.
7,500 GALLON TANK (TYPE 2) - 2 SIDES x 18' 0" LONG x 2' 0" WIDE	= 72.6 S.F.
6,000 GALLON TANK (TYPE 1) - 2 SIDES x 18' 0" LONG x 1' 0" WIDE	= 36.6 S.F.
6,000 GALLON TANK (TYPE 2) - 2 SIDES x 18' 0" LONG x 1' 0" WIDE	= 36.6 S.F.
6,000 GALLON TANK (TYPE 2) - 2 SIDES x 18' 0" LONG x 2' 0" WIDE	= 72.6 S.F.

ANTI-FLOATATION VOLUMES

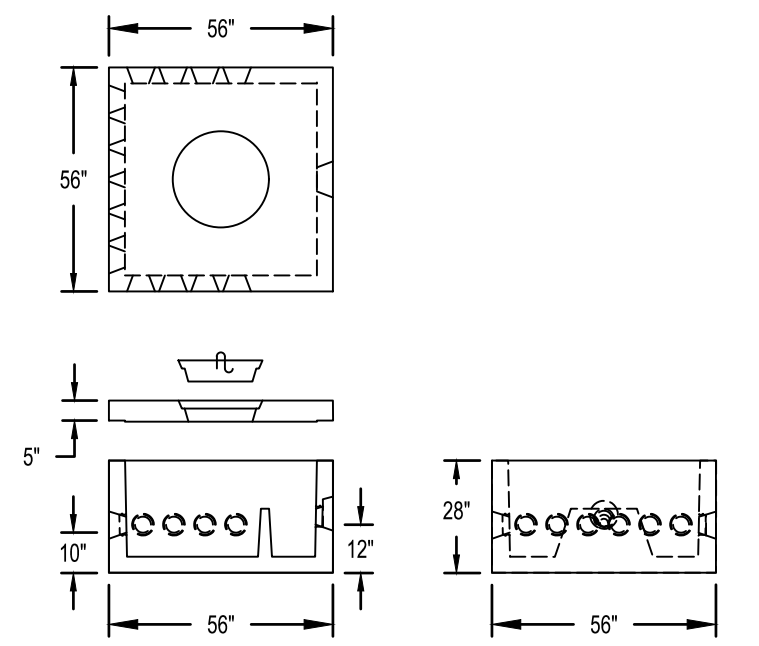
15,000 GALLON TANK (TYPE 1) - 65.66 S.F. x 2.00' HIGH	= 131.32 C.F.
15,000 GALLON TANK (TYPE 2) - 65.66 S.F. x 2.00' HIGH	= 131.32 C.F.
15,000 GALLON TANK (TYPE 2) - 127.32 S.F. x 2.00' HIGH	= 254.64 C.F.
8,000 GALLON TANK (TYPE 1) - 38.6 S.F. x 2.00' HIGH	= 76.6 C.F.
8,000 GALLON TANK (TYPE 2) - 38.6 S.F. x 2.00' HIGH	= 76.6 C.F.
8,000 GALLON TANK (TYPE 2) - 76.6 S.F. x 2.00' HIGH	= 153.2 C.F.
7,500 GALLON TANK (TYPE 1) - 36.6 S.F. x 2.00' HIGH	= 72.6 C.F.
7,500 GALLON TANK (TYPE 2) - 36.6 S.F. x 2.00' HIGH	= 72.6 C.F.
7,500 GALLON TANK (TYPE 2) - 72.6 S.F. x 2.00' HIGH	= 144.4 C.F.
6,000 GALLON TANK (TYPE 1) - 36.6 S.F. x 2.00' HIGH	= 72.6 C.F.
6,000 GALLON TANK (TYPE 2) - 36.6 S.F. x 2.00' HIGH	= 72.6 C.F.
6,000 GALLON TANK (TYPE 2) - 72.6 S.F. x 2.00' HIGH	= 144.4 C.F.

CONSTANTS (WEIGHTS)

CONCRETE	150 POUNDS/C.F.
WATER	62.4 POUNDS/C.F.
SUBMERGED CONCRETE	87.6 POUNDS/C.F.

WEIGHT OF ANTI-FLOATATION IN PLACE

15,000 GALLON TANK (TYPE 1) - 131.32 C.F. x 87.6 POUNDS/C.F.	= 11,503.6 POUNDS
15,000 GALLON TANK (TYPE 2) - 131.32 C.F. x 87.6 POUNDS/C.F.	= 11,503.6 POUNDS
15,000 GALLON TANK (TYPE 2) - 254.64 C.F. x 87.6 POUNDS/C.F.	= 22,306.5 POUNDS
8,000 GALLON TANK (TYPE 1) - 76.6 C.F. x 87.6 POUNDS/C.F.	= 6,697.8 POUNDS
8,000 GALLON TANK (TYPE 2) - 76.6 C.F. x 87.6 POUNDS/C.F.	= 6,697.8 POUNDS
8,000 GALLON TANK (TYPE 2) - 153.2 C.F. x 87.6 POUNDS/C.F.	= 13,395.6 POUNDS
7,500 GALLON TANK (TYPE 1) - 72.6 C.F. x 87.6 POUNDS/C.F.	= 6,399.2 POUNDS
7,500 GALLON TANK (TYPE 2) - 72.6 C.F. x 87.6 POUNDS/C.F.	= 6,399.2 POUNDS
7,500 GALLON TANK (TYPE 2) - 144.4 C.F. x 87.6 POUNDS/C.F.	= 12,614.4 POUNDS
6,000 GALLON TANK (TYPE 1) - 72.6 C.F. x 87.6 POUNDS/C.F.	= 6,399.2 POUNDS
6,000 GALLON TANK (TYPE 2) - 72.6 C.F. x 87.6 POUNDS/C.F.	= 6,399.2 POUNDS
6,000 GALLON TANK (TYPE 2) - 144.4 C.F. x 87.6 POUNDS/C.F.	= 12,614.4 POUNDS



DISTRIBUTION BOX WITH 14 OUTLETS
SCALE 1" = 4"

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS PRECAST STRUCTURES DETAILS

Dwg: Scale: 1" = 20'
Contract No. x Date: JANUARY, 2023

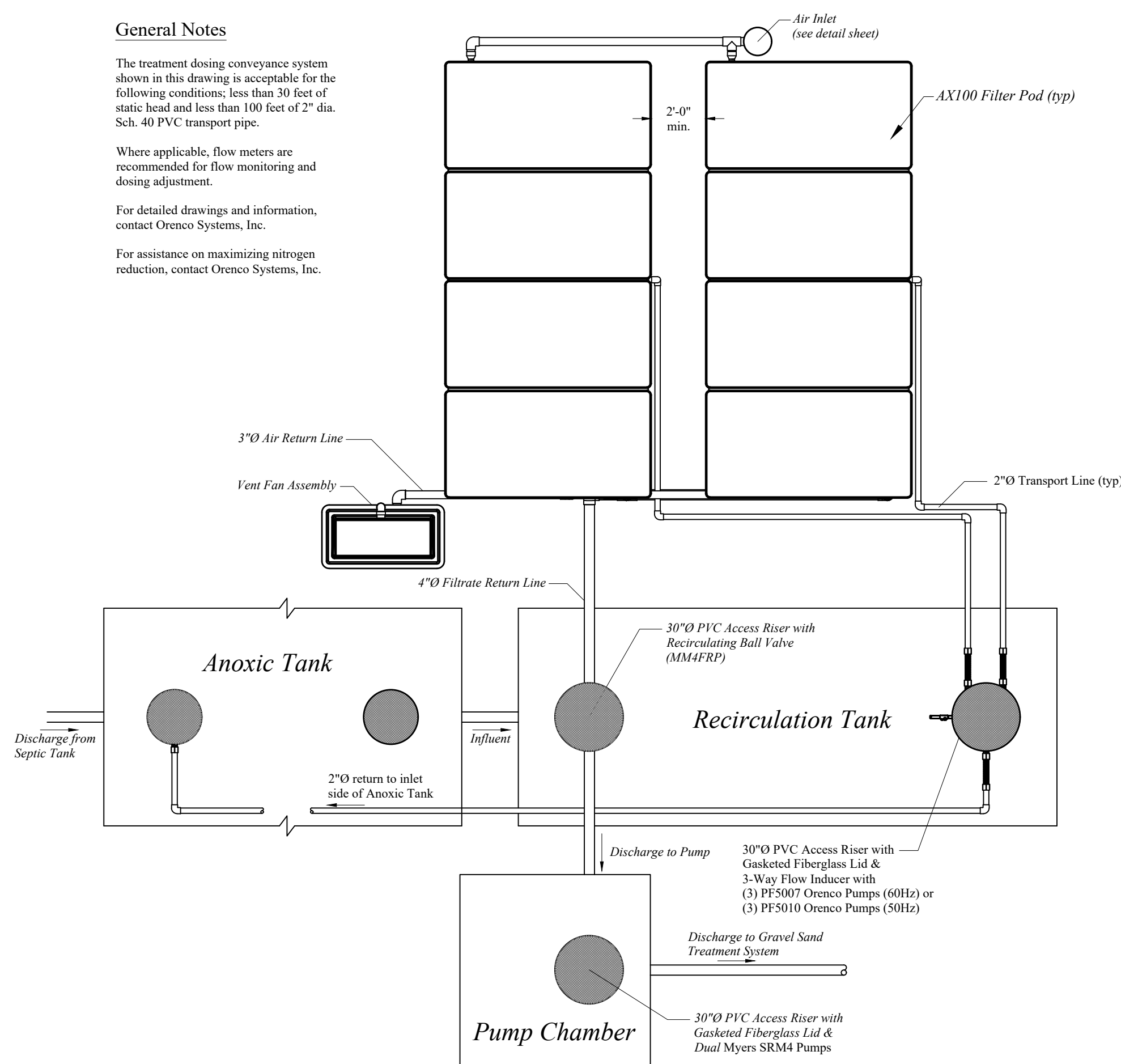
General Notes

The treatment dosing conveyance system shown in this drawing is acceptable for the following conditions: less than 30 feet of static head and less than 100 feet of 2" dia. Sch. 40 PVC transport pipe.

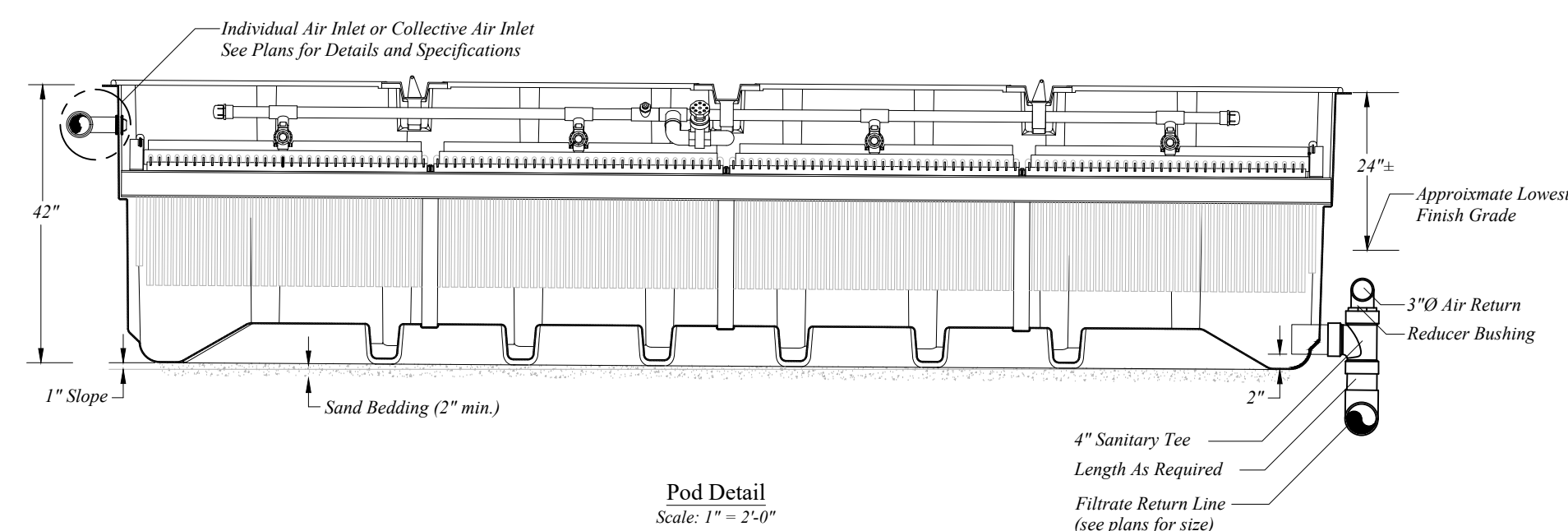
Where applicable, flow meters are recommended for flow monitoring and dosing adjustment.

For detailed drawings and information, contact Oresco Systems, Inc.

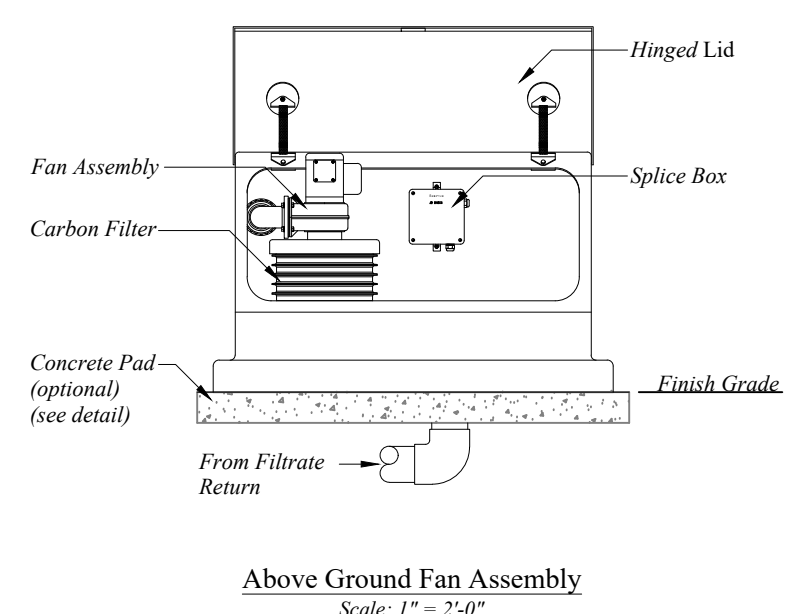
For assistance on maximizing nitrogen reduction, contact Oresco Systems, Inc.



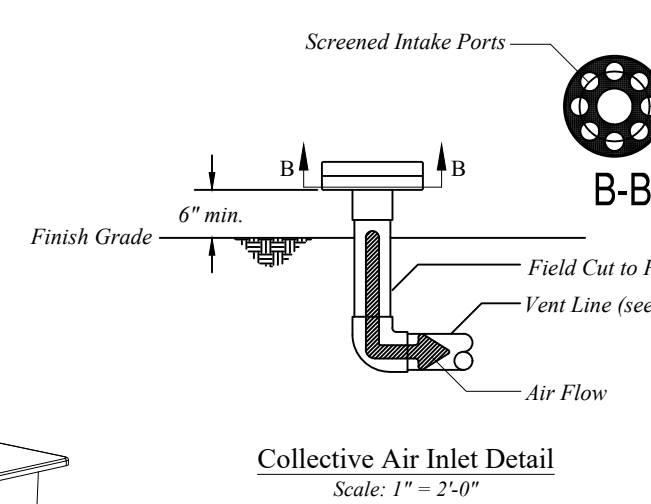
**AdvanTex AX100 SYSTEM - MANIFOLDED VENT INLET
2 POD CONFIGURATION**
SCALE 1" = 4'



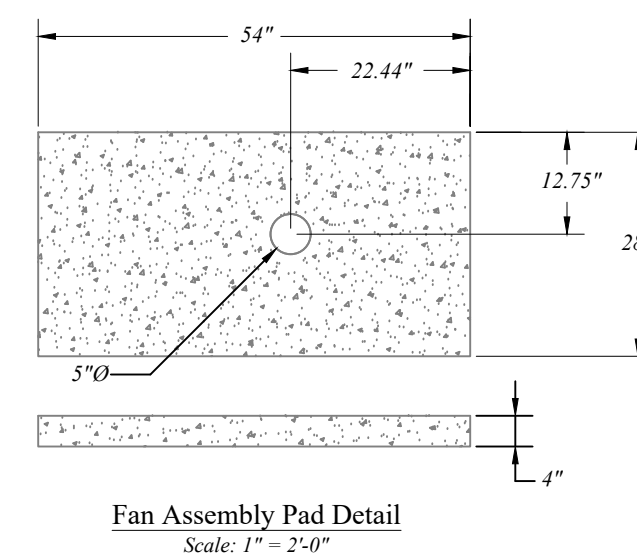
Pod Detail
Scale: 1" = 2'-0"



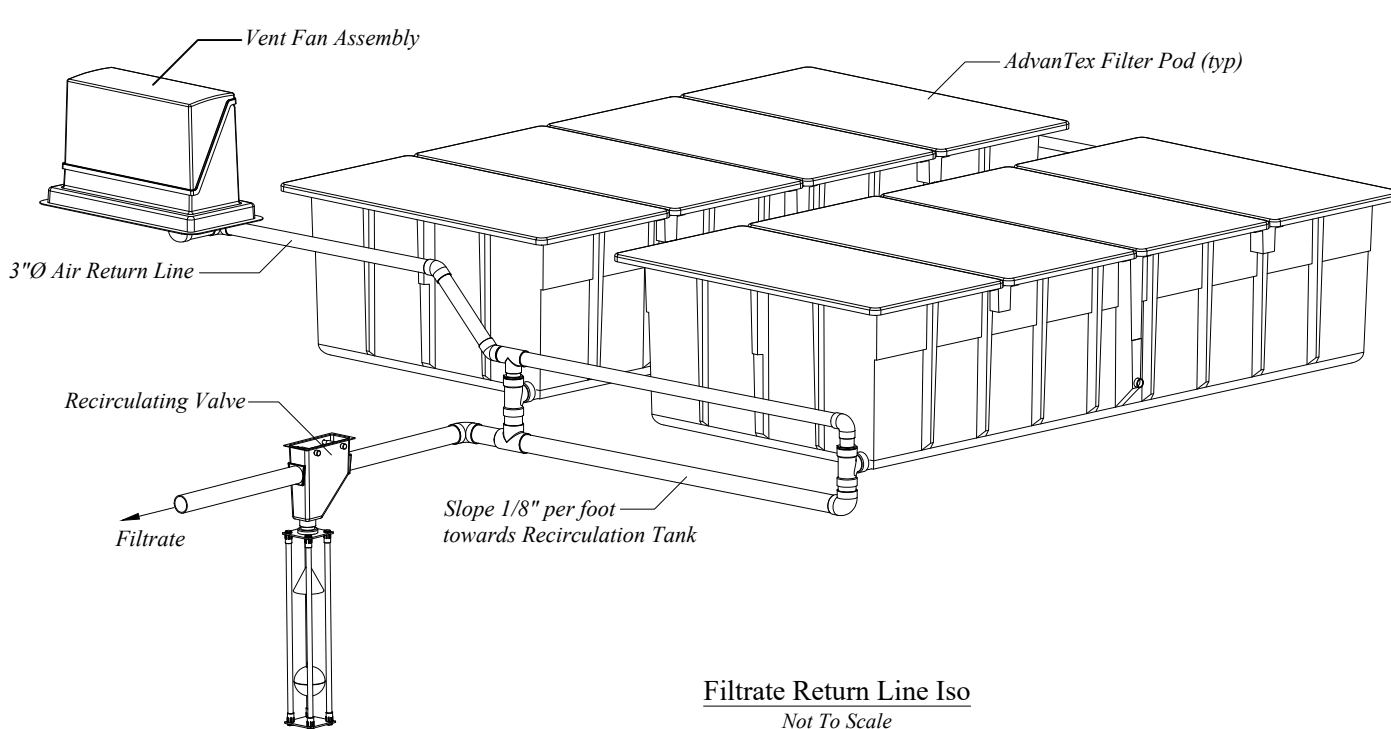
Above Ground Fan Assembly
Scale: 1" = 2'-0"



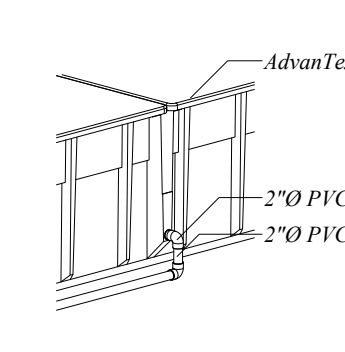
Collective Air Inlet Detail
Scale: 1" = 2'-0"



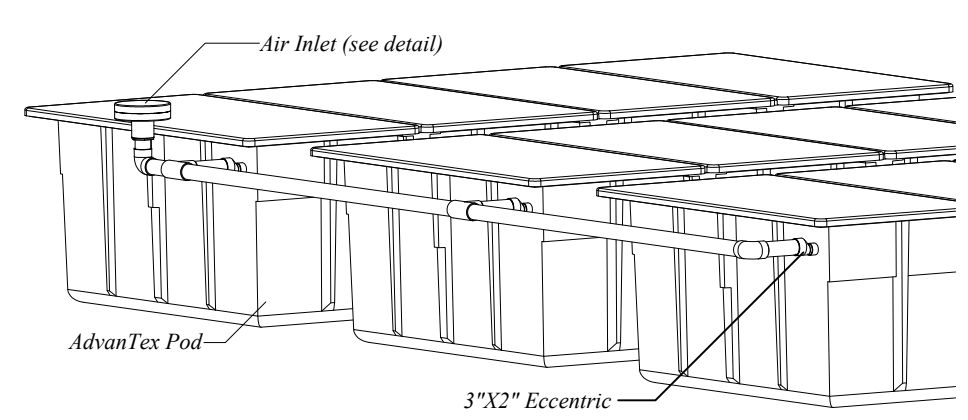
Fan Assembly Pad Detail
Scale: 1" = 2'-0"



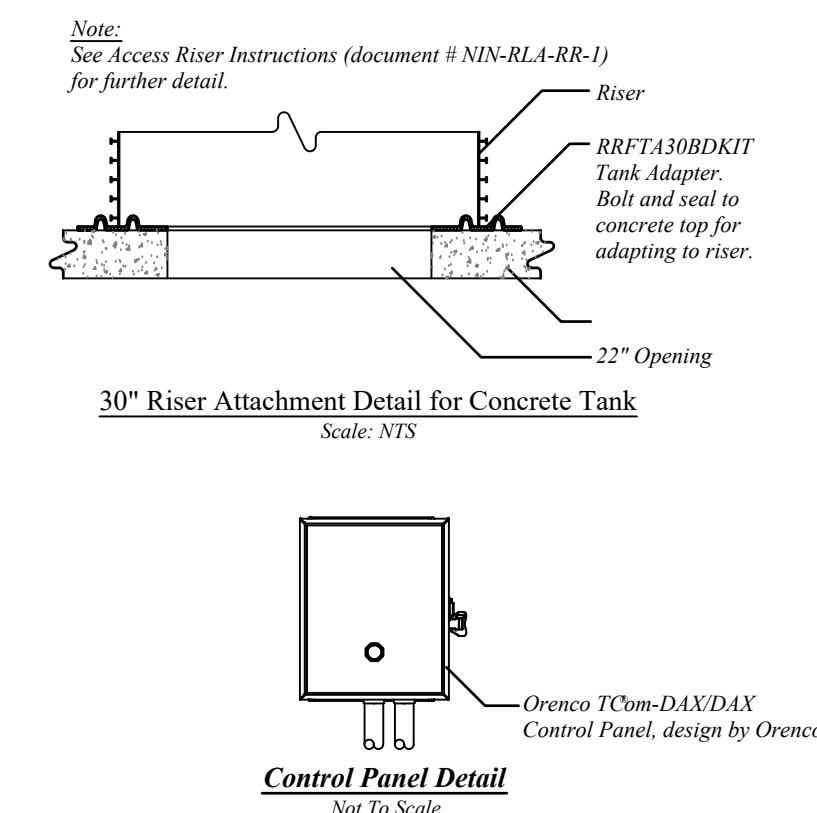
Filtrate Return Line Iso
Not To Scale



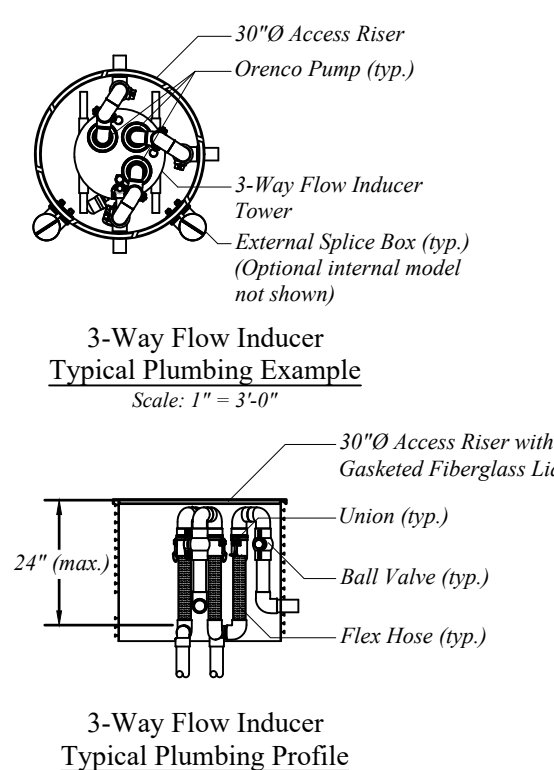
Typical Pod Inlet Connection
Not To Scale



Collective Air Inlet Option
Not To Scale

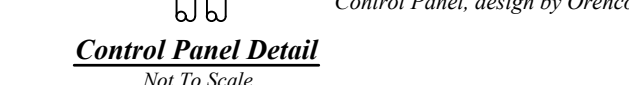


30" Riser Attachment Detail for Concrete Tank
Scale: NTS

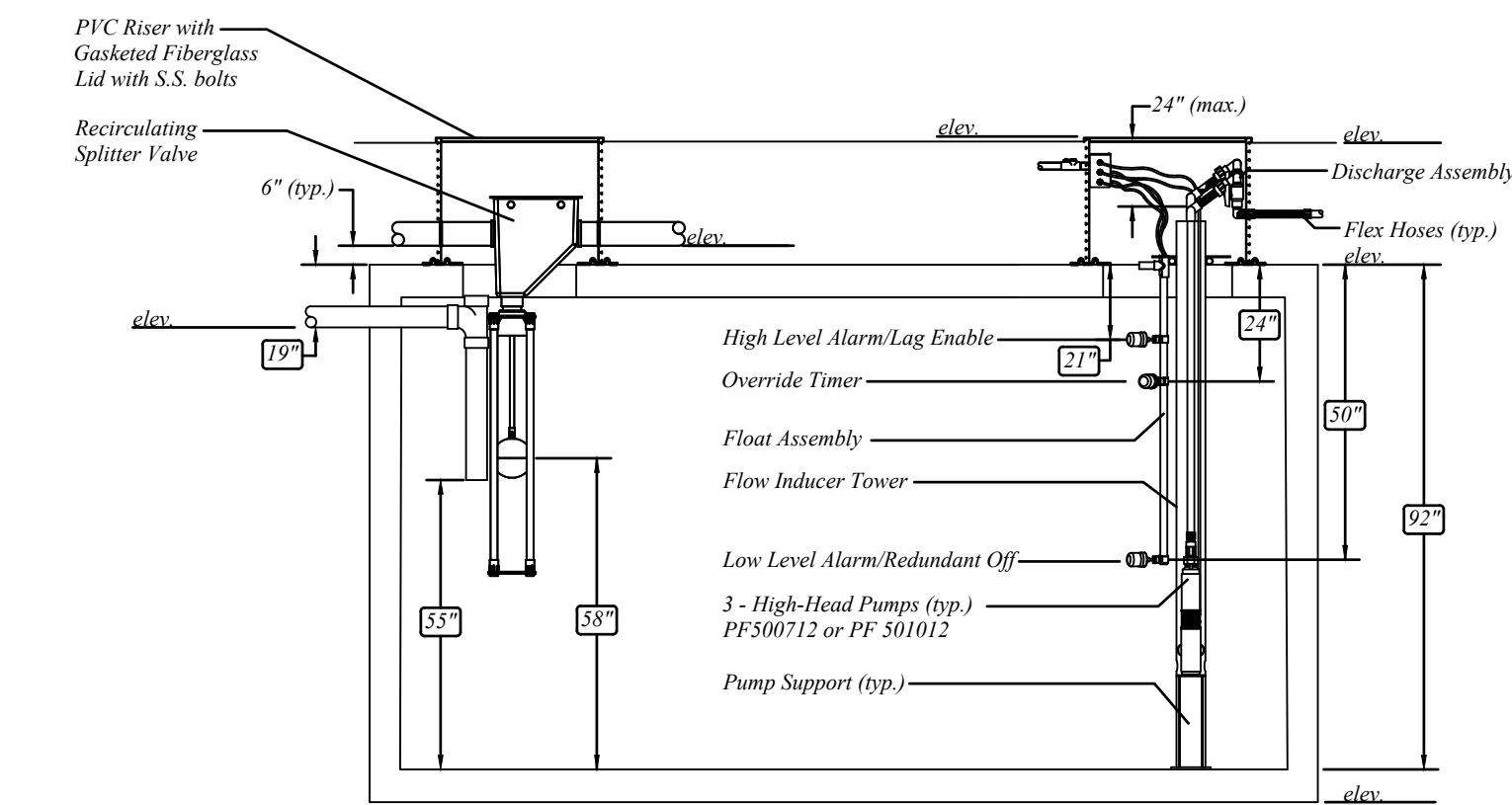


Typical Plumbing Example
Scale: 1" = 3'-0"

Typical Plumbing Profile
Scale: 1" = 3'-0"

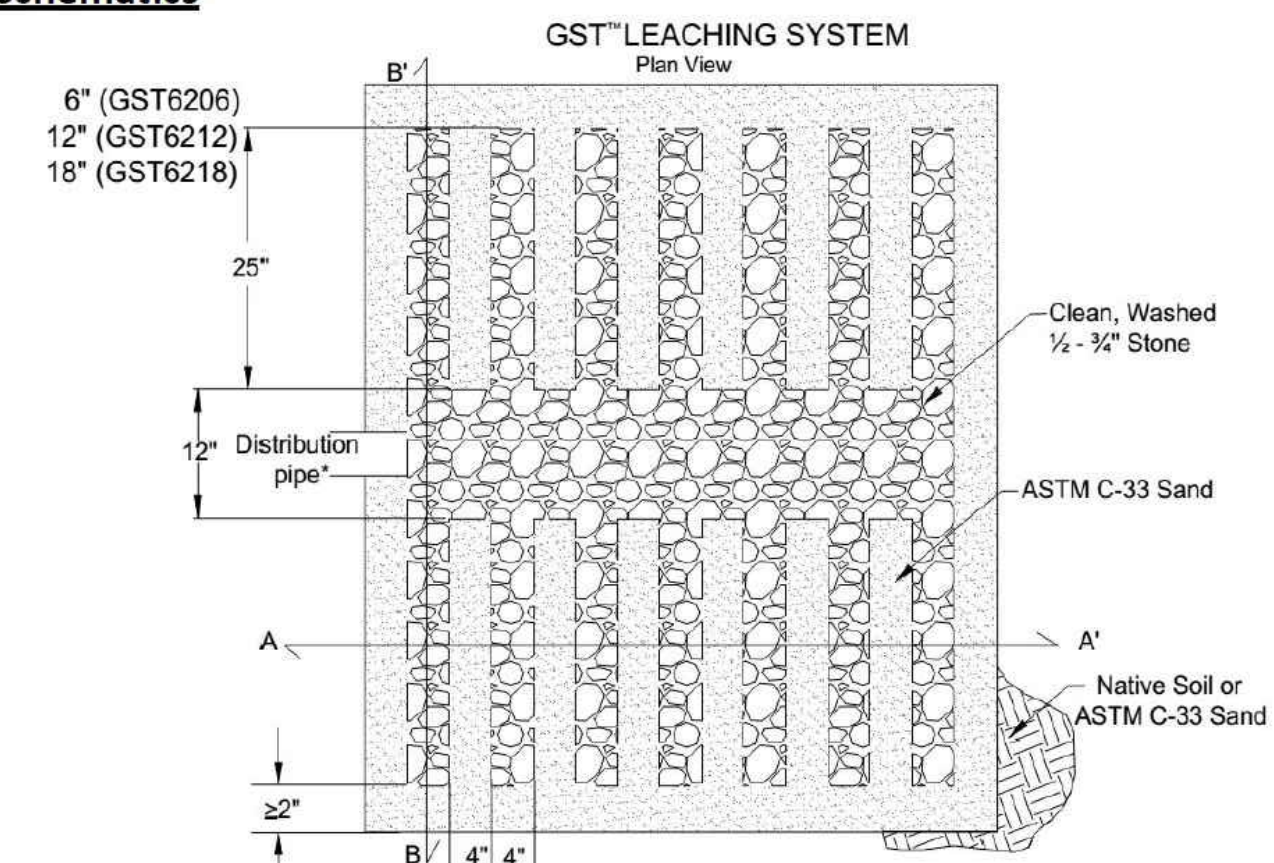


Control Panel Detail
Not To Scale



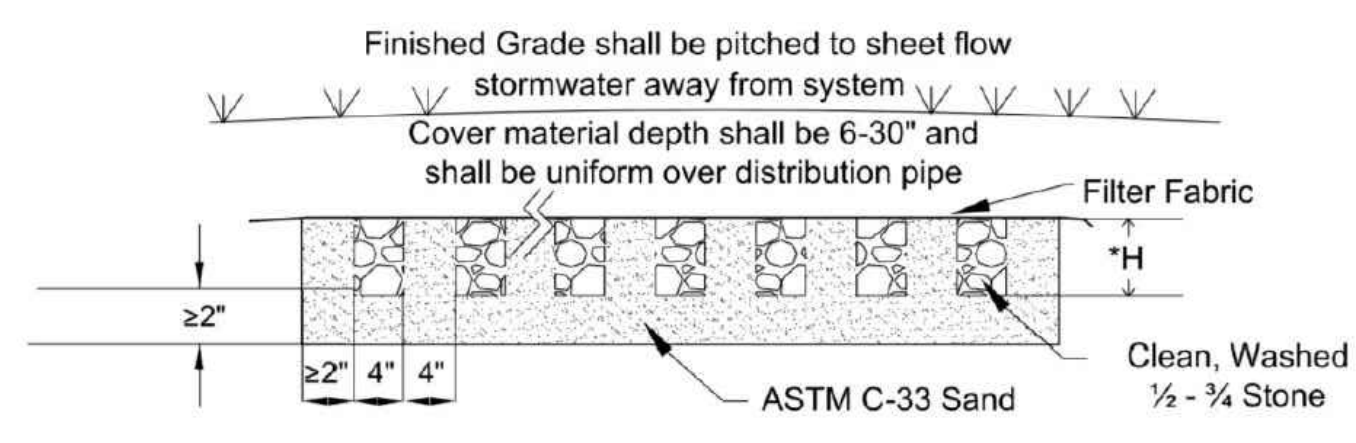
RECIRCULATION TANK FLOAT AND RSV SETTINGS
NOT TO SCALE

GST Schematics

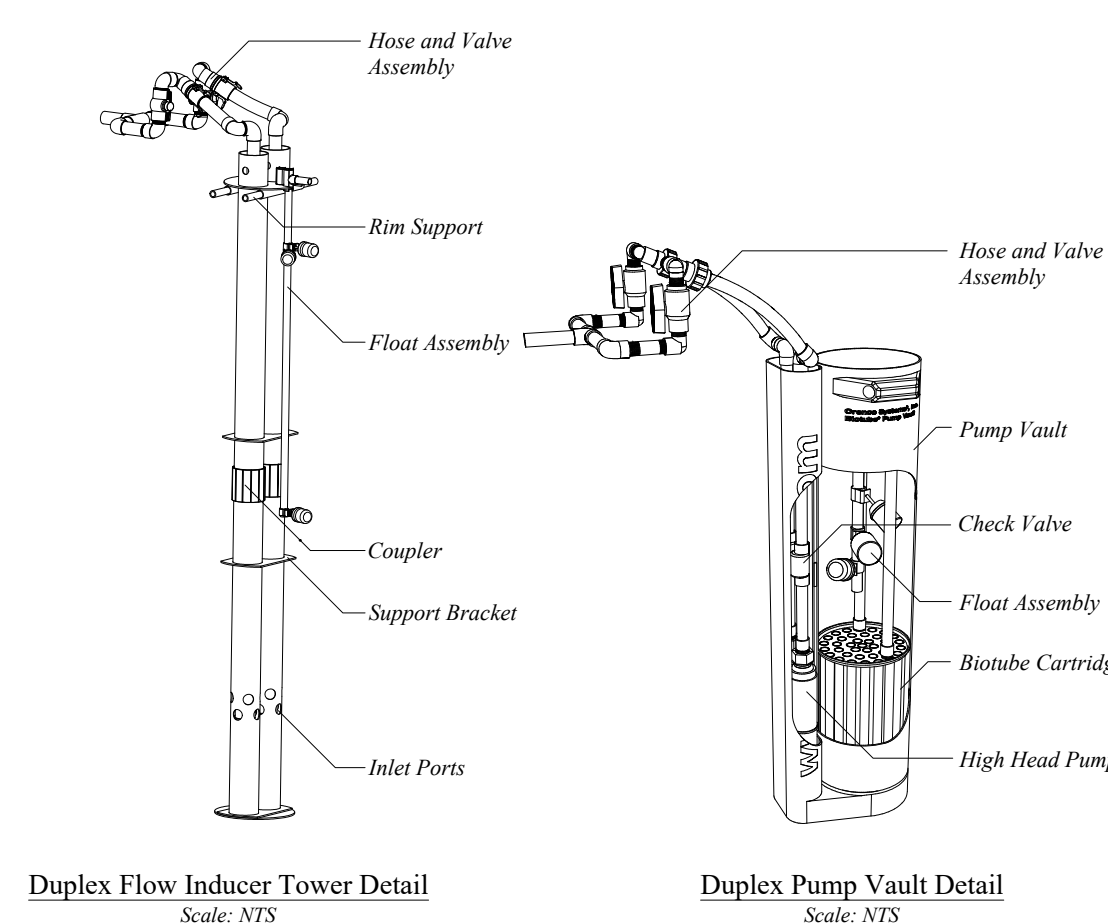
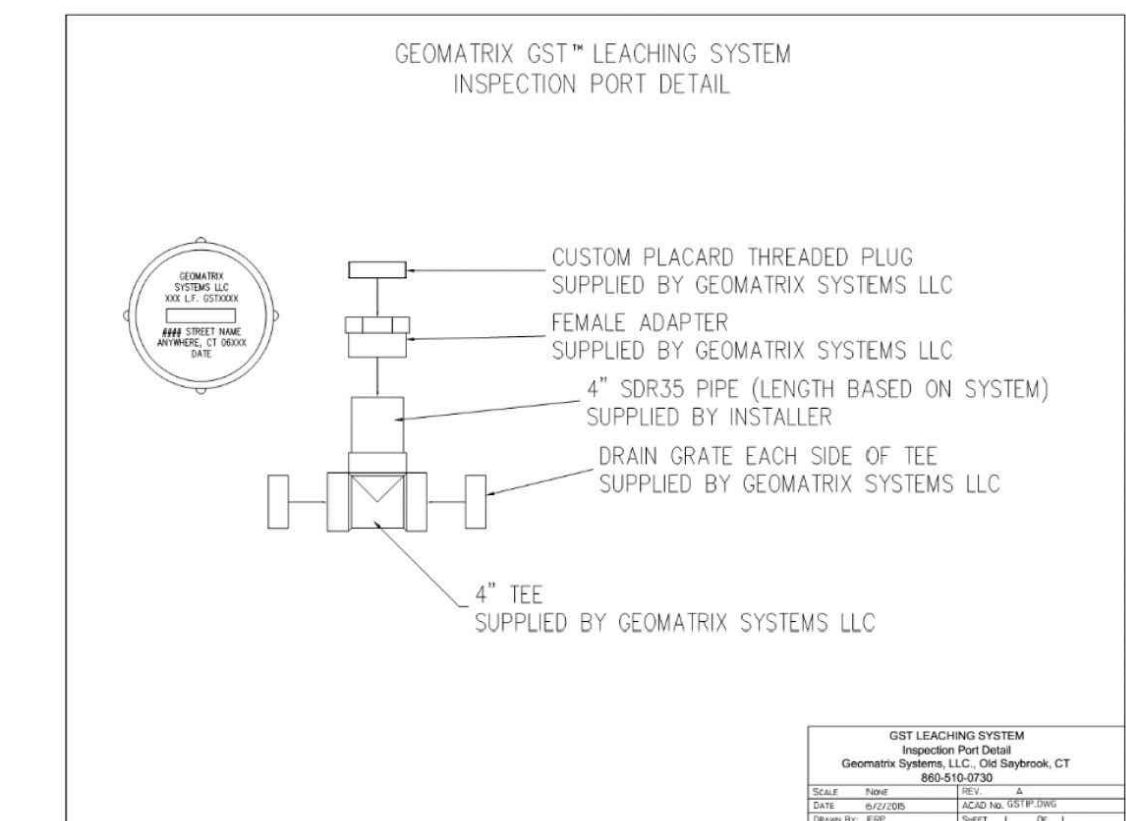
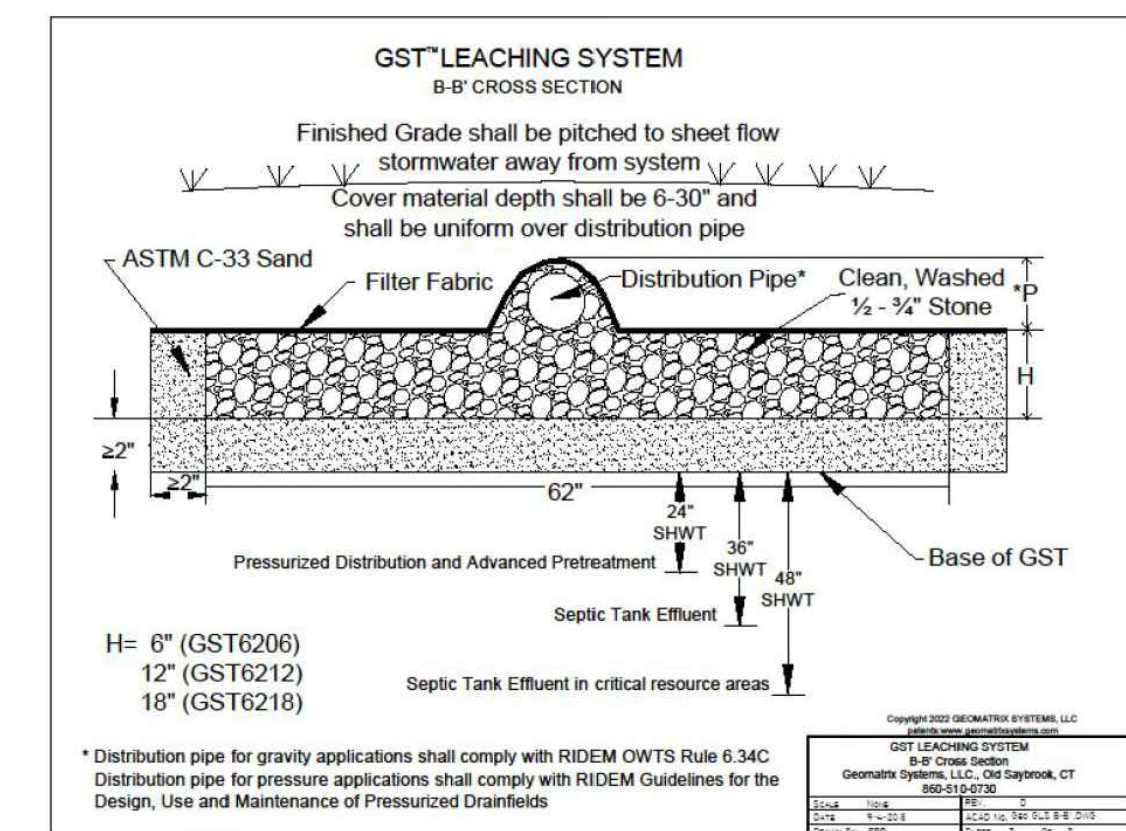


* Distribution pipe for gravity systems shall comply with RIDEM DWTS Rule 6.34C. Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

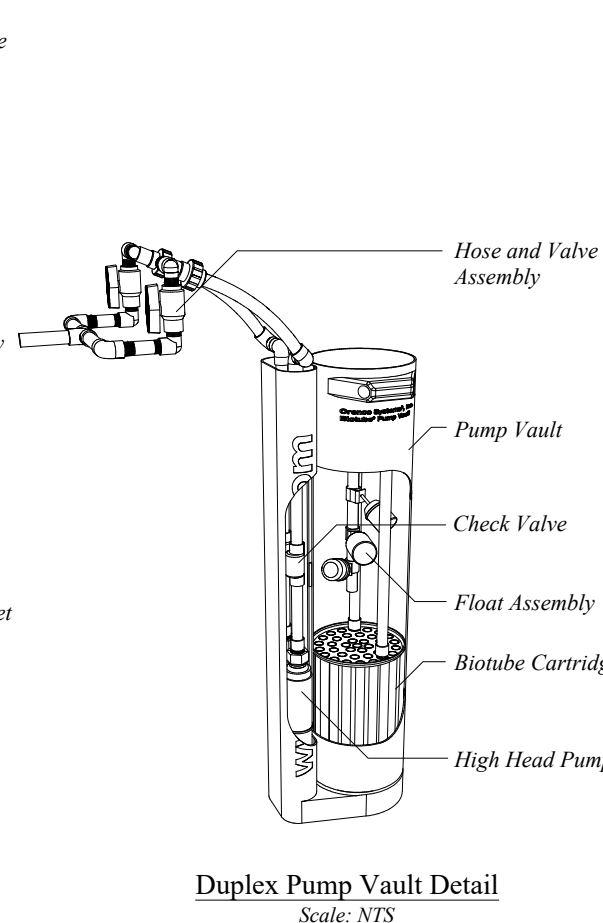
**GEOMATRIX GST LEACHING SYSTEM
A-A' CROSS SECTION**



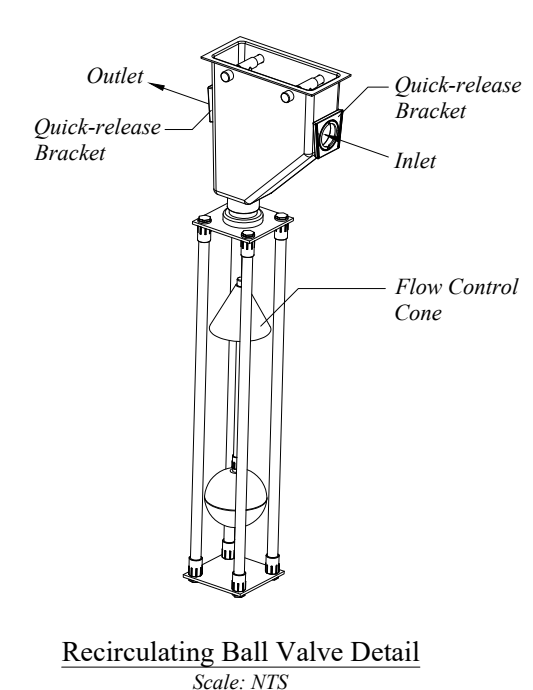
*H= 6" (GST6206)
12" (GST6212)
18" (GST6218)



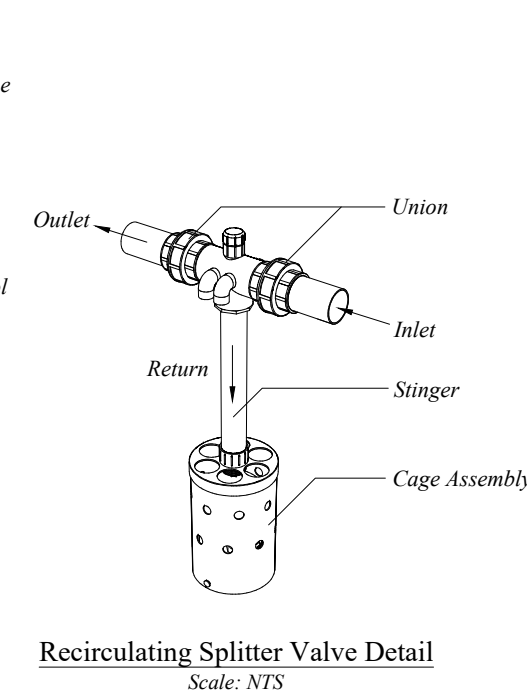
Duplex Flow Inducer Tower Detail
Scale: NTS



AdvanTex AX100 SYSTEM - MISCELLANEOUS DETAILS
SCALE: VARIES



Recirculating Ball Valve Detail
Scale: NTS



Recirculating Splitter Valve Detail
Scale: NTS

BURLINGAME STATE PARK AND CAMPGROUND

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS DETAILS

Dwg: Scale: 1" = 20'
Contract No. x Date: JANUARY, 2023

C-3.2
22



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

20.0179 7A,7B
SHEET 1-2
12/23/21



Site Evaluation Form

Part A - Soil Profile Description

Application Number

Property Owner: RHODE ISLAND STATE OF (DEM) DIVISION OF PARKS

Property Location: 1-100 BURLINGAME PARK RD, CHARLESTOWN, RI PLAT 15 LOT 10

Date of Test Hole: 12/23/21

Soil Evaluator: KAMAL HINGORANY License Number: D4005

Weather: CLOUDY Shaded: Yes [X] No [] Time: 10:30AM

Table with 11 columns: TH Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Contains two soil profile sections (7A and 7B).

TH 7A Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 58" (og)

TH 7B Soil Class B Total Depth 100" Impervious/Limiting Layer Depth 100" (og) GW Seepage Depth - SHWT 48" (og)

Comments:





Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer

Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*

***OFFSETS MUST BE SHOWN**

Key:

-  Approximate location of test holes
-  Approximate location of bedrock test holes
-  Estimated gradient and direction of slope
-  Approximate direction of due north



1. Relief and Slope: _____
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO YES XX
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO YES XX
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO YES XX
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO YES
8. Site's potential for flooding or ponding: NONE SLIGHT MODERATE SEVERE
9. Landscape position: SHOULDER
10. Vegetation: GRASS/DIRT
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site: _____
ITEMS 2,4 AND 6 DONE BY CAPUTO & WICK

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: KAMAL HINGORANY D4005 Part B prepared by: KAMAL HINGORANY D4005
Signature License # Signature License #

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur Inconclusive Disclaim

Unwitnessed Soil Evaluations Decision: Accept Inconclusive Disclaim

Wet Season Determination required Additional Field Review Required

Explanation: _____

Signature Authorized Agent Date



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

20.0179 1A,1B
SHEET 1-2



Site Evaluation Form
Part A - Soil Profile Description

Application Number

Property Owner: RHODE ISLAND STATE OF (DEM) DIVISION OF PARKS

Property Location: 1-100 BURLINGAME PARK RD, CHARLESTOWN, RI PLAT 15 LOT 10

Date of Test Hole: 8/17/21

Soil Evaluator: KAMAL HINGORANY License Number: D4005

Weather: CLOUDY Shaded: Yes [] No [x] Time: 9:30 AM

Table with 11 columns: TH Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Contains data for TH 1A and TH 1B horizons.

TH 1A Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 49" (og)

TH 1B Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 60" (og)

Comments:

Part B

Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer





20.0179 1A,1B
SHEET 2-2

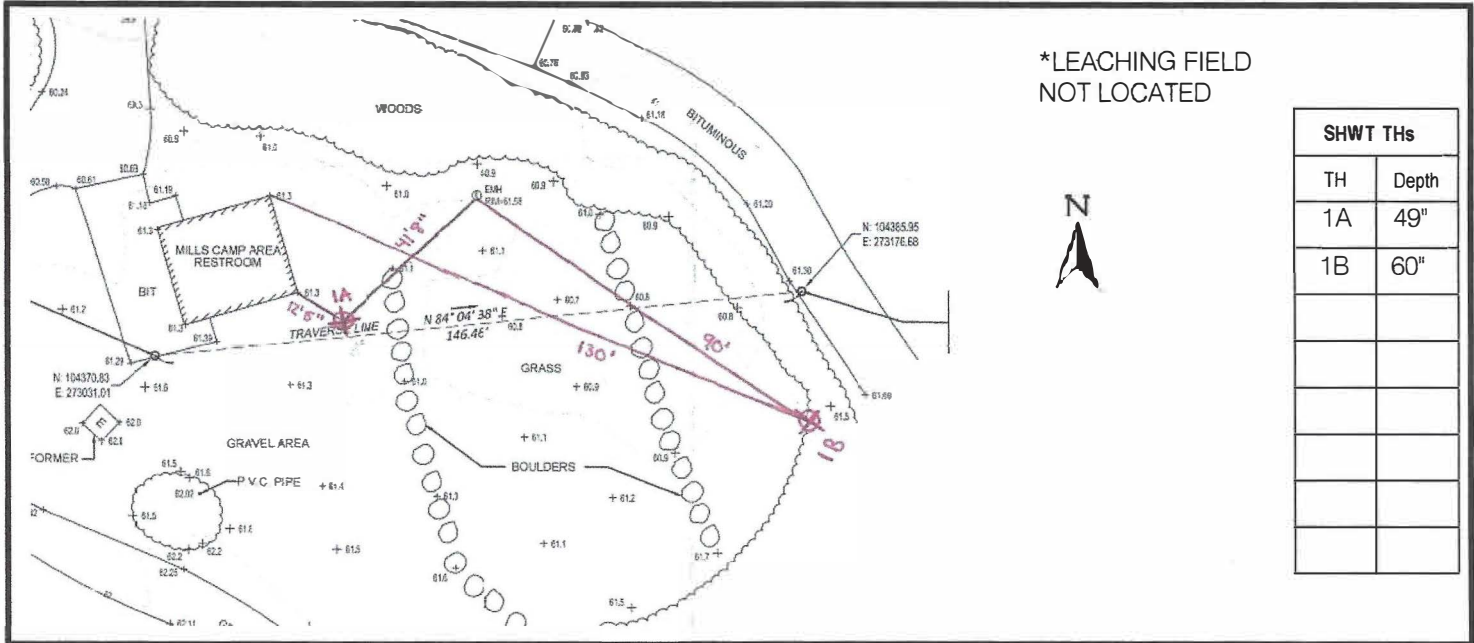
Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*

***OFFSETS MUST BE SHOWN**

Key:

-  Approximate location of test holes
-  Approximate location of bedrock test holes
-  Estimated gradient and direction of slope
-  Approximate direction of due north



1. Relief and Slope: _____
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO YES
8. Site's potential for flooding or ponding: NONE SLIGHT MODERATE SEVERE
9. Landscape position: SHOULDER
10. Vegetation: GRASS
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site: _____

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: [Signature] D4005
Signature License #

Part B prepared by: [Signature] D4005
Signature License #

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur Inconclusive Disclaim

Unwitnessed Soil Evaluations Decision: Accept Inconclusive Disclaim

Wet Season Determination required Additional Field Review Required

Explanation: _____

Signature Authorized Agent

Date



Mills Camp Bathhouse and System Replacement Project
Burlingame State Park and Campground
Charlestown, Rhode Island

DESIGN NARRATIVE

RIDEM is in the process of replacing the Bathhouse and Onsite Wastewater System (OWTS) at this location. Soil logs can be found on Sheet C-1.1 together with the proposed site layout and System Design Data and Notes. Details for the system are on Sheets C-2.1, C-3.1 and C-3.2.

Soil evaluations for this OWTS location were conducted on August 17, 2021, and December 23, 2021, soils are Category 3 and the Estimated Seasonal High Water Table depth at the OWTS is 48" or at elevation 57.9±.

In total the six bathhouses for the overall campground accommodate approximately 720 campsites. Utilizing the RIDEM wastewater design flow for a campground with washroom and toilets of 50 gallons per day we determine a daily flow for the entire campground to be approximately 36,000 gallons per day (GPD). The average daily flow per acre of the campground is (36,000 GPD / 847 Acres) 42.5 GPD/Acre. The average daily flow for each bathhouse is approximately 6,000 GPD. In calculating an estimated daily flow for the Mill Camp Bathhouse OWTS we took a conservative approach utilizing 150 campsites at 50 GPD/campsite to determine a design flow for the Mill Camp Bathhouse to be 7,500 GPD which is greater than the 6,000 GPD average. Please see the attached campsite map which depicts the campsites (as highlighted) chosen to be included within the 150 sites utilized for sizing the OWTS. Please note that sites throughout the campground overlap to agree with the conservative estimate. The system as sized is oversized and is considered a large system. The system is used on a seasonal basis between the months of April and October.

The OWTS will utilize Two (2) Orenco AdvanTEX AX100 Pods for advanced treatment. This system is a Category 1 advanced treatment technology. The system will treat the wastewater and reduce the biochemical oxygen demand (BOD) and comply with the latest Orenco system design criteria and thus the RIDEM OWTS criteria. See attached Final Design Review Letter.

The systems drainfield is designed as a Geomatrix Gravel Sand Treatment (GST) System. The Loading Rate for Category 1 Technology for the GST is 3.5 GPD/square feet (SF). The minimum size drainfield is 7,500 GPD/3.5 GPD/SF which equals 2,143 SF. We propose to use the GST 6212 and the minimum size drainfield requirement for this application is 123 lineal feet (LF). We propose to use the 280 lineal feet (LF) of GST 6212 which provides 17.5 S.F. per LF, which equals 4,900 SF. and is greater than 2,143 SF (minimum size). The GST system has been divided into to equal drainfields and the GST are spaced 7'6" on center. The two drainfields consist of 5 rows each 28 feet long and 62" wide with a stone depth of 12" below the 4" perforated distribution pipe. See pump selection and system specifications on Sheet C-2.1 for additional information.

WATCHAUG POND



FISH CAMP AREA
150

400 AREA

MAIN CAMP AREA
146

A150

B150

LEGIONTOWN
CAMP AREA
156

500 AREA

MILLS CAMP AREA
150

- CHECK STATION
- PERMITS
- COMFORT STATION

TO WESTERLY TO WAKEFIELD & PROVIDENCE



BURLINGAME STATE PARK
RHODE ISLAND DEPT. OF
ENVIRONMENTAL MANAGEMENT

DEVELOPED BY:
PARE
PARE CORPORATION
RICHMOND SQUARE PLAZA
1 RUDOLPH VALLEY PLACE
LITCHFIELD, RI 02881
402-334-1178

LEGEND

- A TENTS ONLY
- B SMALL TRAILERS
- C LARGE TRAILERS AND MOTORHOMES
- M MOTORHOMES
- P PORTAJONS
- Ⓐ WATER
- ▨ RESTROOMS WITH SHOWERS
- ★ DUMPING STATIONS
- CABIN
- D DUMPSTERS

01/19/2023

Kevin Harrop
Caputo & Wick
1150 Pawtucket Ave
Rumford, RI 02916

Subject: Final Design Review of Burlingame Park/Mills Camp

Kevin,

Orenco Systems, Inc. (“Orenco”) has received the Plans with all required fields completed (attached to this letter), a copy of the plan set showing the designed site layout and configuration plans, and other documents that comprise the Final Design for the Burlingame Park project. Orenco staff reviews the Final Design of all wastewater collection and treatment systems for commercial applications to ensure that the design is compliant with the most current version of the system’s applicable design criteria published by Orenco for the specified parameters provided by the system’s designer in the Plans. The findings and conclusions of my review of this Final Design are as follows:

Design Basis

The system has been designed for a Type 2, Park application. Influent flow and constituent concentrations and effluent constituent concentration requirements have been provided by the system’s designer on the attached Plans and were used in my review of the Final Design.

The influent flow on the Plans were not extrapolated from the metered flows from the subject site, but in our experience, they are consistent with influent flows from other, similar Type 2, Park systems that Orenco has previously observed. As such, I have no reason to doubt the accuracy of the designer’s findings and assumptions as to the influent flow, and find that it was reasonable for the designer to use them as the design basis for the system.

System Design

The proposed Final Design of the system consists of a park. Influent will enter a 15,000 gallon Primary Tank, which will then flow into a 7,500 gallon Pre-Anoxic Tank. From here, flow will gravity discharge into a 6,000 gallon Recirculation Tank. The recirc-filtrate blend in this tank will pump into (2) AX100 pods and the filtrate will enter a splitter valve in the front of the Recirculation Tank where it will either be recirculated again or siphon to a drain field..

Design Criteria

The applicable design criteria for this system, which I used to conduct the review of its Final Design, is revision 8.0 of document NDA-ATX-1, titled *Orenco[®] AdvanTex[®] Design Criteria, Commercial Treatment Systems*, which was published by Orenco in October, 2020. A copy of the design criteria can be downloaded from Orenco’s online document library at www.orenco.com/corporate/doclibrary.cfm.

Findings

The findings of my review as to whether the Final Design complies with Orenco’s design criteria for treating wastewater to the effluent constituent concentration requirements provided in the Plans are as follows:

Primary Treatment

The Final Design specifies the use of 1 - 15,000 U.S. Gallon Primary concrete and 1 - 7,500 U.S. Gallon Primary concrete tanks in series for primary treatment. Using the flow data specified on the Plans the hydraulic retention times for grease capture and primary treatment calculate as follows:

Primary Tank(s) Hydraulic Retention Time (HRT)¹				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Effective Combined Primary Tankage (gpd)	Avg HRT (days)	Max Day HRT (days)
3,500	7,500	22,500	6.4	3.0

¹ Design Max Day Flow is the maximum daily flow a facility is expected to receive no more than one day within any week’s time.

The Primary Tank Sizing Recommendations states that the recommended primary tankage for a Park treatment system should be sized to at a minimum of 3 days of hydraulic retention time at the Design Max Day Flow. Therefore, the configuration and specifications of the primary treatment tanks in the Final Design satisfy Orenco’s recommendation for primary tankage for this Park application. This pre-anoxic tank should be sized equal to one day at maximum day design flow and is considered part of the overall primary tank volume.

Recirculation Tank — Standard Stage

The Final Design further specifies the use of 1 - 6,000 U.S. Gallon concrete tank for recirculation and blending of the AdvanTex-treated effluent with primary tank effluent. Using the flow data specified on the Plans the tank is sized to be equal to 80% of the Maximum Day Design Flow. The recirculation tank for the standard stage should be sized at a minimum of 75% of the Maximum Day Design Flow. Therefore, the specification of the recirculation-blend tank in the Final Design satisfies Orenco’s design criteria.

Hydraulic Load — Standard Stage

The Final Design specifies the use of 2 - AX100 pods, which contain a nominal surface area of 200 square feet of treatment media. Using the flow data specified on the Plans the hydraulic loading rate for the system calculates as follows:

Hydraulic Loading Rate (HLR) — Standard Stage				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Nominal Textile Area (sq. ft.)	Average HLR (gal. per day/sq. ft.)	Peak HLR (gal. per day/sq. ft.)
3,500	7,500	200	17.5	37.5

According to the AdvanTex System Loading Chart in the applicable design criteria, the standard AdvanTex treatment system (Stage 1) should not be hydraulically loaded more than 25 gpd/square foot at Design Average Flow or 50 gpd/square foot at Design Max Day Flow. Therefore, the specified type and number of AdvanTex pods in the Final Design satisfy Orenco’s design criteria to achieve the effluent quality listed in the design criteria at a 95% confidence level for this Type 2, Park application.

Organic Load — Standard Stage

The following influent characteristics provided on the Plans were estimated and not derived from direct sampling. Even though the influent characteristics were not derived from direct sampling, the values provided are consistent with values we have seen in other, similar Type 2, Park applications.

Influent (Primary Tank Effluent) Characteristics — Loading to Textile	
Average BOD ₅ (mg/L)	Average TSS (mg/L)
250	200

Based on the average influent biochemical oxygen demand (BOD₅) concentration and flow data specified on the Plans, the system will receive approximately 7.3 pounds of BOD₅ per day at Design Average Flow, and 15.6 pounds of BOD₅ per day at Maximum Day Design Flow. Using this information, the organic loading rate of the system calculates as:

Organic Loading Rate (OLR) — Standard Stage				
Average Organic Load (lbs/day)	Maximum Organic Load (lbs/day)	Nominal Treatment Area (sq. ft.)	Average OLR (lbs BOD/sq. ft./day)	Maximum OLR (lbs BOD/sq. ft./day)
7.3	15.6	200	0.04	0.08

Conclusions

I have reviewed the Final Design of the Burlingame Park wastewater treatment system, and have found that the design is compliant with the most current version of the system's applicable design criteria published by Orenco for the specified parameters provided by the system's designer in the Plans. In addition, I noted no anomalies in the site layout or configuration of the system during my review.

Compliance Table — Meets Minimum Design Standards	
	Standard Stage
Recirc Tank Size	Yes
Hydraulic Load	Yes
Organic Load	Yes

As such, the system as designed satisfactorily complies with Orenco's design criteria to meet the following effluent limits specified in the Plans at a 95% confidence level, provided that all influent flows and constituent concentrations specified in the Plans are not exceeded:

Expected Effluent Quality	
Constituent	Average (mg/L)
BOD ₅	20
TSS	20

It is important to note that even though the AdvanTex Treatment System has the capability to meet or exceed the required treatment parameters, there is no way that Orenco can guarantee that a particular system will be operated or maintained in a manner consistent with the Final Design reviewed. Once the facility is placed into operation, the influent flows and constituent concentrations to the facility should be monitored, and if flow or any of the influent constituent concentrations exceed those listed in the Plans, measures should be taken to reduce the flow or constituent concentration to those listed. However, if additional treatment capacity becomes necessary, the system is designed to have the capability to expand to account for the new flow or constituent concentration.

Proper air ventilation is a critical feature of all commercial AdvanTex Treatment Systems, and as such, adequate active ventilation is required for all systems. In addition, please note that disposing of toxics or chemicals into the system is strictly prohibited. Examples of toxics include restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo, waste products, or any other toxins. Furthermore, water softener brine discharge is prohibited from being discharged into the AdvanTex Treatment System. Failure to adhere to these policies will void Orenco's limited product warranties.

If you have any questions about my review process, findings, or conclusions, please feel free to call or e-mail me.

Sincerely,



Caleb Castleman
Systems Engineering
Orenco Systems Inc.
(800) 348-9843 ext. 548
ccastleman@orencocom

Project: Burlingame State Park and Camp Ground
 Location: Mills Camp

Description	Input values	Units
Finish Grade	62.00	Elevation
Water Table Elevation	57.90	Elevation
Bottom of Tank Elevation	51.08	Elevation
Lowest Pipe Invert	58.75	Elevation
Counter Weight (Type 2)	22,306.50	lbs
Soil Above Tank	18.00	Inches
Length of Tank	30.83	Feet
Width of Tank	11.33	Feet
Depth of Tank	9.33	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	8.00	Inches
Sides Concrete Thickness	8.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	4.00	Inches
Compartment Wall Height	87.00	Inches
Computed Value		
Submerged Depth	6.82	Feet
Top/Bottom Surface Area of Tank	349.44	SF
Displaced Volume	2,382.05	CF
Volume of Tank Top	232.96	CF
Volume of Tank Sides	435.56	CF
Volume of Tank Bottom	232.96	CF
Volume of Baffle	24.17	CF
Weight of Tank Top	34,944.44	lbs
Weight of Tank Sides	65,333.33	lbs
Weight of Tank Bottom	34,944.44	lbs
Weight of Baffle	3,625.00	lbs
Total Weight of Tank	138,847.22	lbs
Volume of Soil	524.17	CF
Weight of Soil Above Tank	52,416.67	lbs
Uplift Created by Submerged Tank	148,639.76	lbs
Total Weight of Tank, Counter Weight and Soil	213,570.39	lbs
Exceeds Displaced Volume by	64,930.63	lbs
Buoyance Point for Empty Tank	6.37	Feet (above bottom)
Buoyance Point for Empty Tank	57.45	Elev
Buoyance Point for Tank in Place	9.79	Feet (above bottom)
Buoyance Point for Tank in Place	60.88	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Mills Camp

Description	Input values	Units
Finish Grade	62.00	Elevation
Water Table Elevation	57.90	Elevation
Bottom of Tank Elevation	50.90	Elevation
Lowest Pipe Invert	58.40	Elevation
Counter Weight (Type 2)	12,614.40	lbs
Soil Above Tank	23.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	9.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
Computed Value		
Submerged Depth	7.00	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	1,190.00	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	208.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	31,200.00	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	60,950.00	lbs
Volume of Soil	325.83	CF
Weight of Soil Above Tank	32,583.33	lbs
Uplift Created by Submerged Tank	74,256.00	lbs
Total Weight of Tank, Counter Weight and Soil	106,147.73	lbs
Exceeds Displaced Volume by	31,891.73	lbs
Buoyance Point for Empty Tank	5.75	Feet (above bottom)
Buoyance Point for Empty Tank	56.65	Elev
Buoyance Point for Tank in Place	10.01	Feet (above bottom)
Buoyance Point for Tank in Place	60.91	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
Location: Mills Camp

Description	Input values	Units
Finish Grade	62.00	Elevation
Water Table Elevation	57.90	Elevation
Bottom of Tank Elevation	50.50	Elevation
Lowest Pipe Invert	57.25	Elevation
Counter Weight (Type 2)	12,614.40	lbs
Soil Above Tank	40.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	8.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
Computed Value		
Submerged Depth	7.40	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	1,258.00	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	182.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	27,300.13	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	57,050.13	lbs
Volume of Soil	566.67	CF
Weight of Soil Above Tank	56,666.67	lbs
Uplift Created by Submerged Tank	78,499.20	lbs
Total Weight of Tank, Counter Weight and Soil	126,331.20	lbs
Exceeds Displaced Volume by	47,832.00	lbs
Buoyance Point for Empty Tank	5.38	Feet (above bottom)
Buoyance Point for Empty Tank	55.88	Elev
Buoyance Point for Tank in Place	11.91	Feet (above bottom)
Buoyance Point for Tank in Place	62.41	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Mills Camp

Description	Input values	Units
Finish Grade	62.25	Elevation
Water Table Elevation	57.90	Elevation
Bottom of Chamber Elevation	53.50	Elevation
Lowest Pipe Invert	59.00	Elevation
Counter Weight	0.00	lbs
Soil Above Chamber	9.00	Inches
Chamber Length	7.00	Feet
Chamber Width	7.00	Feet
Diameter of Opening	2.50	Feet
Chamber Interior Height	7.00	Feet
Top of Concrete Thickness	6.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Concrete Wall Thickness	6.00	Inches
	Computed Value	
Submerged Depth	4.40	Feet
Top Surface Area of Chamber	44.09	SF
Surface Area of Chamber Sides	182.00	
Bottom Surface Area of Chamber	49.00	SF
Displaced Volume	215.60	CF
Volume of Chamber Top	22.05	CF
Volume of Chamber Sides	91.00	CF
Volume of Chamber Bottom	24.50	CF
Weight of Chamber Top	3,306.84	lbs
Weight of Tank Side	13,650.00	lbs
Weight of Chamber Bottom	3,675.00	lbs
Total Weight of Chamber	20,631.84	lbs
Volume of Soil	33.07	CF
Weight of Soil Above Chamber	3,306.84	lbs
Uplift Created by Submerged Chamber	13,453.44	lbs
Total: Chamber, Counter Weight and Soil	23,938.69	lbs
Exceeds Displaced Volume by	10,485.25	lbs
Buoyance Point for Empty Chamber	6.75	Feet (above bottom)
Buoyance Point for Empty Chamber	60.25	Elev
Buoyance Point for Chamber in Place	7.83	Feet (above bottom)
Buoyance Point for Chamber in Place	61.33	Elev

(Soil friction has not been taken into account)

Duplex Control Panels

Applications

Orenco Duplex Control Panels are used to control dual pumps, alarms, and other equipment as specified in pressure sewers and onsite septic systems.



Orenco[®] DAX2 Control Panel



General

Orenco Duplex Control Panels are specifically engineered for pressure sewer (STEP) systems and onsite septic treatment systems that require the use of two alternating pumps. Standard features include circuit breakers, an automatic/manual/off motor control toggle for each pump, an audio/visual high level alarm, an alarm reset, and a duplex alternator. Other standard features and options are listed on page 2. Orenco panels are designed for use with mechanical and/or mercury float switches. Listed per UL 508 in the US and Canada.

Standard Models

DAX1, DAX2

Product Code Diagram



Standard options (list in order):
 PT = programmable timer
 RO = redundant off relay
 CS = current sensor
 ETM = elapsed time meter
 CT = event counter
 HT = heater
 SA = surge arrester
 PRL = pump run light
 PL = power light

Intrinsically safe relays:
 Blank = standard, no IR relays
 IR = intrinsically safe relays

Pump voltage:
 1 = 120 VAC
 2 = 120 VAC or 240 VAC

DAX series duplex control panel

Materials of Construction

Enclosure	UV-resistant fiberglass, UL Type 4X
Hinges	Stainless steel

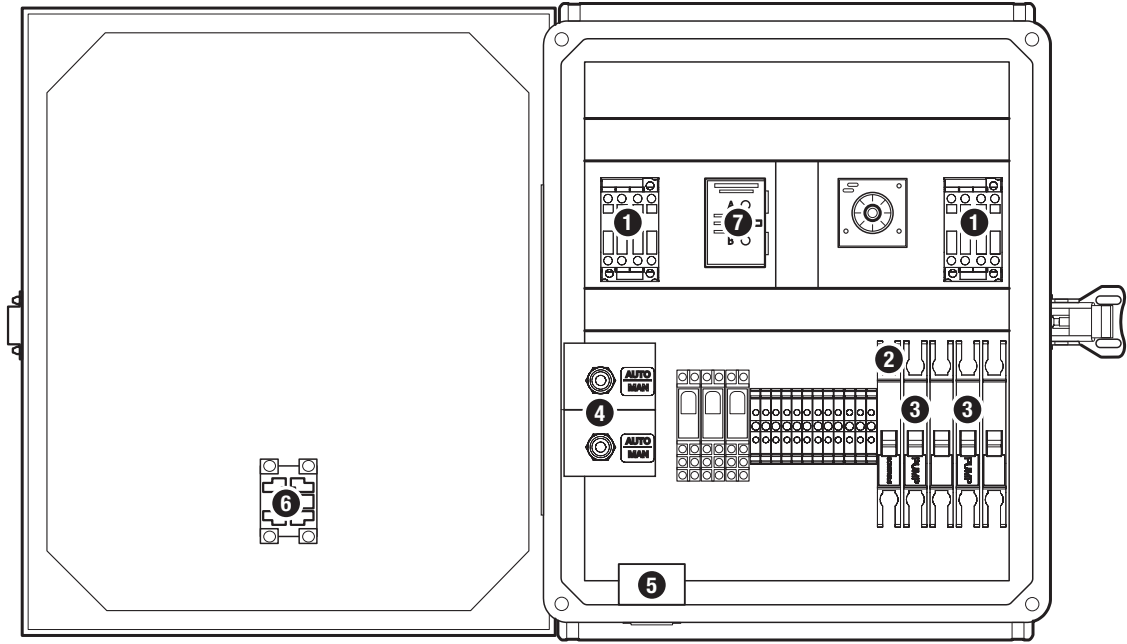
Specifications

Panel Ratings

DAX1:	120 V, 1 hp, 16 amps, single phase, 60 Hz.
DAX2:	240 V, 3 hp, 16 amps, single phase, 60 Hz.

Dimensions

Height, in. (mm)	15.5 (394)
Width, in. (mm)	13.5 (343)
Depth, in. (mm)	6.7 (170)



Orenco® DAX2PTR0 240 V panel

Standard Components

Feature	Specification(s)
1. Motor-Start Contactor	120 V, 16 FLA, 1 hp (0.75 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA). 240 V, 16 FLA, 3 hp (2.24 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).
2. Controls Circuit Breaker	10 A, OFF/ON switch. Single-pole 120 V. DIN rail mounting with thermal magnetic tripping characteristics.
3. Pump Circuit Breakers	20 A, OFF/ON switch. Single-pole 120 V or double-pole 240 V. DIN rail mounting with thermal magnetic tripping characteristics.
4. Toggle Switches	20 A, 1hp (0.75 kW). Single-pole, double-throw HOA switch,
5. Audible Alarm	95 dB at 24 in. (610 mm), warble-tone sound.
6. Visual Alarm	7/8-in. (22-mm) diameter red lens, "Push-to-silence." UL Type 4X rated, 1 W LED light, 120 V.
7. Duplex Alternator	120 V. Cross-wired style for independent lag pump function. Selector switch for locking one pump into lead position.
Audible Alarm Silence Relay (Not shown)	120 V. Automatic reset. DIN rail mount.

Optional Features

Feature	Specification(s)	Code Adder
Intrinsically Safe Control Relays	Listed per UL 698A, for Class 1 Div. 1, groups A, B, C, D hazardous locations (requires larger enclosure).	IR
Programmable Timer	120 V. Repeat cycle from 0.05 seconds to 30 hours. Separate variable controls for OFF & ON time periods.	PT
Redundant Off Relay	120 V. Provides a secondary off. Sounds alarm on low level condition. DIN rail mount.	RO
Elapsed Time Meter	120 V, 7-digit, non-resettable. Limit of 99,999 hours; accurate to 0.01 hours.	ETM
Event Counter	120 V, 6-digit, non-resettable.	CT
Heater	Anti-condensation heater. Self-adjusting: radiates additional wattage as temperature drops.	HT
Surge Arrestor	Status light on unit; protects incoming power supply from electrical surges.	SA
Pump Run Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PRL
Power Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PL

PF-Series Submersible Effluent Pumps: 1-Phase, 60-Hz, 4-inch (100-mm)

Applications

Our PF-Series 4-inch (100-mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or dosing tanks. These pumps are constructed of light-weight, corrosion-resistant stainless steel and engineered plastics, and are field-serviceable and repairable with common tools. They're also CSA- and UL-certified to U.S. and Canadian safety standards for effluent pumps.

PF-Series pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.



Features/Specifications

To specify this pump for your installation, require the following:

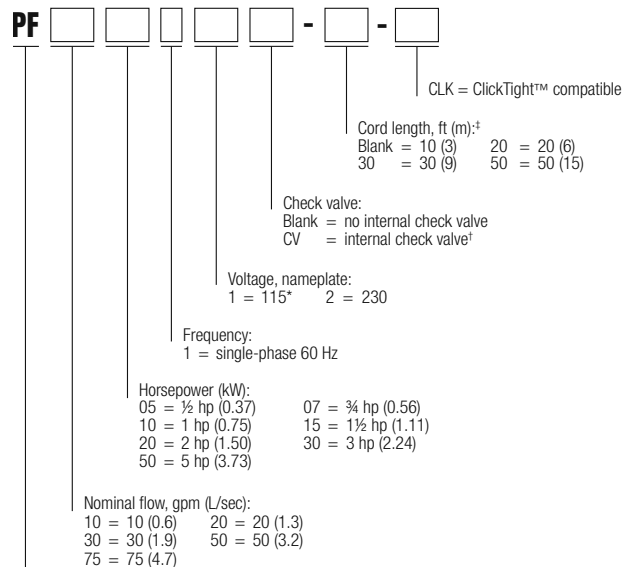
- Minimum 24-hour run-dry capability (liquid end) with no deterioration in pump life or performance*
- 1/8-inch (3-mm) bypass orifice to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid-end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10, 20, and 30 gpm (0.6, 1.3, and 1.9 L/sec) models; floating stack design on 50 and 75 gpm (3.2 and 4.7 L/sec) models
- Franklin Electric Super Stainless motor, rated for continuous use and frequent cycling
- Type SOOW 600-V motor cable (model PF751512 uses 14 AWG, SJ00W, 300-V cord)

* Not applicable for 5-hp (3.73 kW) models

Standard Models

See specifications chart on page 2 for a list of standard pumps. For a complete list of available pumps, call Orenco.

Product Code Diagram



Pump, PF Series

* ½-hp (0.37 kW) only

[†] Available for 10 gpm (0.6 L/sec), 1/2 hp (0.37 kW)

[‡] Note: 20-ft cords are available only for pumps through 1½ hp



C US
LR80980
LR2053896



Powered by
Franklin Electric

Specifications

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Discharge size and material ¹	Length in. (mm)	Min. liquid level in. (mm)	Weight lb (kg)	Rated cycles per day
PF100511 ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100511CV ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512 ⁹	10 (0.6)	0.50 (0.37)	1	230	240	6.3	6.3	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712 ^{4,5,9}	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	1 ¼ in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF101012 ^{5,6,9}	10 (0.6)	1.00 (0.75)	1	230	240	9.6	9.6	1 ¼ in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF200511 ⁹	20 (1.3)	0.50 (0.37)	1	115	120	12.3	12.5	1 ¼ in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512 ⁹	20 (1.3)	0.50 (0.37)	1	230	240	6.4	6.5	1 ¼ in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF201012 ^{4,5,9}	20 (1.3)	1.00 (0.75)	1	230	240	10.5	10.5	1 ¼ in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF201512 ^{4,5}	20 (1.3)	1.50 (1.11)	1	230	240	12.4	12.6	1 ¼ in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF300511 ⁹	30 (1.9)	0.50 (0.37)	1	115	120	11.8	11.8	1 ¼ in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512 ⁹	30 (1.9)	0.50 (0.37)	1	230	240	6.2	6.2	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712 ⁹	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	1 ¼ in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF301012 ^{4,9}	30 (1.9)	1.00 (0.75)	1	230	240	10.4	10.4	1 ¼ in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF301512 ^{4,5}	30 (1.9)	1.50 (1.11)	1	230	240	12.6	12.6	1 ¼ in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF302012 ^{5,6,7}	30 (1.9)	2.00 (1.49)	1	230	240	11.0	11.0	1 ¼ in. SS	35.5 (902)	26 (660)	44 (20)	100
PF303012 ^{5,6,7,8}	30 (1.9)	3.00 (2.23)	1	230	240	16.8	16.8	1 ¼ in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF305012 ^{5,6,7,8}	30 (1.9)	5.00 (3.73)	1	230	240	25.6	25.8	1 ¼ in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF500511 ⁹	50 (3.2)	0.50 (0.37)	1	115	120	12.1	12.1	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512 ⁹	50 (3.2)	0.50 (0.37)	1	230	240	6.2	6.2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500712 ⁹	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501012 ⁹	50 (3.2)	1.00 (0.75)	1	230	240	10.1	10.1	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF501512 ⁴	50 (3.2)	1.50 (1.11)	1	230	240	12.5	12.6	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF503012 ^{4,5,7,8}	50 (3.2)	3.00 (2.23)	1	230	240	17.7	17.7	2 in. SS	43.0 (1092)	37 (940)	55 (25)	100
PF505012 ^{5,6,7,8}	50 (3.2)	5.00 (3.73)	1	230	240	26.2	26.4	2 in. SS	65.4 (1661)	55 (1397)	64 (29)	100
PF751012 ⁹	75 (4.7)	1.00 (0.75)	1	230	240	9.9	10.0	2 in. SS	27.0 (686)	27 (686)	34 (15)	100
PF751512	75 (4.7)	1.50 (1.11)	1	230	240	12.1	12.3	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

1 GFP = glass-filled polypropylene; SS = stainless steel. The 1 ¼-in. NPT GFP discharge is 2 7/8 in. octagonal across flats; the 1 ¼-in. NPT SS discharge is 2 1/8 in. octagonal across flats; and the 2-in. NPT SS discharge is 2 7/8 in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

2 Minimum liquid level is for single pumps when installed in an Orenco Biotube® Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

3 Weight includes carton and 10-ft (3-m) cord.

4 High-pressure discharge assembly required.

5 Do not use cam-lock option (Q) on discharge assembly.

6 Custom discharge assembly required for these pumps. Contact Orenco.

7 Capacitor pack (sold separately or installed in a custom control panel) required for this pump. Contact Orenco.

8 Torque locks are available for all pumps and are supplied with 3-hp and 5-hp pumps.

9 ClickTight™ compatible.

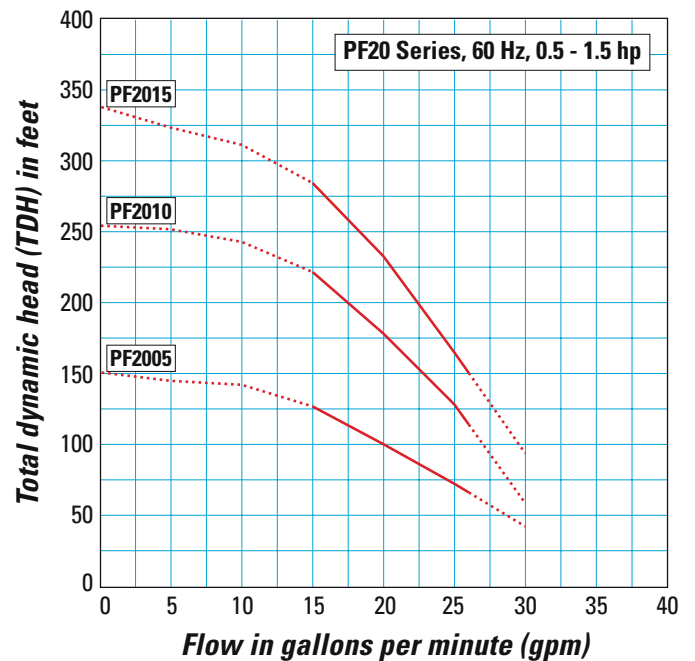
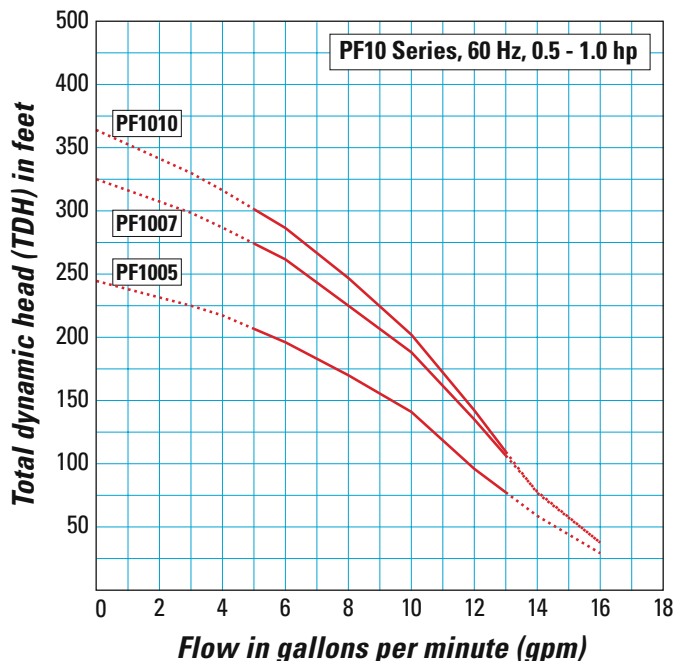
Materials of Construction

Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (Noryl GFN3)
Impellers	Celcon® acetal copolymer on 10-, 20-, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	7/16-in. hexagonal stainless steel, 300 series
Coupling	Sintered stainless steel, 300 series
Shell	Stainless steel, 300 series
Motor	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing ensures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Single-phase motors are equipped with surge arrestors for added security. Single-phase motors through 1.5 hp (1.11 kW) have built-in thermal over-load protection, which trips at 203-221° F (95-105° C).

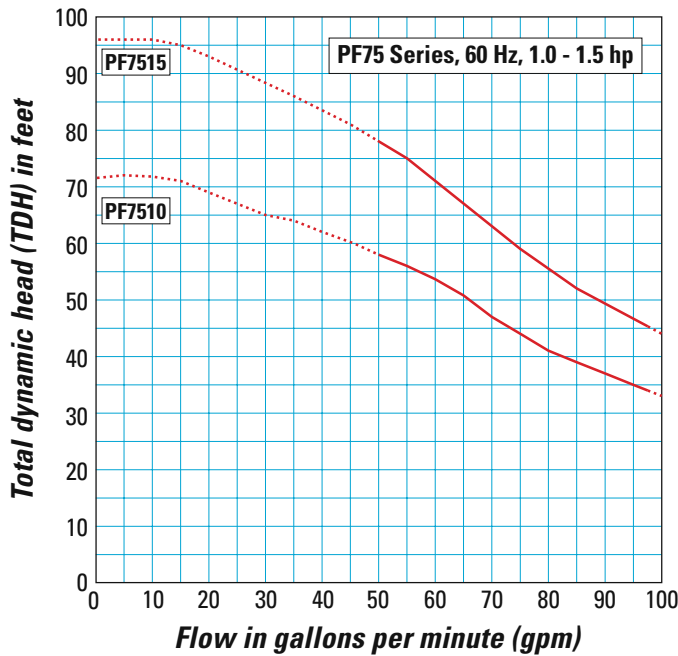
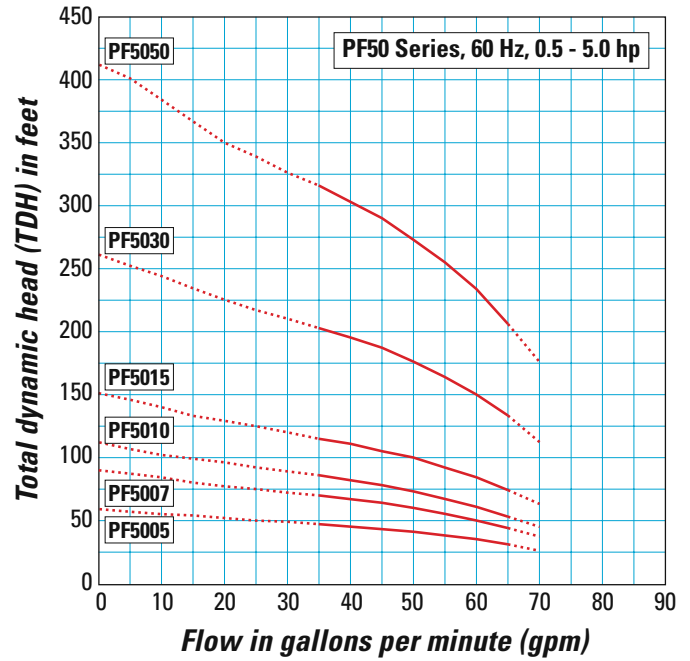
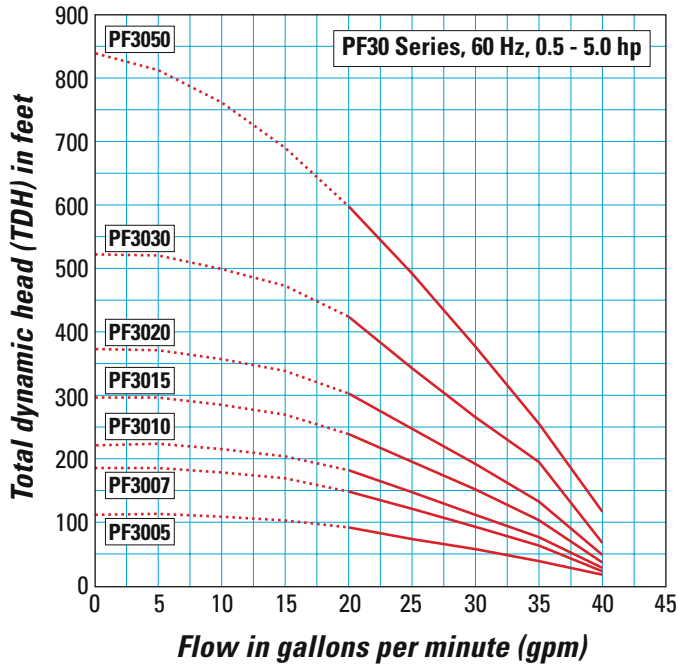
Using a Pump Curve

A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow and pressure (total dynamic head or “TDH”), providing a graphical representation of a pump’s optimal performance range. Pumps perform best at their nominal flow rate. These graphs show optimal pump operation ranges with a solid line and show flow rates outside of these ranges with a dashed line. For the most accurate pump specification, use Orenco’s PumpSelect™ software.

Pump Curves



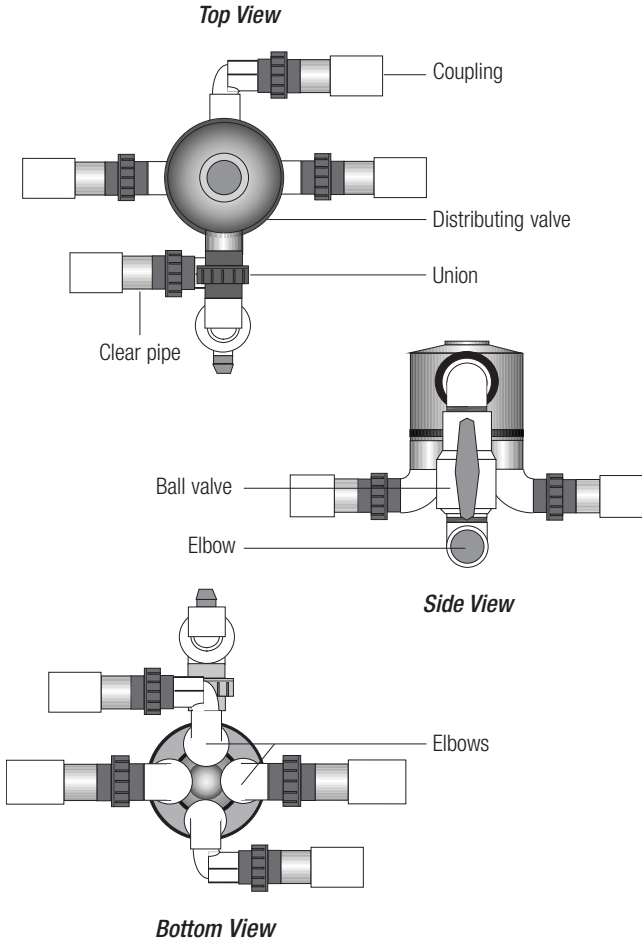
Pump Curves, cont.



Distributing Valves

Applications

Automatic Distributing Valve Assemblies are used to pressurize multiple zone distribution systems including textile filters, sand filters and drainfields.



General

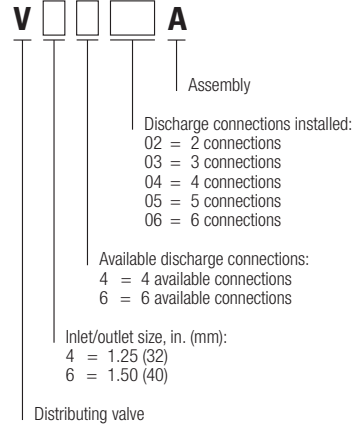
Orenco's Automatic Distributing Valve Assemblies are mechanically operated and sequentially redirect the pump's flow to multiple zones or cells in a distribution field. Valve actuation is accomplished by a combination of pressure and flow. They allow the use of smaller horsepower pumps on large sand filters and drainfields. For example, a large community drainfield requiring 300 gpm (18.90L/sec) can use a six-line valve assembly to reduce the pump flow rate requirement to only 50 gpm (3.14L/sec).

Orenco only warrants Automatic Distributing Valves when used in conjunction with High-Head Effluent Pumps with Biotube[®] pump vaults to provide pressure and flow requirements, and to prevent debris from fouling valve operation. An inlet ball valve, a section of clear pipe, and a union for each outlet are provided for a complete assembly that is easy to maintain and monitor. Ideal valve location is at the high point in the system. Refer to Automatic Distributing Valve Assemblies (NTP-VA-1) for more information.

Standard Models

V4402A, V4403A, V4404A, V4605A, V4606A, V6402A, V6403A, V6404A, V6605A, V6606A.

Product Code Diagram



Materials of Construction

All Fittings	Sch. 40 PVC per ASTM specification
Unions	Sch. 80 PVC per ASTM specification
Ball Valve	Sch. 40 PVC per ASTM specification
Clear Pipe	Sch. 40 PVC per ASTM specification

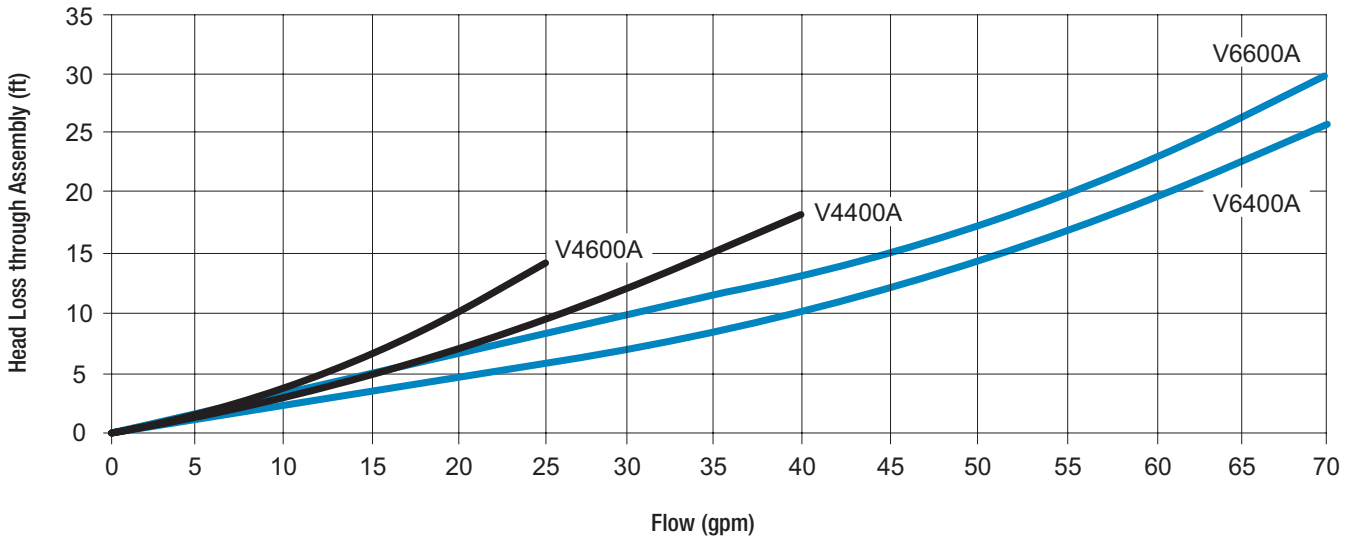
Specifications

Model	Inlet Size, in. (mm)	Outlets Size, in. (mm)	Flow Range, gpm (L/sec)	Max Head, ft (m)	Min. Enclosure*
V4402A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4403A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4404A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4605A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V4606A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V6402A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6403A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6404A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6605A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6606A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418

* When using an enclosed basin, choose the next larger-sized diameter.

Table 1. Automatic Distributing Valve Assembly Headloss Equations

Model Series	Equation	Operating Range, gpm (L/sec)
V4400A	$H_L = 0.085 \times Q^{1.45}$	10 - 40 (0.63 – 2.52)
V4600A	$H_L = 0.085 \times Q^{1.58}$	10 - 25 (0.63 – 1.57)
V6400A	$H_L = 0.0045 \times Q^2 + 3.5 \times (1 - e^{-0.06Q})$	15 - 70 (0.95 – 4.42)
V6600A	$H_L = 0.0049 \times Q^2 + 5.5 \times (1 - e^{-0.1Q})$	15 - 70 (0.95 – 4.42)



AdvanTex® AX100 Textile Filter

Applications

Orenco's AdvanTex® AX100 Treatment System is an innovative technology for onsite treatment of domestic-strength wastewater. The heart of the system is the AdvanTex Filter, a sturdy, watertight fiberglass basin filled with an engineered textile material. This lightweight, highly absorbent textile material treats a tremendous amount of wastewater in a small space. AX100 Treatment Systems are ideal for:

- New construction
- System upgrades and repairs
- Small sites
- Poor soils
- Pretreatment
- Nitrogen reduction
- Price-sensitive markets

For sizing, see AdvanTex® Design Criteria (NDA-ATX-COMM-1-PKG).



The heart of the AdvanTex® AX100 Treatment System is this sturdy, watertight fiberglass basin filled with an engineered textile material.

Features/Specifications

To specify this product, require the following:

- Wastewater treatment to better than secondary treatment standards
- Consistent treatment, even during peak flows
- Timer operation for flow monitoring, flow modulation, and surge control
- Fixed-film, engineered textile media, operated in an unsaturated condition
- Consistent media quality
- Low energy consumption
- Low maintenance requirements
- Complete pre-manufactured package, ready to install
- Watertight construction, corrosion-proof materials, and components
- Foam-core lid provides insulation value of R-6 (RSI-1.1)
- Quiet operation

Standard Model

AX100

Specifications**

Length, in. (mm)	191 (4851)
Width, in. (mm)	94 (2388)
Height, in. (mm)	42 (1067)
Area (footprint), ft ² (m ²)	128 (11.9)
Dry Weight, lb (kg)	1616 (733)

* Covered by U.S. patent numbers 6,540,920; 6,372,137; 5,531,894; 5,480,561; 5,360,556

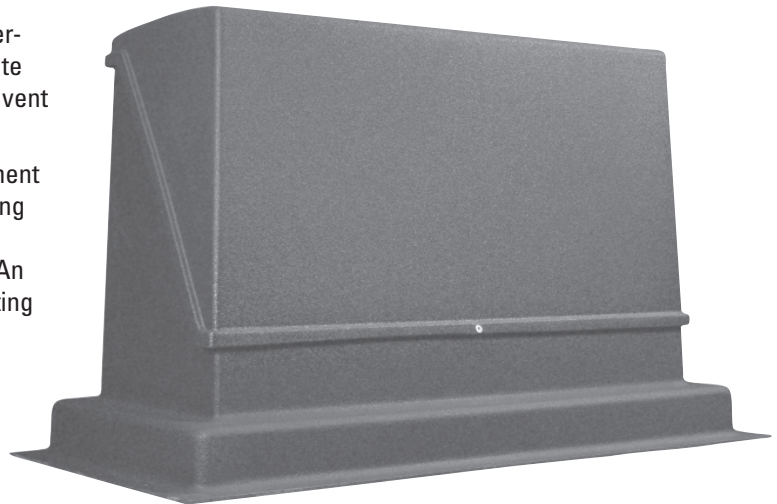
** Nominal values provided. See AdvanTex® Treatment System drawings for exact dimensions.

AdvanTex[®] Vent Fan Assembly

Applications

Oreco's AdvanTex[®] Vent Fan Assembly consists of a water-proof fiberglass enclosure with equipment for venting onsite wastewater treatment systems. One enclosure can hold a vent fan with carbon filter and an optional heater.

The vent fan is used in commercial-sized AdvanTex Treatment Systems to gently pull air through the textile media, ensuring that adequate oxygen is available for biological treatment. The carbon filter scrubs the air that the system exhausts. An optional heater can be added where climate requires heating of the air that enters the AdvanTex textile filter pods.



Standard Models

AXVFACF — AX above ground Vent Fan Assembly with LMF-3 Fan

AXVFACF-HT — AX above ground Vent Fan Assembly with LMF-3 Fan and HT10 Heater

Enclosure

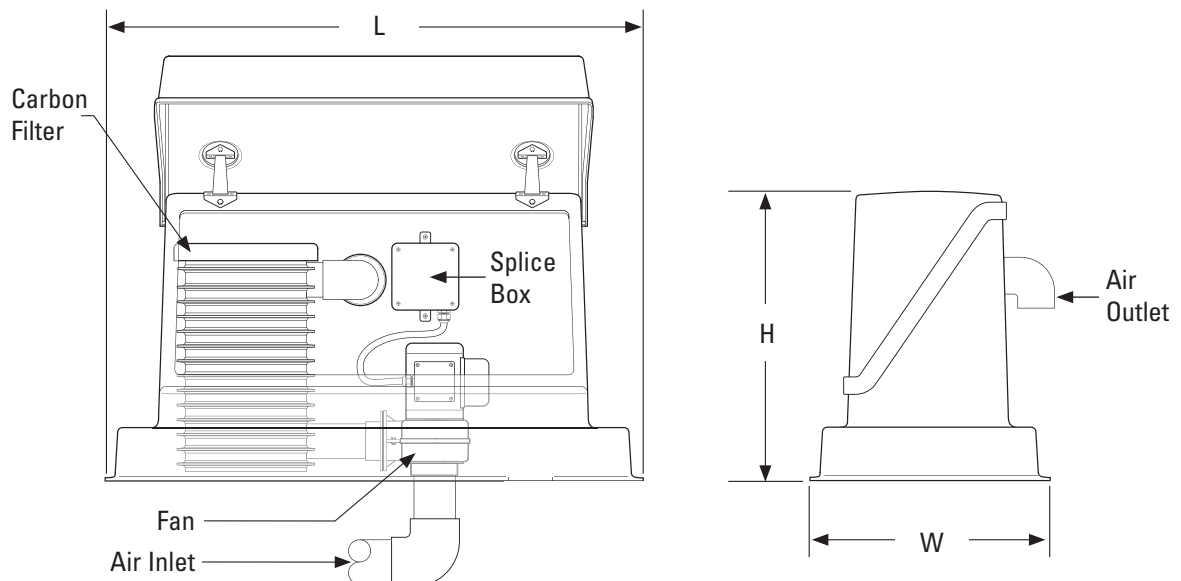
Physical Specifications

Materials of Construction

Shell	Fiberglass-reinforced polyester (FRP)
Hardware	Stainless steel
Exterior finish	Green, textured, UV resistant
Straps	Nylon

Dimensions

Length (L)	50 in. (1270 mm)
Width (W)	24 in. (610 mm)
Height (H)	30 in. (762 mm)
Volume	15.1 ft ³ (0.43 m ³)
Area (footprint)	8.3 ft ² (0.77 m ²)



AdvanTex[®] Vent Fan Assembly (continued)

Fan

Physical Specifications

Dimensions

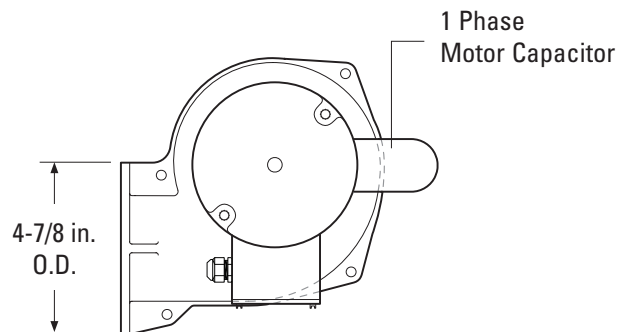
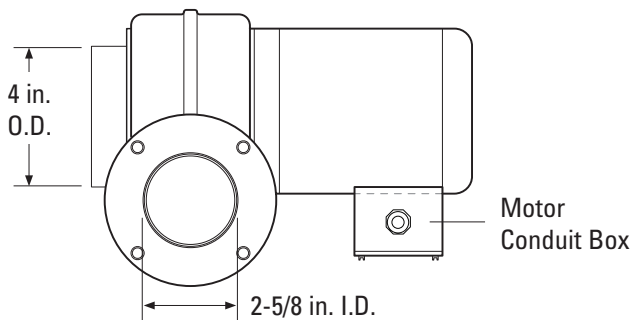
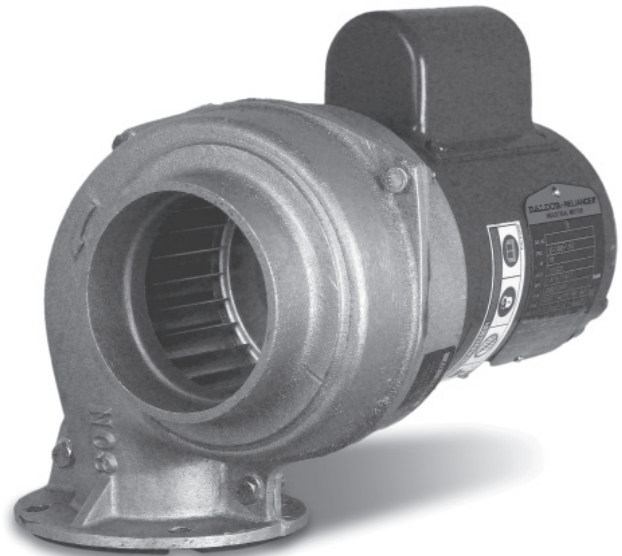
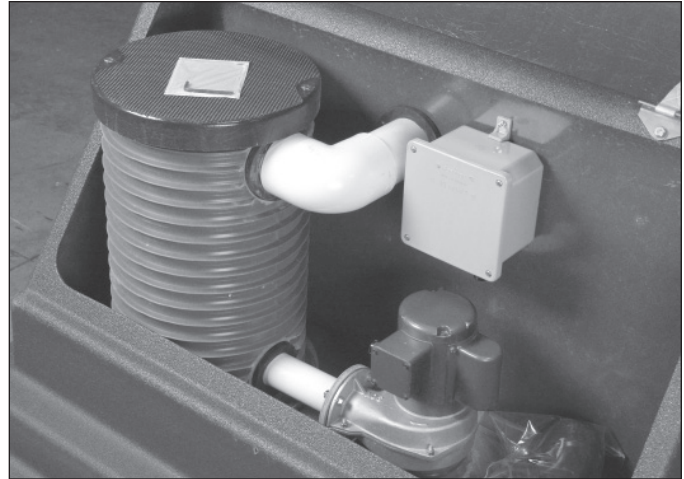
Inlet O.D.	4 in. (100 mm)
Inlet nominal pipe size	4 in. (100 mm)
Outlet I.D.	2-5/8 in. (67 mm)
Outlet Flange O.D.	4-7/8 in. (124 mm)

Materials of Construction

Housing	Aluminum
Wheel	Steel

Performance Data

	60 Hz	50 Hz
Horsepower (kW)	0.08 (0.06 kW)	0.08 (0.06 kW)
Phase	1 phase	1 phase
Volts	115/230	110/220
Amperage	1.4 A/0.7 A	1.8 A/0.9 A
RPM	3400	2900
CFM at 0" H ₂ O static pressure	245	205
CFM at 0.4" H ₂ O static pressure	220	170
CFM at 0.8" H ₂ O static pressure	190	130
CFM at 1.5" H ₂ O static pressure	120	N/A



AdvanTex® Vent Fan Assembly (continued)

Carbon Filter Basin

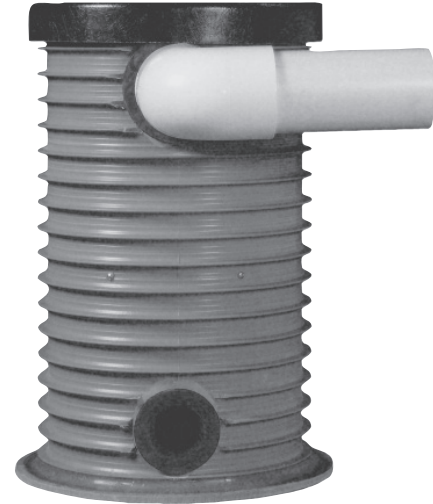
Physical Specifications

Dimensions

Outlet diameter	Accepts nominal 3-in. PVC pipe
Inlet diameter	Accepts nominal 2-in. PVC pipe
Height	21.5 in. (546 mm)
Diameter	12 in. (305 mm)

Materials of Construction

Housing	PVC
Bottom	Fiberglass-reinforced polyester (FRP)
Interior supports	Polypropylene grid and polyethylene screen
Support rings	PVC
Lid	Fiberglass
Fill material	Activated carbon



Heater (Optional)

Physical Specifications

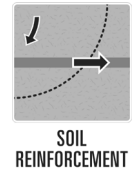
Dimensions

Outlet diameter	Fits nominal 3-in. Class 125 PVC pipe
Length (inlet to outlet)	11.75 in. (297 mm)
Width	11.25 in. (286 mm)
Depth	8.25 in. (210 mm)

Performance Data

Watts	1000
Volts	120
Amps	8.3





Miragrid® 22XT

Miragrid® 22XT geogrid is composed of high molecular weight, high tenacity polyester multifilament yarns woven in tension and finished with a PVC coating. Miragrid® 22XT geogrid is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Miragrid 22XT geogrid is used as soil reinforcement in MSE structures such as segmental retaining walls, precast modular block walls, wire faced walls, geosynthetic wrapped faced walls and steepened slopes. Miragrid 22XT is also used in MSE stabilized platforms for voids bridging, embankments on soft soils, landfill veneer stability, reducing differential settlement and for foundation seismic stability.

TenCate Geosynthetics Americas is accredited by Geosynthetic Accreditation Institute – Laboratory Accreditation Program ([GAI-LAP](#)).

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE
			MD
Tensile Strength @ Ultimate	ASTM D6637 (Method B)	lbs/ft (kN/m)	20559 (300.0)
Tensile Strength @ 5% strain	ASTM D6637 (Method B)	lbs/ft (kN/m)	6700 (97.8)
Mass/Unit Area ¹	(ASTM D5261)	oz/yd ² (g/m ²)	28.2 (956)
			MINIMUM ROLL VALUE
Creep Rupture Strength ²	ASTM D5262/D6992	lbs/ft (kN/m)	14277 (208.3)
Long Term Design Strength ³		lbs/ft (kN/m)	12361 (180.4)
PHYSICAL PROPERTIES		UNIT	ROLL CHARACTERISTIC
Roll Dimensions ⁴ (width x length)		ft (m)	12 x 200 (3.6 x 61)
Roll Area		yd ² (m ²)	267 (220)
Estimated Roll Weight		lbs (kg)	470 (213)
Label Roll Color			WHITE

¹ Typical Value

² 75-year design life based on NTPEP Report [REGEO-2016-01-069](#).

³ Long Term Design Strength for sand, silt, clay. $RF_{CR} = 1.44$; $RF_{ID} = 1.05$; $RF_D = 1.1$ (Installation damage reduction factor for other soils available upon request).

⁴ Special order roll lengths are available upon request

Disclaimer: TenCate assumes no liability for the accuracy or completeness of this information or for the ultimate use by the purchaser. TenCate disclaims any and all express, implied, or statutory standards, warranties or guarantees, including without limitation any implied warranty as to merchantability or fitness for a particular purpose or arising from a course of dealing or usage of trade as to any equipment, materials, or information furnished herewith. This document should not be construed as engineering advice. Mirafi™ is a registered trademark of Nicolon Corporation. Copyright © 2021 Nicolon Corporation. All Rights Reserved
FGS000105
ETQR19



MYERS[®]
MODEL SRM4
4/10 HORSEPOWER
RESIDENTIAL SEWAGE PUMP



MYERS® MODEL SRM4 Residential Sewage Pump

The Right Choice

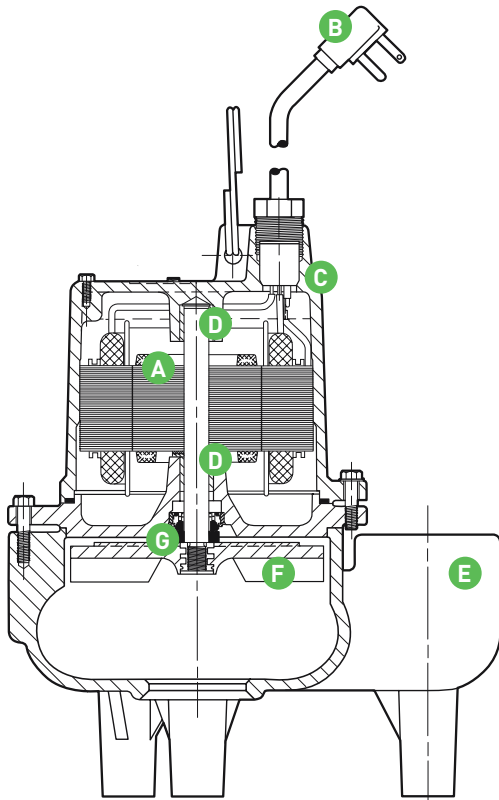
The SRM4 solids handling pump is the most reliable 4/10 horsepower residential sewage pump available today. The SRM4 is a plumbers/contractors dream! Its recessed impeller design allows 2" solids to pass freely through the volute without the chance of jamming the impeller. The SRM4 series pump has a national field-proven record of reliability. Look to your Myers distributor for the answer to your residential sewage handling needs ... and across the counter will be the Myers mini solids handling, the SRM4. It works for you! For more information, call your Myers distributor today, or the Myers Ohio sales office at 419-289-6898.



Product Capabilities		
Capacities To	95 gpm	360 lpm
Heads To	18 ft. 19 ft. shutoff	5.5 m 5.8 m
Pump Down Range Float Switch	7 to 14 in.	178 to 356 mm
Solids Handling Capacity	2 in.	50.8 mm
Liquids Handling	raw sewage, effluent, drain water	
Intermittent Liquid Temp.	up to 140°F	up to 60°C
Motor Electrical Data	4/10 HP shaded pole 1650 RPM	
Electrical	115V, 12A or 230V, 6A, 1Ø, 60 Hz.	
Acceptable pH Range	6 - 9	
Discharge, NPT	2 in.	50.8 mm
Min. Sump Diameter		
Simplex	18 in.	457 mm
Duplex	30 in.	762 mm

Note: Consult factory for applications outside these recommendations.

Pump Features and Applications



A. 4/10 HP Motor

Pressed in place and oil-filled for best alignment and heat transfer. Built-in overload protection.

B. Power Cord

Quick-disconnect watertight fitting.

C. Motor Housing

Heavy cast iron for efficient heat transfer.

D. Dual Thrust Washers, Sleeve Bearings

Oil lubricated, enhance smooth operation and extend pump life..

E. Cast Iron Volute

Passes 2" diameter solids.

F. Recessed Impeller

Operates out of volute passage, allowing maximum flow of liquids and solids.

G. Mechanical Shaft Seal

Carbon and ceramic faces, body is stationary, prevents string or trash from winding on seal..

Mechanical Float Switch

Mercury-free, 90° angle operation. (Piggyback models only).

Durable Motor Will Deliver Many Years Of Reliable Service.

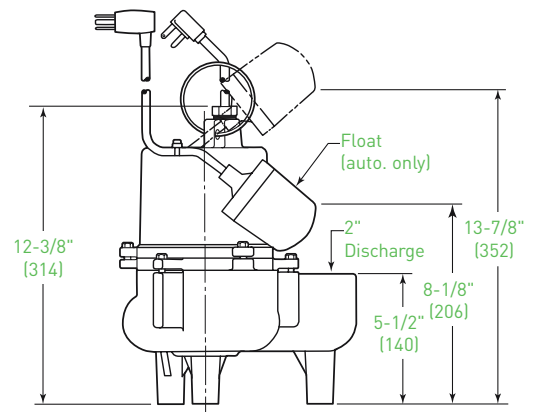
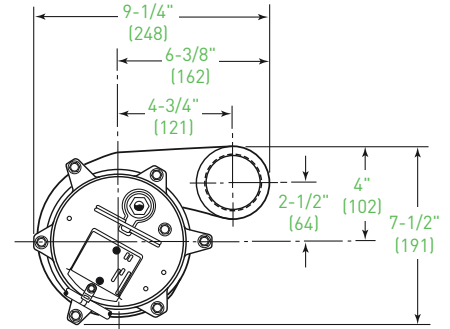
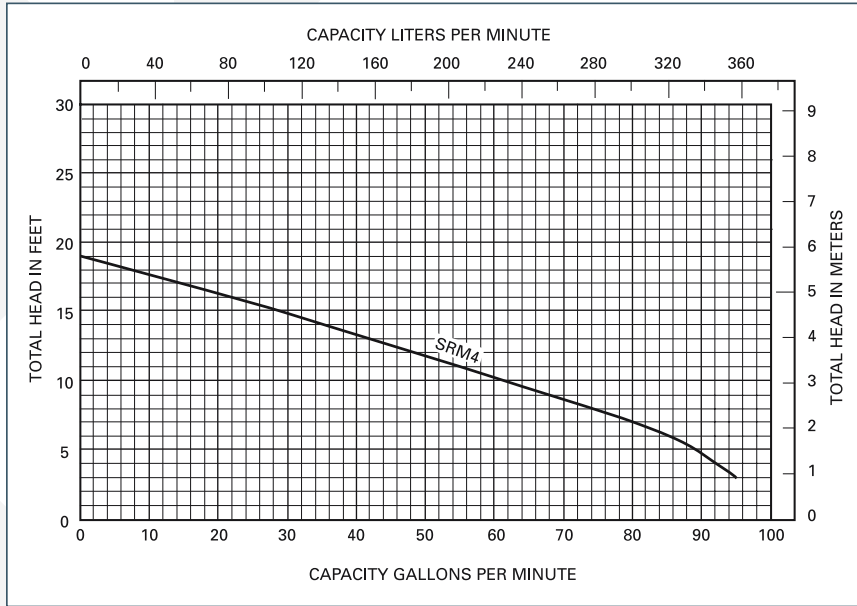
- Oil-filled motor for maximum heat dissipation and continuous bearing lubrication.
- Overload protected shaded pole motor eliminates starting switches.
- Recessed vortex impeller provides minimal radial loading for long bearing life.

The SRM4P Is Engineered For Many Years Of Maintenance-Free Operation.

- Wide-angle piggy-back float switch for maximum draw down. (Automatic models.)
- Pump can be operated manually by unplugging piggy-back switch and plugging pump directly into outlet (Automatic models).
- Recessed vortex impeller operates completely out of volute and provides free flow through passage for solids and liquids.

Performance Data and Dimensions [Dimensions in mm]

1650 RPM



740 EAST 9TH STREET,
ASHLAND, OHIO 44805
WWW.FEMYERS.COM

269 TRILLIUM DRIVE, KITCHENER,
ONTARIO, CANADA N2G 4W5
WWW.FEMYERS.COM

Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.
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January 13, 2023

David T. Bray, PLS
President
Caputo & Wick LTD
1150 Pawtucket Ave.
Rumford, RI 02916-1897
Phone: (401) 434-8880

RE: Burlingame State Park and Camp Ground, Charlestown, RI

Dear Mr. Bray:

This letter will confirm that you have been trained and certified to design GST™ Leaching Systems by Geomatrix Systems, LLC ("Geomatrix") in the State of Rhode Island.

This letter also confirms that Geomatrix has reviewed the design of the GST Leaching System proposed for installation at Burlingame State Park and Camp Ground, Charlestown, RI and found the site and design to be suitable and in compliance with the approved design manuals for the aforementioned product.

If you have any questions, please contact me.

Sincerely,
GEOMATRIX SYSTEMS, LLC

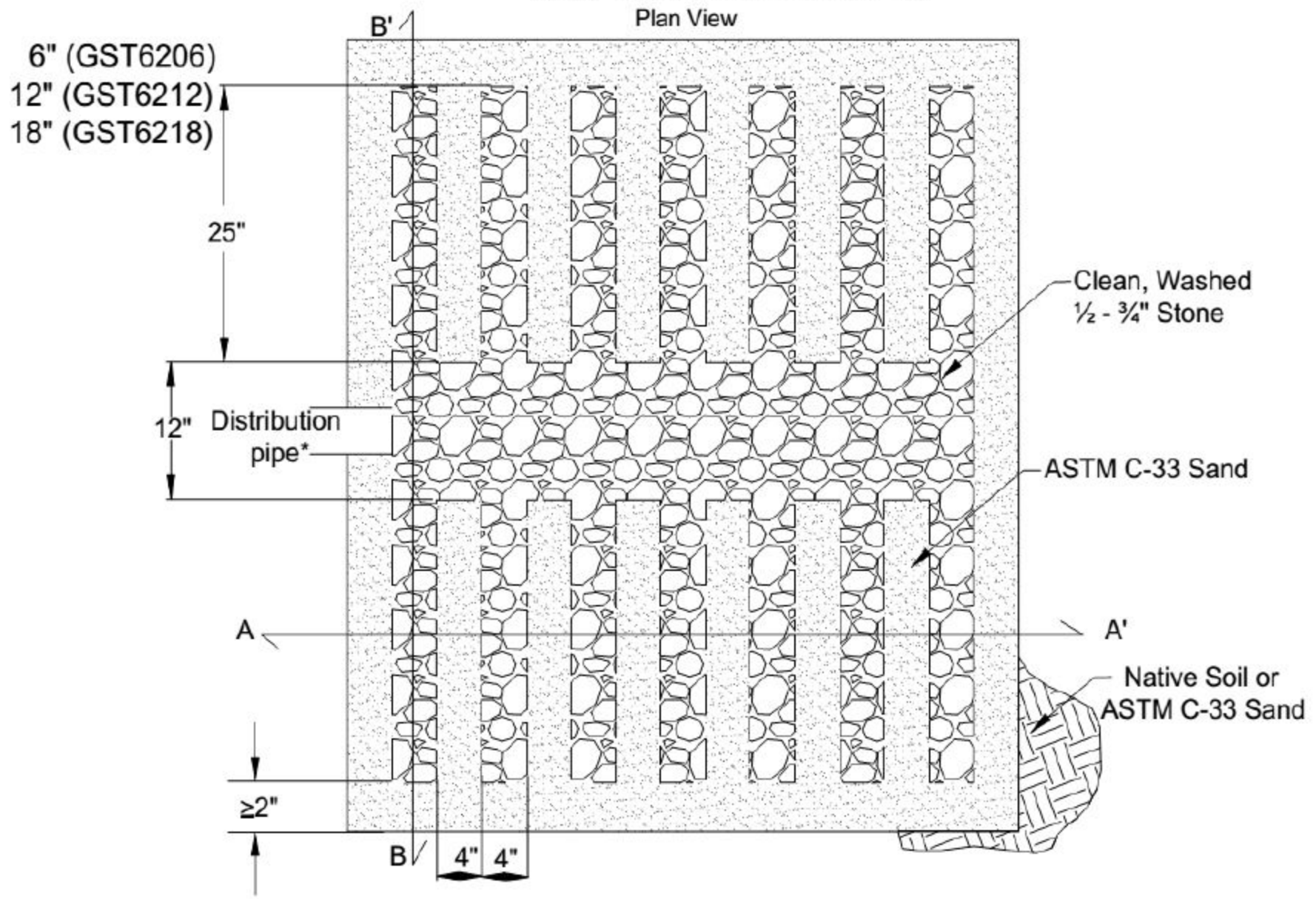
A handwritten signature in black ink that reads "David Jewett". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

David Jewett

Geomatrix Systems, LLC
114 Mill Rock Road East - Old Saybrook, CT 06475
Phone: 860-510-0730 – Fax: 860-510-0735

GST Schematics

GST™ LEACHING SYSTEM



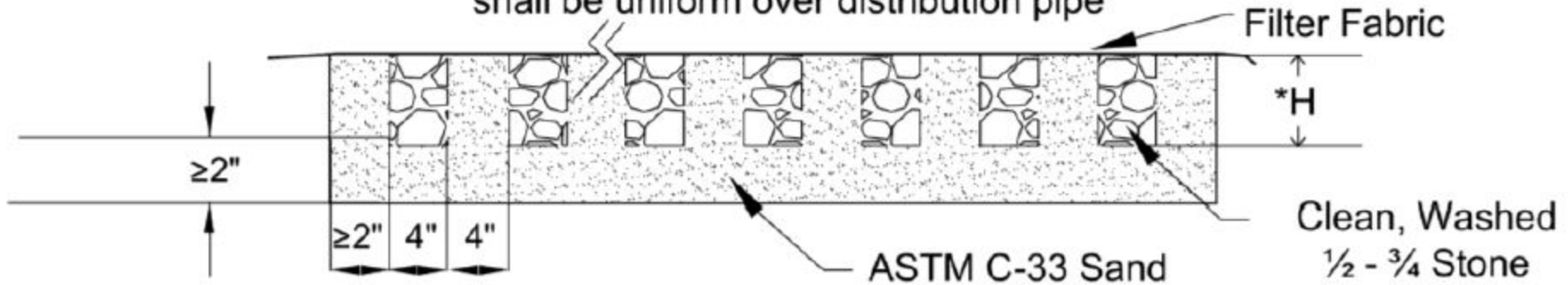
* Distribution pipe for gravity systems shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

GEOMATRIX GST™ LEACHING SYSTEM

A-A' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



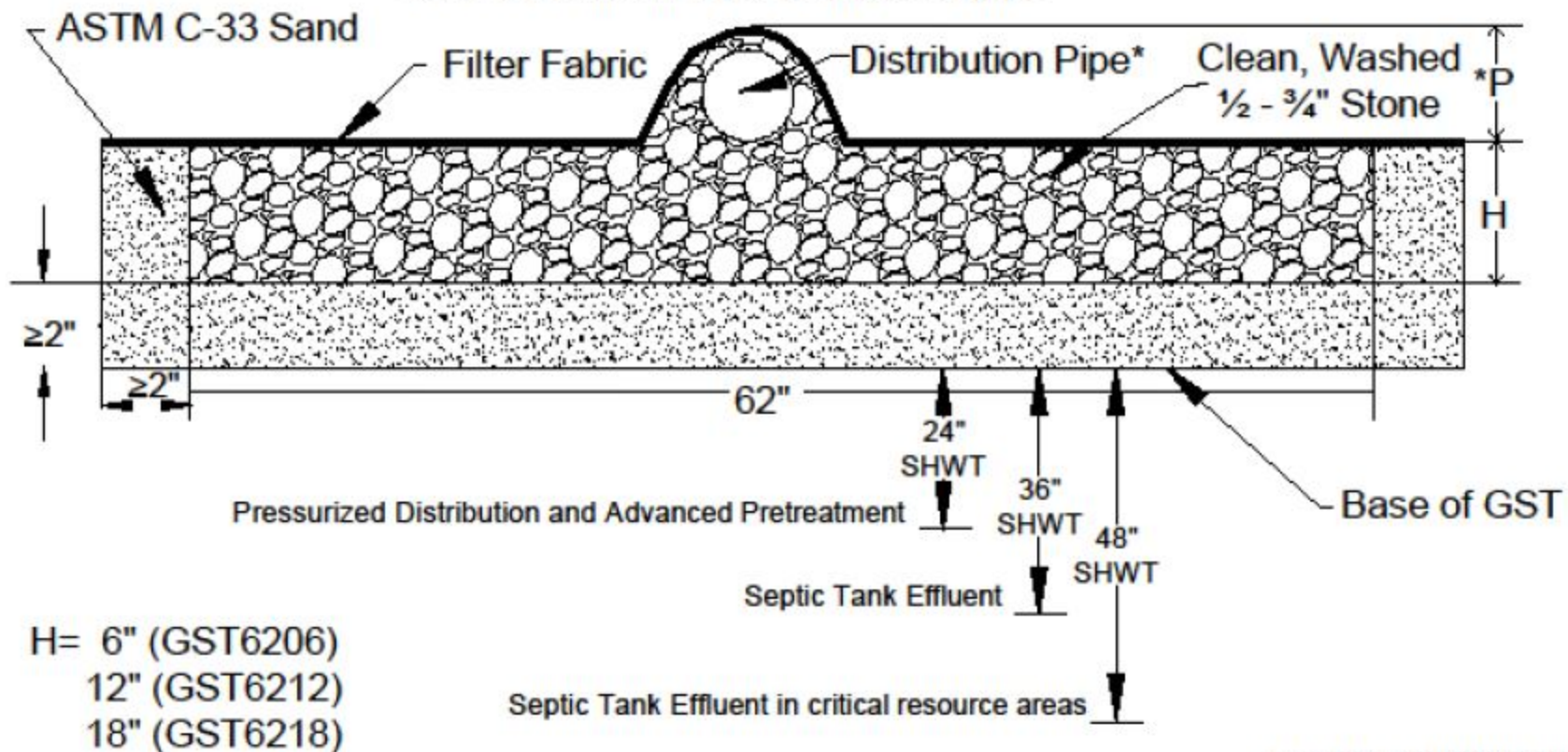
- *H= 6" (GST6206)
- 12" (GST6212)
- 18" (GST6218)

GST™ LEACHING SYSTEM

B-B' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



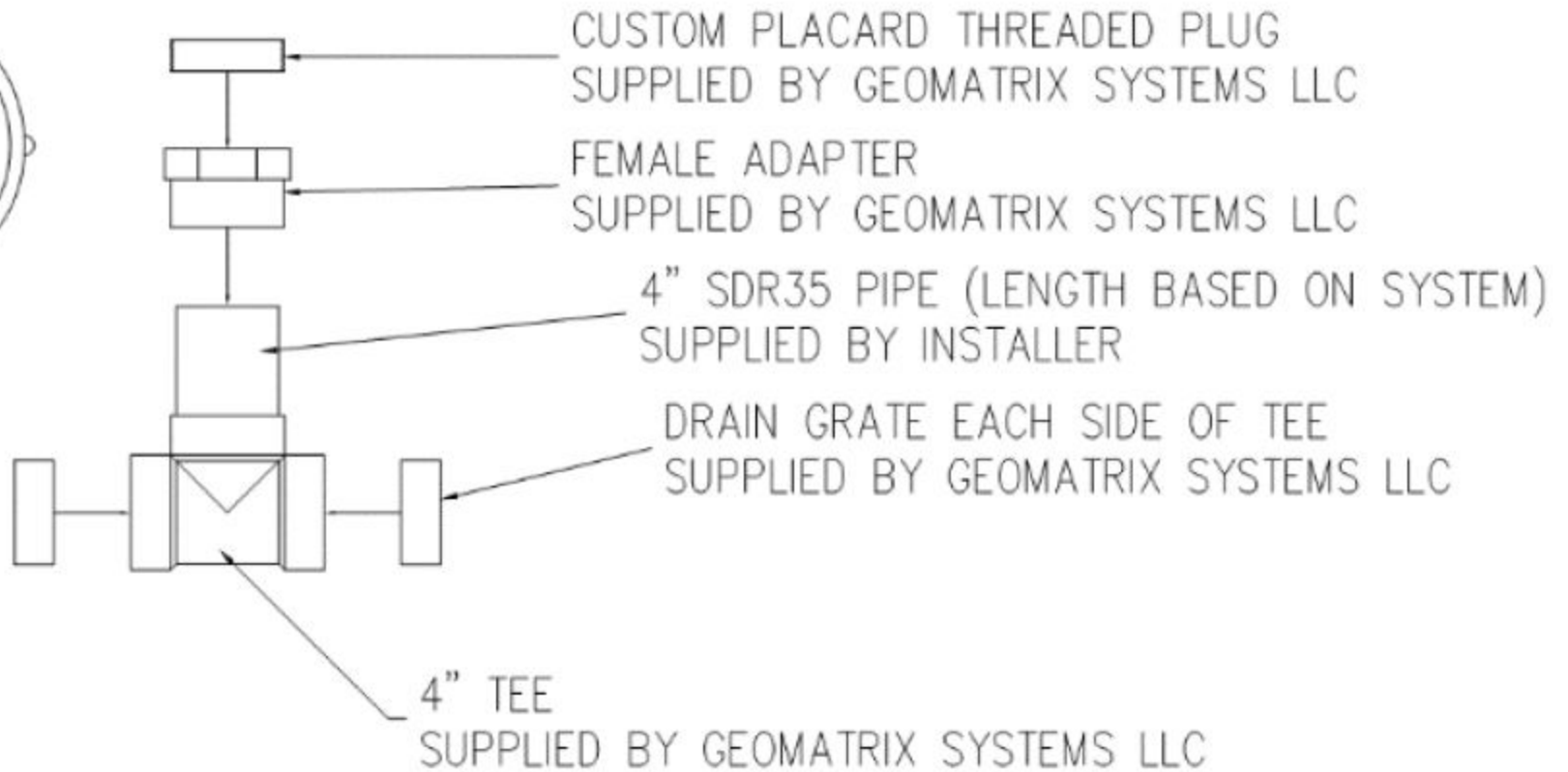
* Distribution pipe for gravity applications shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the
Design, Use and Maintenance of Pressurized Drainfields

Copyright 2022 GEOMATRIX SYSTEMS, LLC
patents: www.geomatrixsystems.com

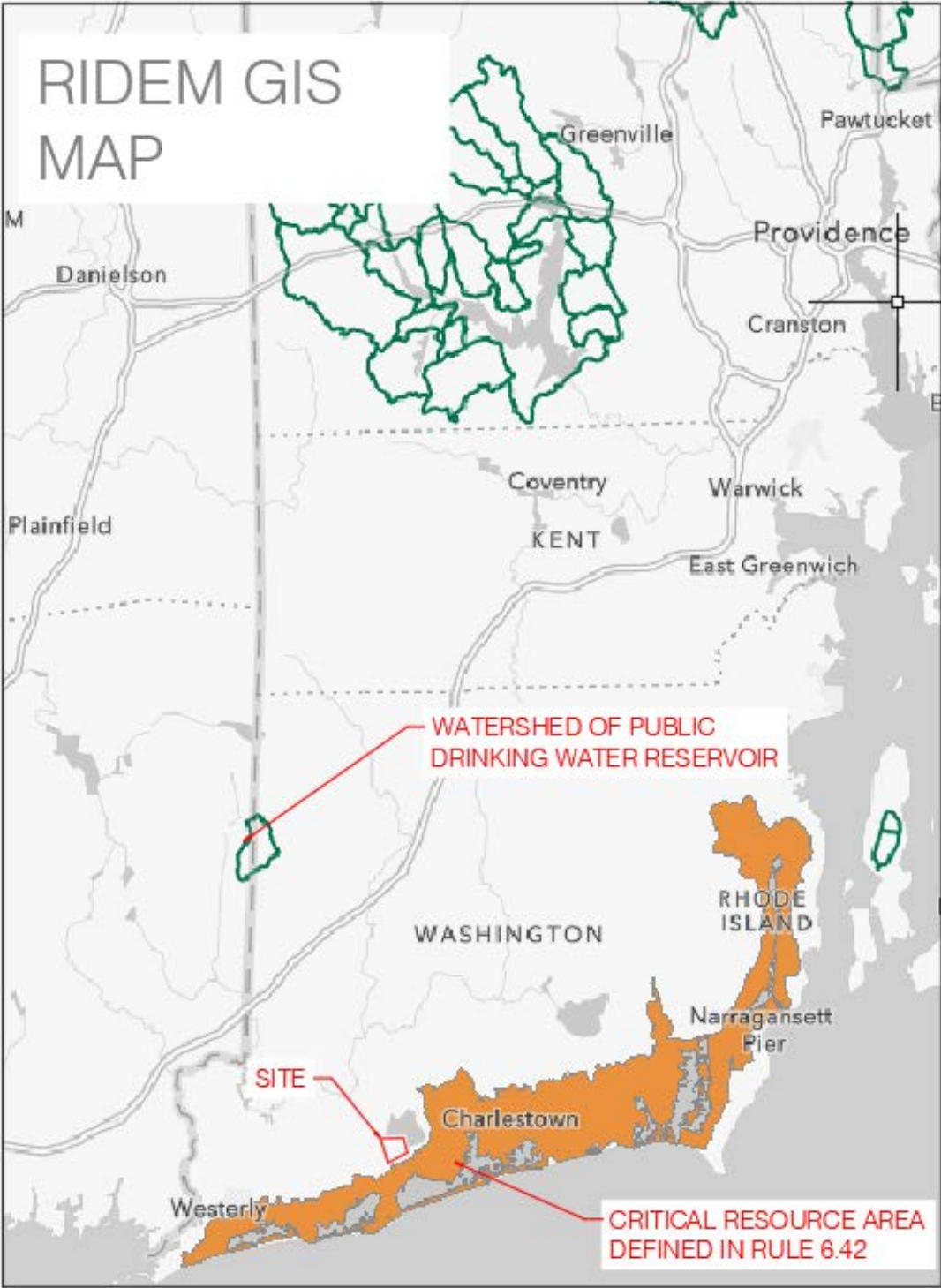
GST LEACHING SYSTEM
B-B' Cross Section
Geomatrix Systems, LLC., Old Saybrook, CT
860-510-0730

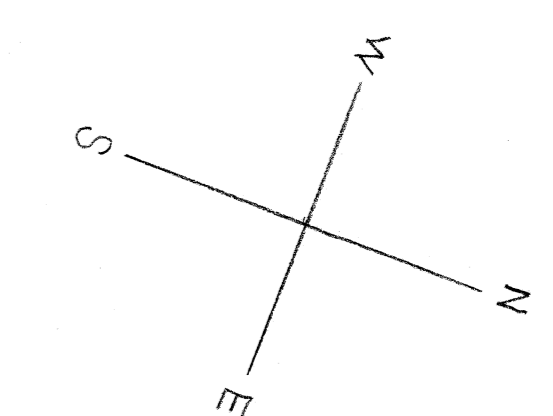
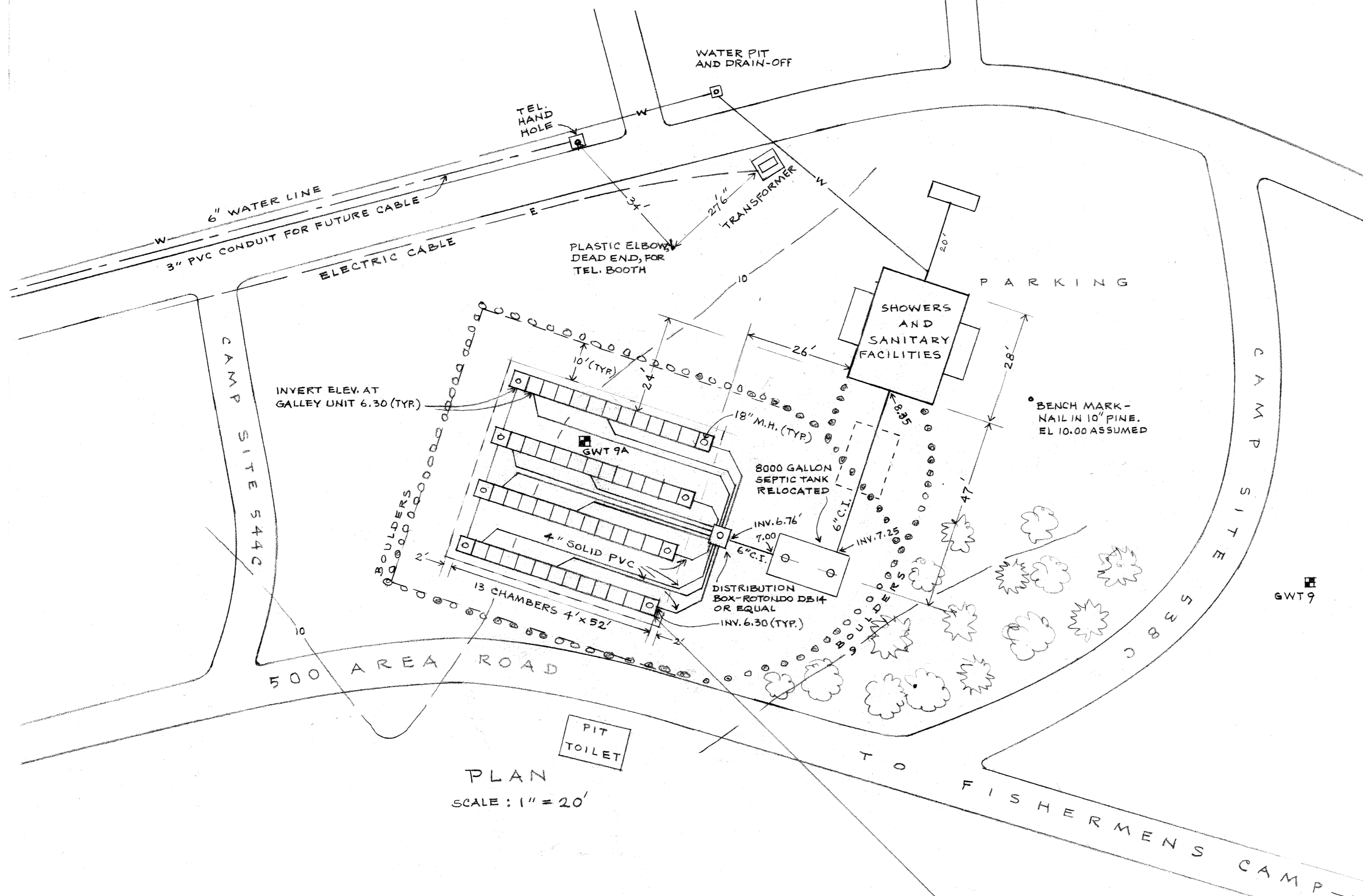
SCALE	None	REV.	0
DATE	9-4-2018	ACAD No.	040 GLS B-B'.DWG
DRAWN BY:	ERP	SHEET	3 Of 3

GEOMATRIX GST™ LEACHING SYSTEM INSPECTION PORT DETAIL



GST LEACHING SYSTEM			
Inspection Port Detail			
Geomatrix Systems, LLC., Old Saybrook, CT			
860-510-0730			
SCALE	None	REV.	A
DATE	6/2/2015	ACAD No.	GSTIP.DWG
DRAWN BY:	ERP	SHEET	1 OF 1





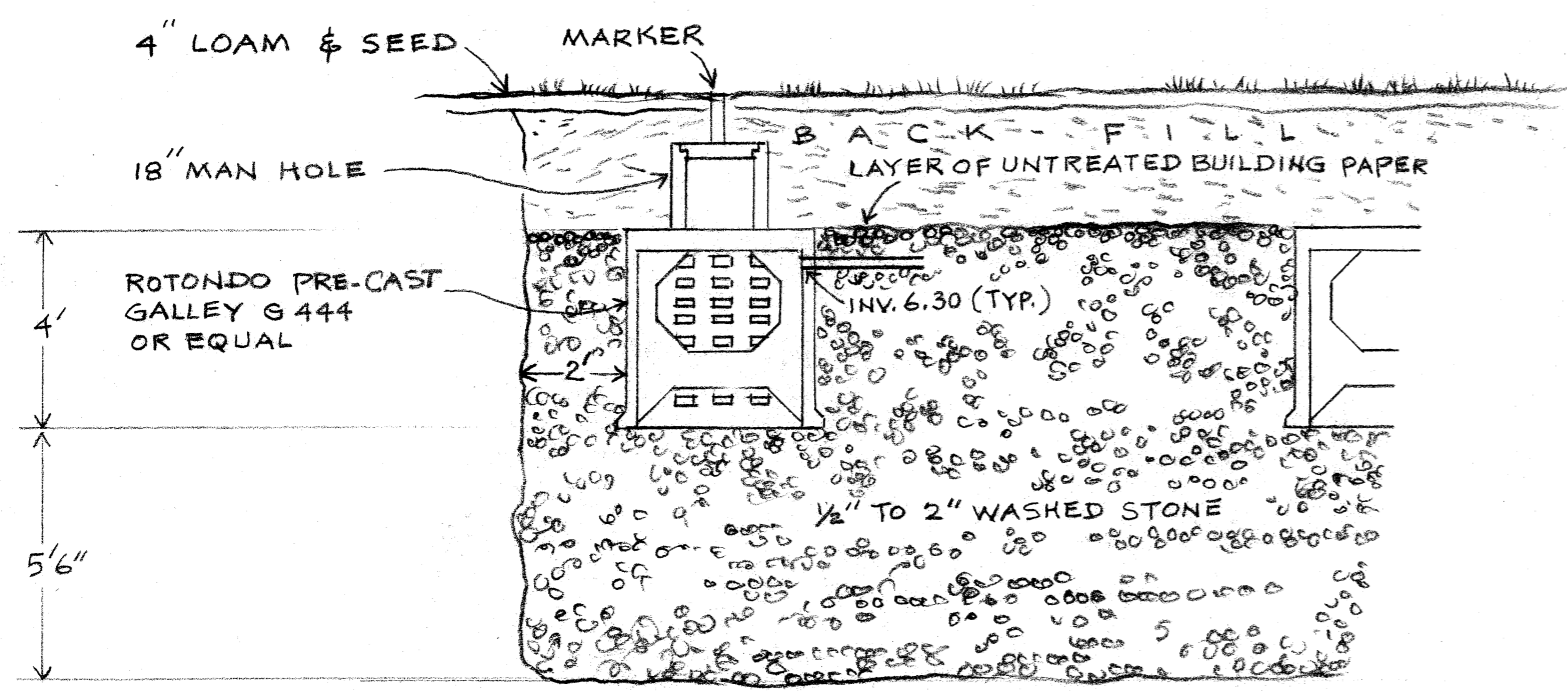
PLAN
SCALE: 1" = 20'

TEST PITS

EL. 9.8	GRADE	EL. 6.9
6" LM		6" LM
2'0" mc STL		1'8" STL
4'6" mc Gray		5'0" lc MS, 1-ST Gray
10'0" mc FS & 3 ST Gray		7'6" mc MS, CS 3-G, 2 ST Gray
12'0" mc CS & 2 G Gray		
		mc Brown

HOLE 9
HOLE EXCAVATED 3/18/82
DRY AT 7'6"
DRY AT 7'6" 3/22/82

HOLE 9A
DRY 3/15/83
EXCAVATED SAME DATE



SECTION
SCALE: 1" = 4'

AREA 500
AS BUILT

STATE OF RHODE ISLAND
DEPT. OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING & DEVELOPMENT
SEWAGE DISPOSAL PLAN AREA 500
BURLINGAME STATE PARK CHARLESTOWN, R.I.

DRAWN BY EVW DATE: 8/26/83 SHEET 2 OF 3



“Building – “B” Bathhouse and Onsite Wastewater Treatment System Replacement”

For

Rhode Island Department of Environmental Management
Burlingame State Park and Campground

Burlingame Park Road
Charlestown, Rhode Island

Assessors Map 15 – Lot 10
Area: 847 Acres±

July 2022
Rev.: February 2023

Prepared by

Caputo & Wick Ltd.
1150 Pawtucket Avenue
Rumford, Rhode Island 02916-1897
401-434-8880



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ON-SITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**



www.dem.ri.gov/septic

FOR RIDEM USE ONLY

APPLICATION No. 2205-1139 DATE RECEIVED 02/27/23 AMOUNT RECEIVED \$ 0.00 CHECK # --- NOTE CPA

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- | | |
|---|--|
| <input checked="" type="checkbox"/> NEW BUILDING CONSTRUCTION | <input checked="" type="checkbox"/> A/E TECHNOLOGY TYPE <u>GREYED AND/OR GST</u> |
| <input type="checkbox"/> ALTERATION | <input type="checkbox"/> VARIANCE |
| <input type="checkbox"/> REPAIR | <input type="checkbox"/> REDESIGN |
| <input type="checkbox"/> TRANSFER | <input type="checkbox"/> JOINT OWTS / WETLANDS PD |

CERTIFICATION

I, KEVIN HARROD (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

Designer's Signature Kevin Harrod License # D3155

Designer's Email khharrod@cult.net Phone # 401-454-9933

Business/Company Name CAPUTO W/LLC LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

Owner's Phone Number (401) 222-4700 ext. 2774307

Owner's Email MEGAN.DIPRETE@DEM.RI.GOV

Owner(s) Signature M. Diprete

SITE INFORMATION

BURLINGAME STATE PARK AND CAMPGROUND (BUILDING B)
1-100 BURLINGAME PARK ROAD CHARLESTOWN
NO. STREET CITY/TOWN POLE #
PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.
LOT SIZE 847 SF/ACRES
SUBDIVISION NAME N.A.
SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

OWNER INFORMATION

STATE OF RI DEM
LAST NAME FIRST NAME M.I.
235 PRAMENADE ST. PROVIDENCE 02908
NO. STREET CITY/TOWN ZIP CODE

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1139
DEPTH TO APPROVED WATER TABLE 48" HOW DETERMINED SOIL EVALUATION
TEST HOLE # 4C DATE EXCAVATED 8/18/21 WETLANDS within 200' OF OWTS YES NO
WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE 1/1
LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial FEB 21 2023
 Other BATHHOUSE
WATER SUPPLY: public water public well private well
OF DESIGN UNITS 150
UNIT DESIGN FLOW 50 gallons per SITE (unit) TOTAL DAILY FLOW 7,500 gallons
TANK SIZE 15,000 gallons DESIGN LOADING RATE 35 gpd/sf
MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet
LEACHFIELD TYPE GRAVEL SAND TREATMENT (GST)
TOTAL AREA OF LEACHFIELD PROVIDED 5,040 square feet

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other

Signature of RIDEM Official <u>[Signature]</u>	Date of Approval <u>2/27/23</u>	Date of Expiration <u>1/27/30</u>
---	------------------------------------	--------------------------------------

DESIGNER



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**



www.dem.ri.gov/septic

FOR RIDEM USE ONLY

APPLICATION No. _____ DATE RECEIVED ____/____/____ AMOUNT RECEIVED \$ _____ CHECK # _____ NOTE _____

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- NEW BUILDING CONSTRUCTION
- ALTERATION
- REPAIR
- TRANSFER

- A/E TECHNOLOGY TYPE ORENCO AX100/GST
- VARIANCE
- REDESIGN
- JOINT OWTS / WETLANDS PD

CERTIFICATION

I, KEVIN HARROP (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

Designer's Signature Kevin Harrop License # D 3155

Designer's Email kharrop@cw1td.net Phone # 401-434-8880

Business/Company Name CAPUTO and WICK LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

Owner's Phone Number (401) 222-4700 ext. 2774307

Owner's Email MEGAN.DIPRETE@DEM.RI.GOV

Owner(s) Signature _____

SITE INFORMATION

BURLINGAME STATE PARK AND CAMP GROUND (BUILDING 5)
1-100 BURLINGAME PARK ROAD, CHARLESTOWN

NO. STREET _____ CITY/TOWN _____ POLE # _____
PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.
LOT SIZE 847 ~~81~~ ACRES
SUBDIVISION NAME N.A.
SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

OWNER INFORMATION

STATE OF RI DEM

LAST NAME	FIRST NAME	M.I.
<u>235 PROMENADE ST.</u>	<u>PROVIDENCE</u>	<u>02908</u>
NO. STREET	CITY/TOWN	ZIP CODE

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1139
DEPTH TO APPROVED WATER TABLE 48" HOW DETERMINED SOIL EVALUATION
TEST HOLE # 4C DATE EXCAVATED 8/18/21 WETLANDS within 200' OF OWTS YES NO
WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE ____/____/____
LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial _____
 Other BATHHOUSE

WATER SUPPLY: public water public well private well

OF DESIGN UNITS 150
UNIT DESIGN FLOW 50 gallons per SITE (unit) TOTAL DAILY FLOW 7,500 gallons
TANK SIZE 15,000 gallons DESIGN LOADING RATE 3.5 gpd/sf
MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet
LEACHFIELD TYPE GRAVEL SAND TREATMENT (GST)
TOTAL AREA OF LEACHFIELD PROVIDED 5,040 square feet

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

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IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other

Signature of RIDEM Official _____ Date of Approval _____ Date of Expiration _____



RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

OFFICE OF WATER RESOURCES
235 Promenade Street, Providence, Rhode Island 02908

February 27, 2023

State of Rhode Island
Rhode Island Department of Environmental Management Division of Planning and Development
235 Promenade Street
Providence, RI 02908

RE: Bathhouse "B"
Burlingame State Park and Campground
Charlestown, RI
OWTS Application No. 2205-1139

Dear Applicant:

Attached herewith are revised monitoring and reporting requirements applicable to the above listed permit. As you are aware the above listed Onsite Wastewater Treatment System (OWTS) permit is granted based on a maximum daily design flow of **7,500** gallons per day and includes 1 - 15,000 gallon septic tank, 1 - 7,500 gallon anoxic tank, 1 - 6,000 gallon recirculation tank, 2 - Advantex AX 100 filter pods followed by a 6 x 6 pump chamber to a Gravel Sand Treatment (GST) type of leaching system.

Advanced treatment systems are utilized to mitigate against possible adverse impacts of residual onsite wastewater pollutants on groundwater quality and surface water quality. Owners of advanced OWTSs with design flows $\geq 2,000$ gallons per day are subject to regular monitoring and reporting. The following stipulations now apply to your permit:

1. The following discharge limits as measured at the 6 x 6 pump chamber shall apply:

Orengo Systems, Inc. AdvanTex AX-100 – Mode 1
Biochemical Oxygen Demand (5 Day) ≤ 20 mg/L
Total Suspended Solids ≤ 20 mg/L
Oil & Grease ≤ 5 mg/L

2. Wastewater flow shall not exceed a maximum daily flow of **7,500** gallons per day. Wastewater flow shall be monitored and recorded to ensure compliance with this stipulation.
3. Sampling and testing shall be conducted quarterly at the compliance point specified in Item 1 above. Sampling and measurements shall be representative of the monitored activity. The Permittee shall sample and test the wastewater in each system as follows:

Dissolved Oxygen (mg/L) – *Field Test*
Effluent Temperature (°F) – *Field Test*
pH (s.u.) – *Field Test*
Biochemical Oxygen Demand (5-Day) (mg/L)
Total Suspended Solids (mg/L)
Oil and Grease (mg/L)
Alkalinity (mg/L)

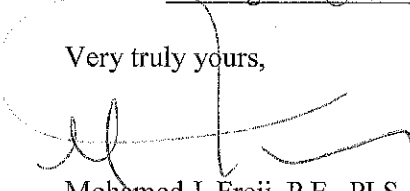
4. Corrective Action – Corrective action must be taken as soon as practicable following receipt of monitoring results which indicate that system modifications or maintenance is required. The system must be resampled no sooner than seven (7) days after any adjustment is made to the system and within thirty (30) days of the routine quarterly sample date. Samples must be analyzed for each of the parameters listed in Item 3 for any post corrective action sampling events.
5. Annual Report – All monitoring results including wastewater flow data shall be submitted to the DEM in the form of an annual report. The annual report is due **February 15th** of each year. The annual report must summarize all monitoring results and corrective actions implemented during the previous calendar year. A clear determination regarding the compliance status of the OWTS must be made as part of the annual report. The annual report must include a copy of the most recent Operation and Maintenance Contract as proof of compliance with this requirement.
6. The Permittee shall properly operate and maintain all facilities and equipment associated with the OWTS in accordance with the most recent operation and maintenance (O&M) plan. The O&M plan specifies procedures for operation, process control, record keeping, monitoring, weekly maintenance checks, other routine and periodic maintenance, safety and security. Also, the O&M plan includes a contingency plan to address emergency actions and procedures in the event of equipment failure and power loss.
7. Your permit approval is for the discharge of sanitary waste only. No toxic, hazardous or industrial processing waste may be discharged into the system.
8. All septage, sludges, screenings or other pollutants removed from the system shall be disposed in accordance with all applicable state and federal laws.
9. The permit may be automatically transferred by the Permittee to a new owner provided:
 - a. The current Permittee notifies the DEM by certified mail at least thirty (30) days in advance of the proposed transfer date;
 - b. The notice includes the name and address of the new Permittee and a written agreement between the existing and new Permittee containing a specific date for the transfer of permit responsibility, surety and liability between them and;
 - c. The DEM does not notify the existing Permittee and the proposed new Permittee of its intent to modify or reissue the permit.
10. The operator or person in responsible charge of the OWTS shall have at a minimum a Rhode Island Class 1 Wastewater Treatment Plant Operator Certification or an equivalent certification from another jurisdiction acceptable to the DEM. If the operator is not employed directly by the Permittee, a service agreement with the operator shall be entered into and continuously maintained, and a copy of the active service agreement shall be submitted to the DEM as part of the annual report.
11. The permit may be modified, suspended, or revoked for cause. The DEM reserves the right to revise the permit to ensure compliance with applicable state and federal regulations. Failure to comply with the conditions of this permit approval letter may result in an enforcement action.

12. The Permittee shall allow the DEM or their authorized representative to access the OWTS and work areas to inspect equipment, practices, records pertinent to this permit and stipulated compliance requirements, and to sample and monitor the wastewater for the purposes of determining compliance.
13. In the event of treatment interruption, bypass or sewage overflow, the Permittee shall notify the DEM verbally within twenty-four (24) hours. Such incident shall be reported in writing within five (5) days after it becomes known to the Permittee, the report shall include the date and time(s) of the incident, the duration of the incident, and actions taken to correct the problem and prevent a reoccurrence.
14. For purposes of notification, monitoring, compliance or inquiries pursuant to this permit, all correspondence, telephone calls and other contacts must reference the OWTS permit number and shall be directed to:

The Rhode Island Department of Environmental Management
Onsite Wastewater Treatment Systems Program
235 Promenade Street
Providence, RI 02908
Telephone: (401) 222-3961
www.dem.ri.gov/septic

Should you have any questions concerning these permit requirements, please contact Tom Angelone by email at tom.angelone@dem.ri.gov or by phone at 401-222-3961, extension 2777607.

Very truly yours,



Mohamed J. Freij, P.E., PLS
Supervising Sanitary Engineer

KF

Enclosure(s)

cc: Joseph L. Warner Jr., Charlestown Building Official

TH-4A - GROUND ELEV: 72.1 - AUGUST 18, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 9"	C	S	2.5YR 6/3			La	Zghd	Vfr	3
Bw	9" - 30"	C	S	10YR 5/6			La	Zghd	Fr	3
C	30" - 120"	C	S	2.5YR 7/3			La	Zghd	Fr	3

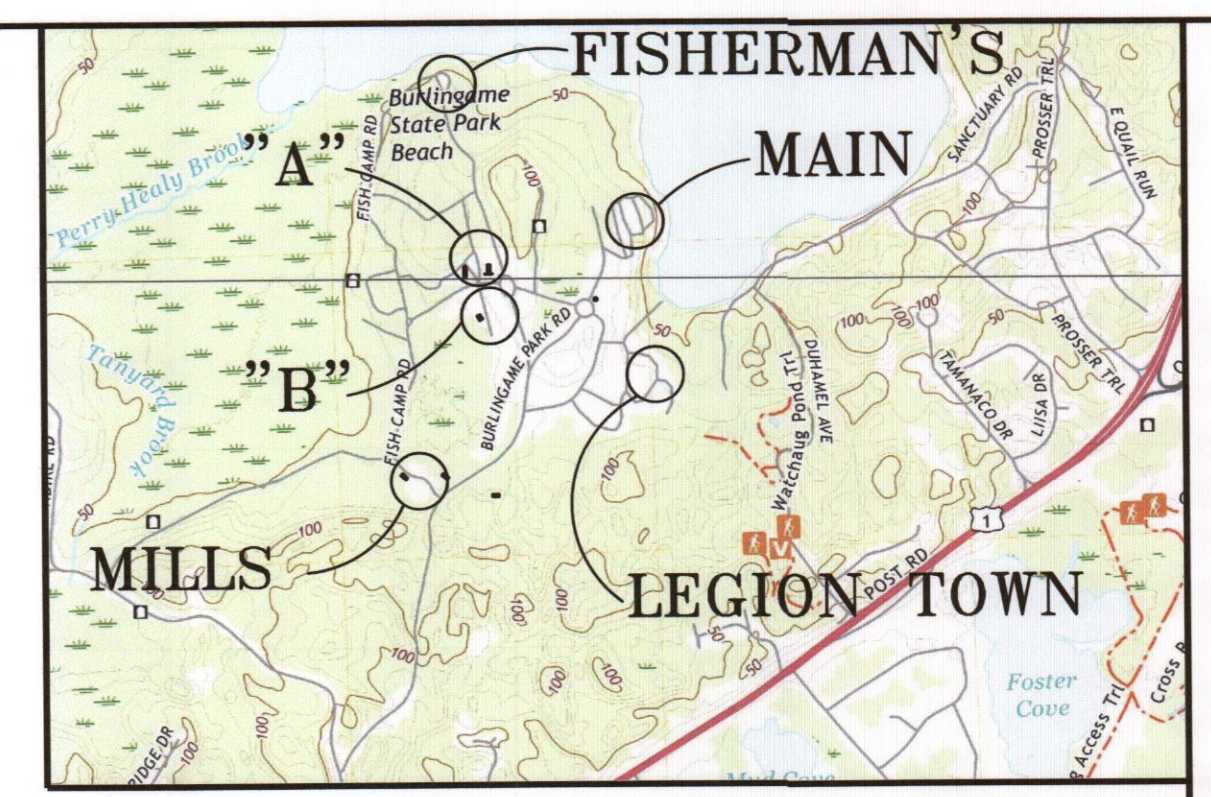
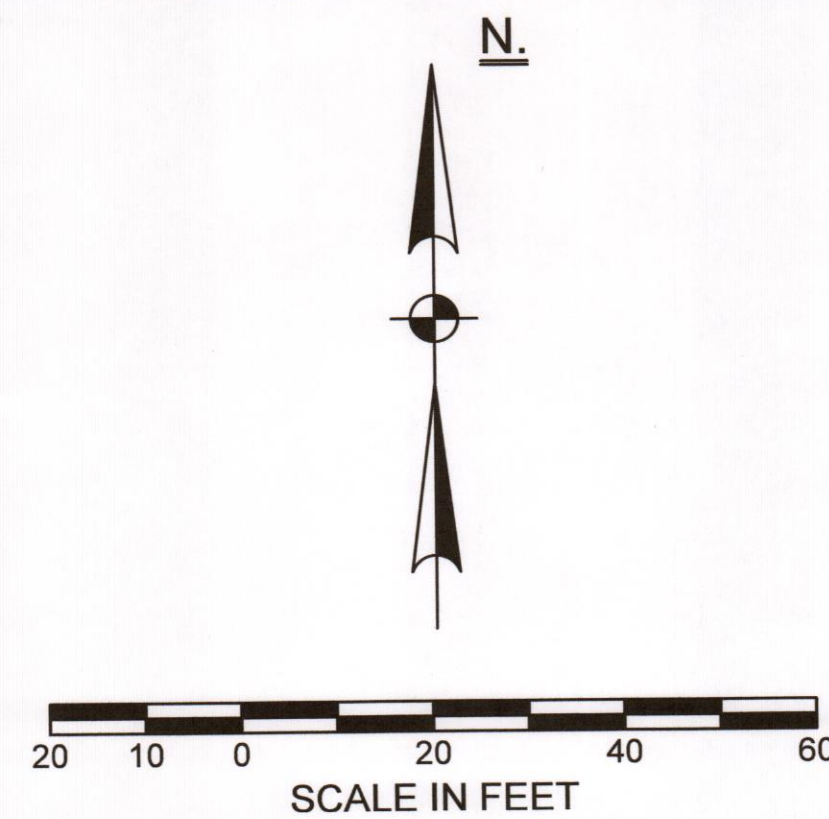
SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV: 62.1) PERFORMED BY: KAMAL HINGORARY

TH-4B - GROUND ELEV: 71.5 - AUGUST 18, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
FILL	0 - 10"	C	S	-			-	-	-	-
P	10" - 28"	C	S	10YR 8			La	Zghd	Fr	3
Bw	28" - 48"	C	S	2.5YR 7/3			La	Zghd	Fr	3
C	48" - 120"	C	S	2.5YR 7/3	5YR 4/4	M M P	La	Zghd	Fr	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV: 61.5) PERFORMED BY: KAMAL HINGORARY

TH-4C - GROUND ELEV: 72.6 - AUGUST 18, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 12"	C	S	2.5YR 6/3			La	Zghd	Vfr	3
Bw	12" - 40"	C	S	10YR 5/6			La	Zghd	Fr	3
C	40" - 120"	C	S	2.5YR 7/3			La	Zghd	Fr	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV: 62.6) PERFORMED BY: KAMAL HINGORARY



LOCUS MAP

NOTES:

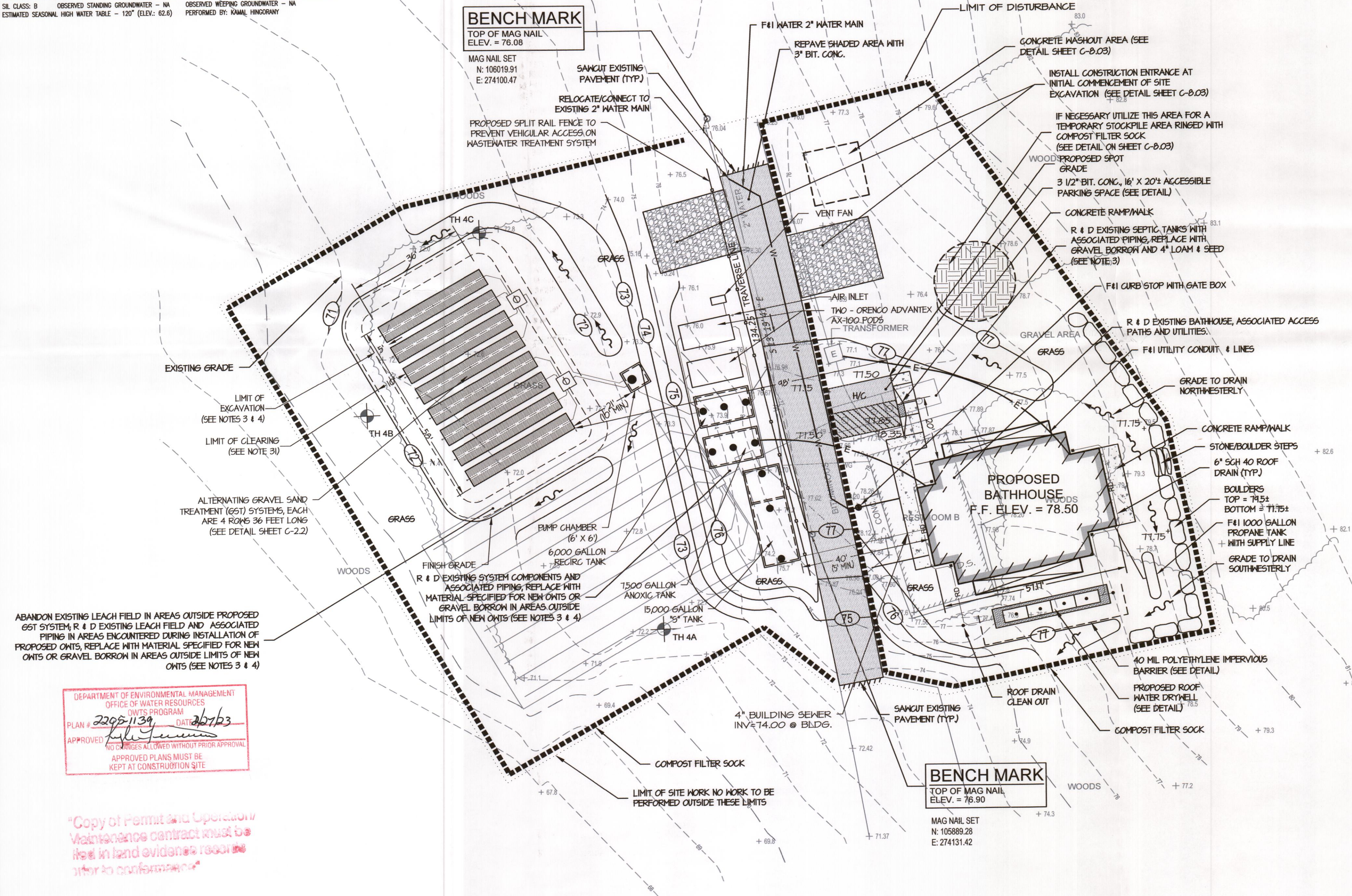
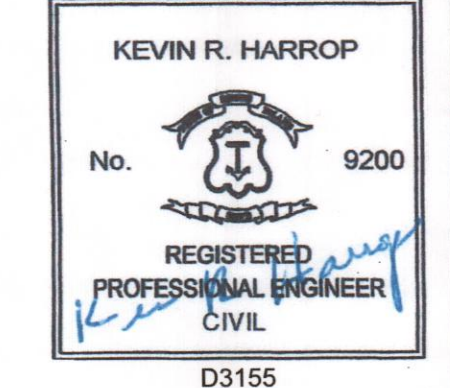
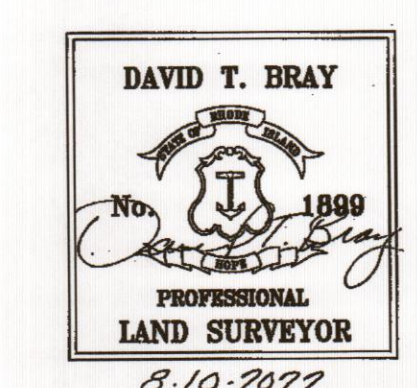
- ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, OFFICE OF WATER RESOURCES "RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION AND MAINTENANCE OF ONSITE WASTEWATER TREATMENT SYSTEMS", LATEST EDITION.
- THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL OF ALL PROPOSED CONSTRUCTION MATERIALS AND EQUIPMENT PRIOR TO ANY CONSTRUCTION.
- EXISTING ONSITE WASTEWATER TREATMENT SYSTEM (OWTS) PRECAST STRUCTURES ARE TO BE PUMPED OUT, RINSED WITH CLEAN WATER AND PUMPED OUT AGAIN. PUMPING MUST BE PERFORMED BY A STATE LICENSED SEPTIC HAULER AND THE CONTENTS OF THE TANK DISPOSED OF PROPERLY. AFTER PUMPING, THE EXISTING OWTS STRUCTURES MUST BE FILLED WITH FLOWABLE FILL OR REMOVED AND REPLACED WITH GRAVEL BORROW AND 4" LOAM AND SEED.
- REMOVE ALL PORTIONS OF THE EXISTING OWTS WITHIN 5' OF THE GRAVEL SAND TREATMENT SYSTEM; AND ALL FILL, A HORIZON SOIL, B HORIZON SOIL AND SCARIFY 3" OF THE C HORIZON SOIL BELOW THE GRAVEL SAND TREATMENT SYSTEM AND THOROUGHLY MIX WITH ASTM C-33 SAND (SEE NOTE 16) TO INTERFACE THE FILL WITH THE SOIL, AND REPLACE ALL REMOVED SOIL WITH ASTM C-33 SAND. A AND B SOIL HORIZON LAYERS ARE TO BE REMOVED IN THIS APPLICATION DUE TO COMPACTION CAUSED BY PREVIOUS SYSTEM INSTALLATION AND FILL BEING PLACED ABOVE.
- UNSUITABLE MATERIAL USED TO BACKFILL THE TEST HOLES SHALL BE REMOVED AND REPLACED WITH WITH ASTM C-33 SAND (SEE NOTE 16).
- ASTM C-33 SAND (SEE NOTE 16) MUST BE PLACED ON SCARIFIED, RELATIVELY DRY NATURAL SOIL. THE CONTRACTOR SHALL PROVIDE FOR DEWATERING AS REQUIRED AND ALL WORK SHALL BE PERFORMED UNDER DRY CONDITIONS.
- BUILDING SEWER PIPE TO BE 4" P. V. C. SCH. 40 UNLESS OTHERWISE NOTED.
- 6" MINIMUM COMPACTED CRUSHED STONE UNDER SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER, ADVANTEX TREATMENT TANKS AND SYSTEM STRUCTURES.
- INLET AND OUTLET TEES FOR SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK AND PUMP CHAMBER ARE TO BE LOCATED DIRECTLY BELOW ACCESS COVERS.
- SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
- IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION. IF IN DOUBT, ASK.
- NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6-27.
- INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
- IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
- MINIMUM PERIMETER INVERT ELEVATION = 70.25. NO FINISHED GRADE BELOW 70.25 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM.
- THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL DELIVERED TO THE SITE IS REQUIRED.
- OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEX PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEX INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL, AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
- INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEX INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR-150-6. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEM LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE VENDORS TO INSTALL THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
- REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY AN INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEX TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
- THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-6.4.7 OF THE "REGULATIONS". FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE SYSTEM COMPONENTS FOR OBSERVATION.
- THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
- CONTRACTOR SHALL CONTACT "DIG-SAFE" PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
- THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
- NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
- I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
- ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO BE WATER TIGHT.
- PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR POCKETS.
- CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
- CONTROL PANEL AND ALARM IS TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION, EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
- THE PUMP DOSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOWS.
- ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
- THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STAKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
- NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
- MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.

DESIGN DATA

DAILY SEWAGE FLOW:
50 GPD/CAMPSITE x 150 CAMPSITES = 7500 GALLONS PER DAY (G.P.D.)
GROUND WATER TABLE : 120"
DEPTH TO IMPERVIOUS : NOT ENCOUNTERED
SOIL CLASS: B, SOIL CATEGORY: 3, LOADING RATE: 0.70 GAL/S.F./DAY
SEPTIC TANK REQUIREMENTS VOLUME = 2 X 7,500 G.P.D. = 15,000 GALLONS
LEACHING AREA REQUIREMENTS:
GRAVEL SAND TREATMENT (GST) SYSTEM WITH CATEGORY 1 TREATMENT (ORENCO ADVANTEX TREATMENT AX100)
ASSIGNED EFFLUENT LOADING RATE = 3.5 GPD PER S. F.
SQUARE FOOTAGE OF GST REQUIRED = 7500 GPD / 3.5 GPD PER S.F. = 2,143 S.F.
LENGTH OF GST 6212 REQUIRED = 2,143 S.F. / 17.5 S.F./L.F. = 123 L.F.
LENGTH OF GST 6212 SPECIFIED: 288 L.F.
TOTAL GST SYSTEM CAPACITY = 288 L.F. X 17.5 S.F./L.F. X 3.5 G.P.D./S.F. = 17,640 GPD
17,640 GPD > 7,500 GPD - CAPACITY = 235% OF ANTICIPATED DESIGN FLOW

CERTIFICATION:

THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 9 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 28, 2015, AS FOLLOWS:
TYPE OF BOUNDARY SURVEY: MEASUREMENT SPECIFICATION:
OTHER TYPE OF SURVEY: DATA ACCUMULATION SURVEY (LOCATIONS) CLASS II
TOPOGRAPHIC SURVEY ACCURACY: 1/2" (IMMEDIATE AREA AROUND DWELLING AND OWTS AS IDENTIFIED)
THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ONSITE WASTEWATER TREATMENT SYSTEM.
David T. Bray 8/10/2022
DAVID T. BRAY PLS NO. 1898 DATE
CAPUTO AND WICK LTD., CCA NO. A177



ABANDON EXISTING LEACH FIELD IN AREAS OUTSIDE PROPOSED GST SYSTEM. R & D EXISTING LEACH FIELD AND ASSOCIATED PIPING IN AREAS ENCOUNTERED DURING INSTALLATION OF PROPOSED OWTS, REPLACE WITH MATERIAL SPECIFIED FOR NEW OWTS OR GRAVEL BORROW IN AREAS OUTSIDE LIMITS OF NEW OWTS OR GRAVEL BORROW IN AREAS OUTSIDE LIMITS OF NEW OWTS (SEE NOTES 3 & 4)

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
OWTS PROGRAM
PLAN 2205-1134 DATE 26/23
APPROVED: [Signature]
NO CHANGES ALLOWED WITHOUT PRIOR APPROVAL
APPROVED PLANS MUST BE KEPT AT CONSTRUCTION SITE

Copy of Permit and Operation & Maintenance contract must be filed in land evidence register after construction

LEGEND

- 100 - EXISTING CONTOUR
- RI, STD. INV. - PROPOSED CONTOUR
- P. V. C. - RHODE ISLAND STANDARD INVERT OF PIPE
- S. D. R. - POLYVINYL CHLORIDE PIPE STANDARD DIMENSION RATIO
- CONC. - CONCRETE
- BIT. - BITUMINOUS
- TYP. - TYPICAL
- F.S. 100x00 FINISHED SPOT GRADE
- + 100.00 - EXISTING SPOT GRADE
- - SPLIT RAIL FENCE
- ⊙ - DEEP OBSERVATION HOLE
- ⊙ - OUT CROP OR SURFACE ROCK
- E--- - EXIST. UNDERGROUND ELECTRIC
- W--- - EXIST. WATER
- T--- - EXIST. UNDERGROUND TELEPHONE
- >--- - FINISH GRADE SURFACE FLOW DIRECTION

CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

BURLINGAME STATE PARK AND CAMPGROUND

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

BATHHOUSE "B" - SITE PLAN

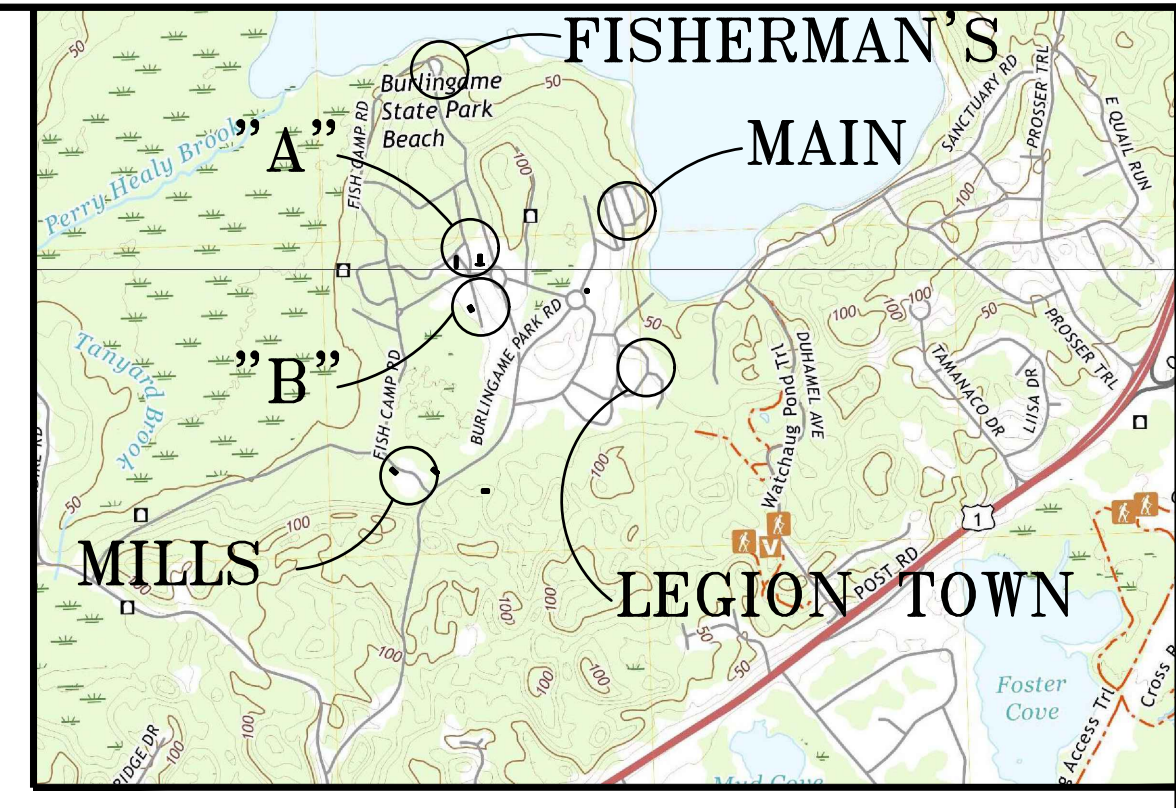
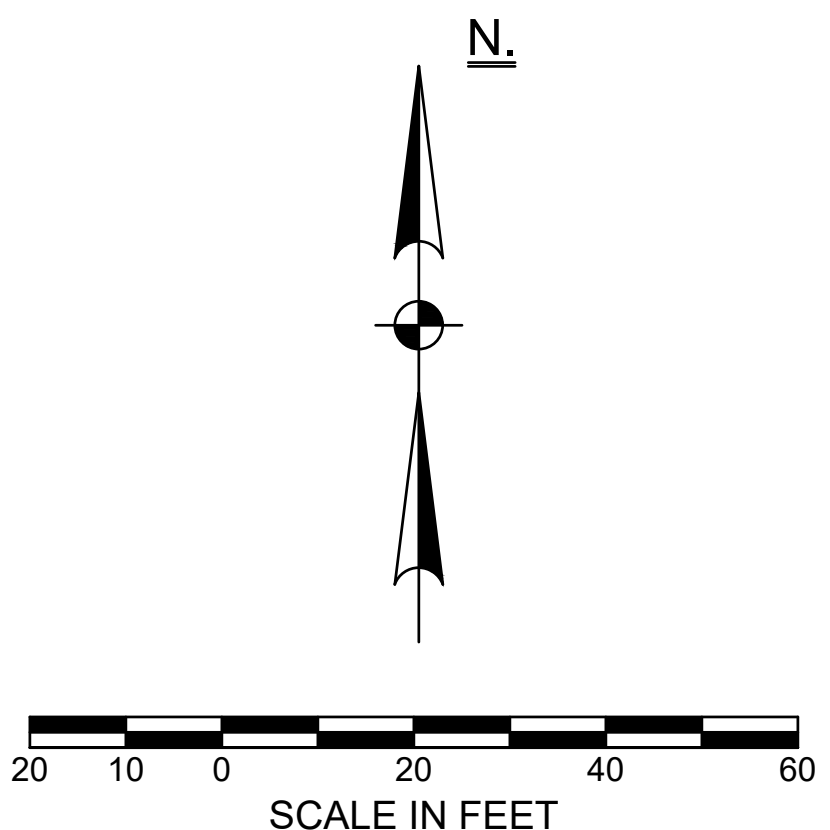
Dwg: Scale: 1" = 20'
Contract No. x Date: FEBRUARY, 2023

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TH-4A - GROUND ELEV: 72.1 - AUGUST 18, 2021										
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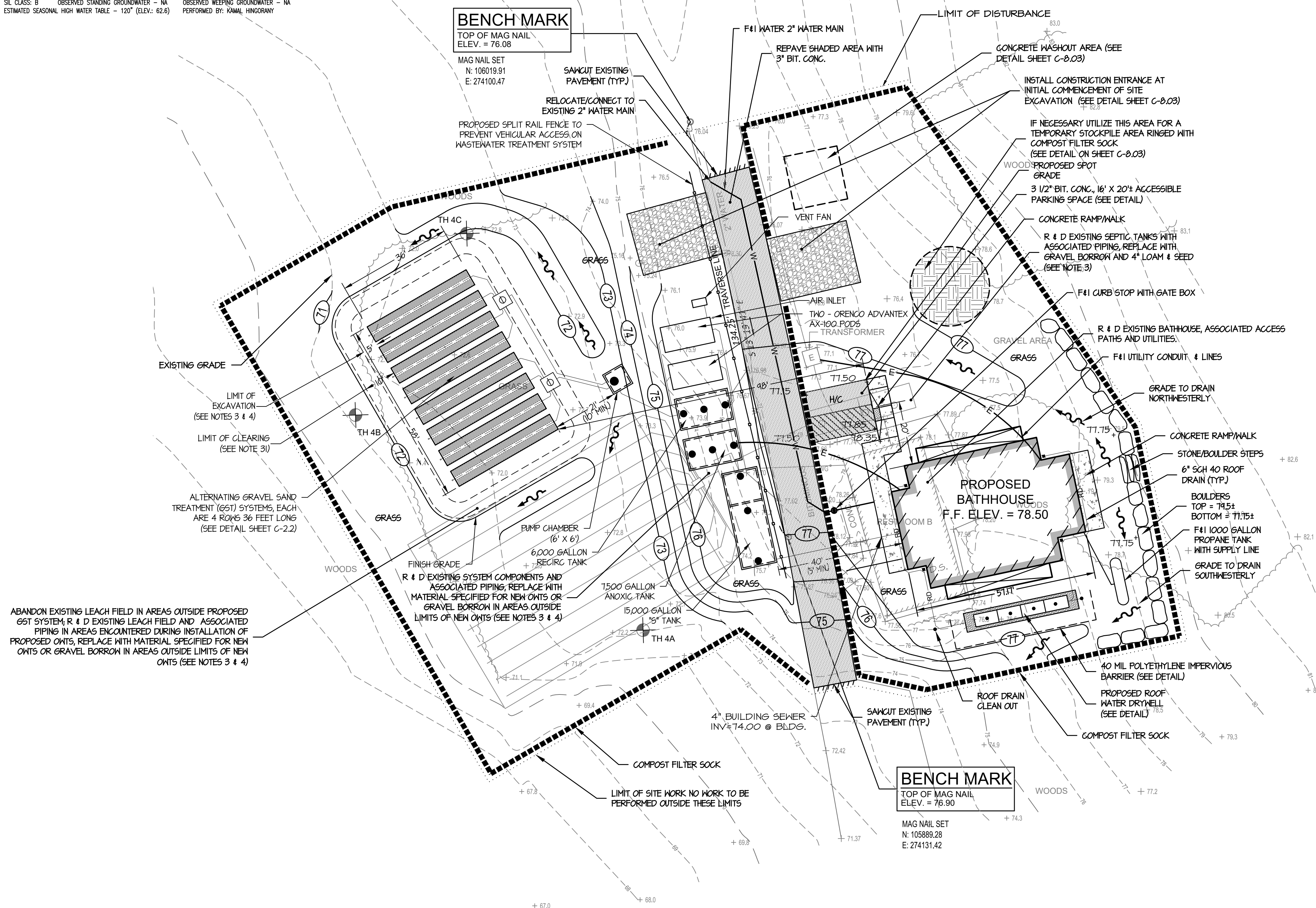
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LOCUS MAP

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- PLACE 6" MINIMUM COMPACTED CRUSHED STONE UNDER SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER, ADVANTEX TREATMENT TANKS AND SYSTEM STRUCTURES.
- INLET AND OUTLET TEES FOR SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK AND PUMP CHAMBER ARE TO BE LOCATED DIRECTLY BELOW ACCESS COVERS.
- SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
- IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION. IF IN DOUBT, ASK.
- NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6.27.
- INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
- IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
- MINIMUM PERIMETER INVERT ELEVATION = 70.25. NO FINISHED GRADE BELOW 70.25 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM.
- THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL DELIVERED TO THE SITE IS REQUIRED.
- OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEX PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEX INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL, AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
- INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEX INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR-150-6. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEM LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE VENDORS TO INSTALL THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
- REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY AN INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEX TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
- THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-6.4.7 OF THE "REGULATIONS". FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE SYSTEM COMPONENTS FOR OBSERVATION.
- THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
- CONTRACTOR SHALL CONTACT "DIG-SAFE" PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
- THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
- NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
- I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
- ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO BE WATER TIGHT.
- PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR POCKETS.
- CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
- CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION, EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
- THE PUMP POSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
- ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
- THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STAKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
- NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
- MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.

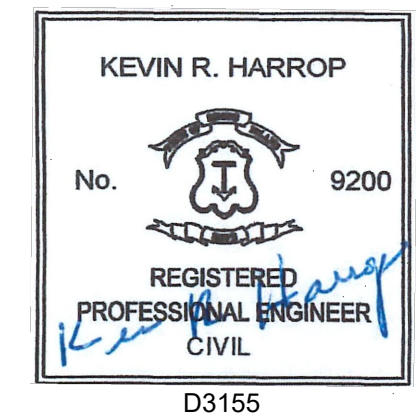
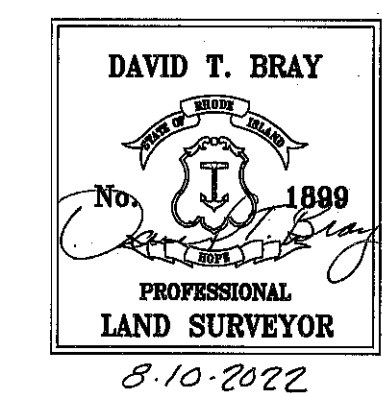


ABANDON EXISTING LEACH FIELD IN AREAS OUTSIDE PROPOSED GST SYSTEM. R 4 D EXISTING LEACH FIELD AND ASSOCIATED PIPING IN AREAS ENCOUNTERED DURING INSTALLATION OF PROPOSED OWTS. REPLACE WITH MATERIAL SPECIFIED FOR NEW OWTS OR GRAVEL BORROW IN AREAS OUTSIDE LIMITS OF NEW OWTS (SEE NOTES 3 & 4)

LEGEND

— 100 —	EXISTING CONTOUR	F.S. 100x00	FINISHED SPOT GRADE
— 100.00 —	PROPOSED CONTOUR	+ 100.00	EXISTING SPOT GRADE
RI. STD.	RHODE ISLAND STANDARD	—	SPLIT RAIL FENCE
INV.	INVERT OF PIPE	—	DEEP OBSERVATION HOLE
P. V. C.	POLYVINYL CHLORIDE PIPE	—	OUT CROP OR SURFACE ROCK
S. D. R.	STANDARD DIMENSION RATIO	—	EXIST. UNDERGROUND ELECTRIC
CONC.	CONCRETE	—	EXIST. WATER
BIT.	BITUMINOUS	—	EXIST. UNDERGROUND TELEPHONE
TYP.	TYPICAL	—	FINISH GRADE SURFACE FLOW DIRECTION

CERTIFICATION:
 THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 8 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 28, 2015, AS FOLLOWS:
TYPE OF BOUNDARY SURVEY: NOT A BOUNDARY SURVEY
MEASUREMENT SPECIFICATION: CLASS III T-2 (IMMEDIATE AREA AROUND DWELLING AND OWTS AS IDENTIFIED)
OTHER TYPE OF SURVEY: DATA ACQUISITION SURVEY (LOCATIONS)
 THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ON-SITE WASTEWATER TREATMENT SYSTEM.
David T. Bray 8/10/2022
 DAVID T. BRAY PLS NO. 1898 DATE 8-10-2022
 CAPUTO AND WICK LTD., COA NO. A177



CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

BURLINGAME STATE PARK AND CAMPGROUND

STATE OF RHODE ISLAND
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
 DIVISION OF PLANNING AND DEVELOPMENT

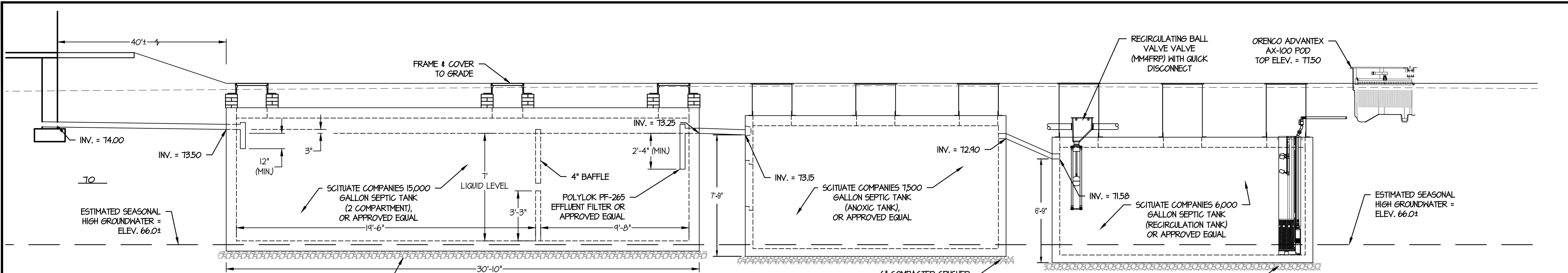
DEMOLITION AND REBUILD OF BATHHOUSES
 BURLINGAME STATE PARK AND CAMPGROUND
 CHARLESTOWN, RHODE ISLAND

BATHHOUSE "B" - SITE PLAN

Dwg: Contract No. x Scale: 1" = 20' Date: FEBRUARY, 2023

C-1.2 10

J:\RhodeIsland\Charleston\RIDEM - Burlingame\009 - 025 - and S-6 Site Design\2023\02.10.10.dwg



VOLUMES

TOP SLAB: 11.83' WIDE X 30.83' LONG X 0.67' THICK = 232.96 C.F. (CUBIC FOOT)
 SIDES: 2 SIDES X 10.20' LONG X 8.00' HIGH X 0.67' WIDE = 106.67 C.F.
 2 SIDES X 30.83' LONG X 8.00' HIGH X 0.67' WIDE = 328.84 C.F.
 BOTTOM: 11.83' WIDE X 30.83' LONG X 0.67' THICK = 232.96 C.F.
 Baffle: 12.00' LONG X 1.25' HIGH X 0.39' WIDE = 28.32 C.F.
 TOTAL VOLUME OF CONCRETE FOR TANK = 425.40 C.F.
 EARTH: 11.83' WIDE X 30.83' LONG X 1.50' THICK = 551.40 C.F.

CONSTANTS (HEIGHTS)

CONCRETE: 150 POUNDS/C.F.
 EARTH: 100 POUNDS/C.F.
 WATER: 62.4 POUNDS/C.F.
 COUNTER HEIGHT: N/A

HEIGHT OF TANK IN PLACE

CONCRETE: 425.40 C.F. X 150 POUNDS/C.F. = 63,810 POUNDS (EMPTY TANK)
 COUNTER HEIGHT: = 0 POUNDS
 EARTH: 551.40 C.F. X 100 POUNDS/C.F. = 55,140 POUNDS (EARTH COVER)
 TOTAL HEIGHT OF TANK SET IN PLACE = 118,950 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL

BOTTOM SLAB AREA: 11.83' WIDE X 30.83' LONG = 364.44 S.F. (SQUARE FEET)
 TANK: 364.44 S.F. X BP X 62.4 POUNDS/C.F. = 158,810 POUNDS (EMPTY TANK)
 BP = 158,810 POUNDS / 62.4 POUNDS/C.F. = 2,544.87 S.F.
 BP = 6.37' - 6'-4" (ELEV. 11.93)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE

BP = 118,950 POUNDS / 62.4 POUNDS/C.F. + 1,170.00 S.F.
 BP = 8.95' - 8'-11" (ELEV. 14.48)

VOLUMES

TOP SLAB: 10.00' WIDE X 17.00' LONG X 0.67' THICK = 113.33 C.F. (CUBIC FOOT)
 SIDES: 2 SIDES X 10.00' LONG X 8.00' HIGH X 0.50' WIDE = 80.00 C.F.
 2 SIDES X 17.00' LONG X 8.00' HIGH X 0.50' WIDE = 136.00 C.F.
 BOTTOM: 10.00' WIDE X 17.00' LONG X 0.50' THICK = 85.00 C.F.
 TOTAL VOLUME OF CONCRETE FOR TANK = 434.33 C.F.
 EARTH: 10.00' WIDE X 17.00' LONG X 1.50' THICK = 255.00 C.F.

CONSTANTS (HEIGHTS)

CONCRETE: 150 POUNDS/C.F.
 EARTH: 100 POUNDS/C.F.
 WATER: 62.4 POUNDS/C.F.
 COUNTER HEIGHT: N/A

HEIGHT OF TANK

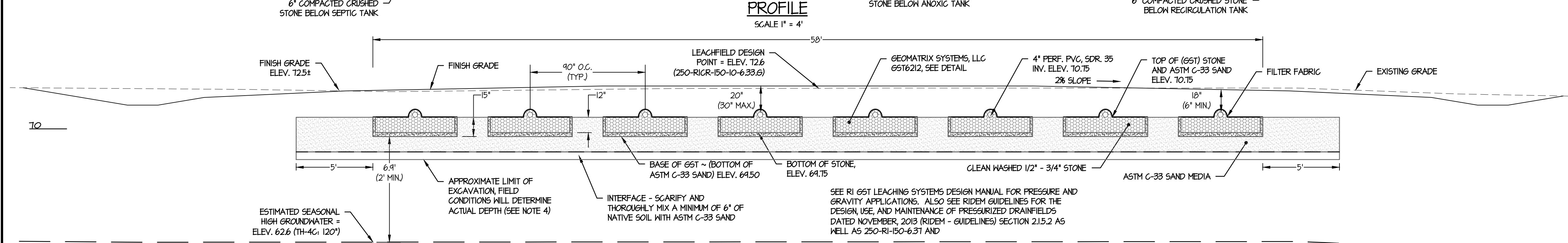
CONCRETE: 434.33 C.F. X 150 POUNDS/C.F. = 65,150 POUNDS (EMPTY TANK)
 COUNTER HEIGHT: = 0 POUNDS
 EARTH: 255.00 C.F. X 100 POUNDS/C.F. = 25,500 POUNDS (EARTH COVER)
 TOTAL HEIGHT OF TANK SET IN PLACE = 90,650 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL

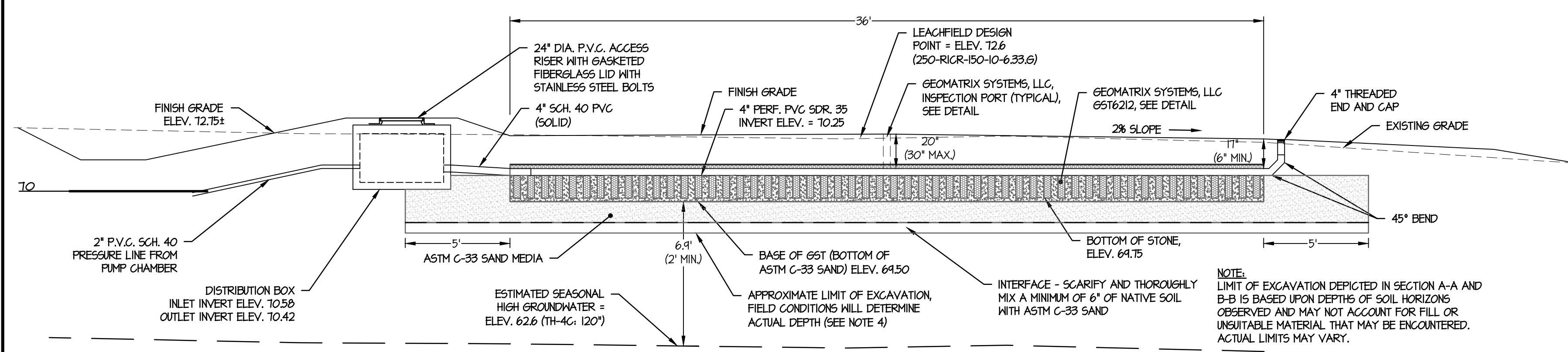
BOTTOM SLAB AREA: 10.00' WIDE X 17.00' LONG = 170.00 S.F. (SQUARE FEET)
 TANK: 170.00 S.F. X BP X 62.4 POUNDS/C.F. = 60,150 POUNDS (EMPTY TANK)
 BP = 60,150 POUNDS / 62.4 POUNDS/C.F. + 1,170.00 S.F.
 BP = 5.75' - 5'-9" (ELEV. 11.00)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE

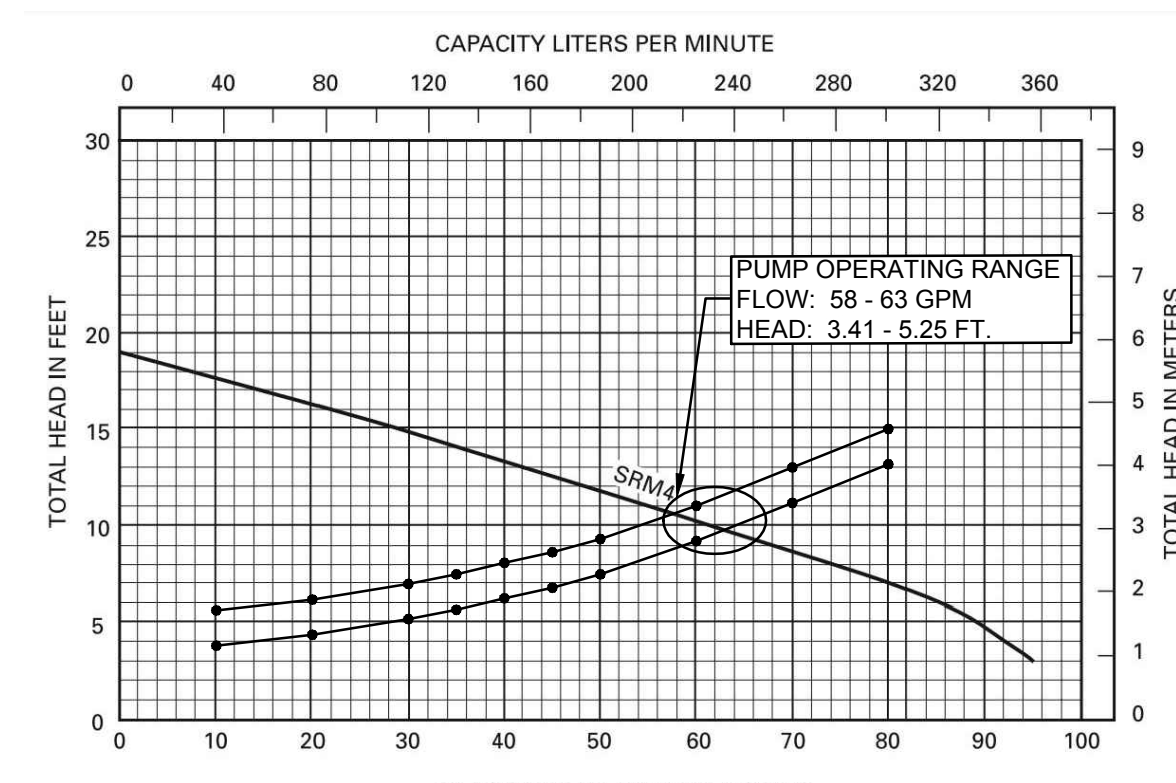
BP = 90,650 POUNDS / 62.4 POUNDS/C.F. + 1,170.00 S.F.
 BP = 8.62' - 8'-7" (ELEV. 14.22)



GRAVEL TREATMENT SYSTEM (GST) SECTION B-B
SCALE 1" = 4'



GRAVEL TREATMENT SYSTEM (GST) SECTION A-A
SCALE 1" = 4'



PUMP CURVE: MYERS SRM4

VOLUMES

TOP SLAB: 10.00' WIDE X 17.00' LONG X 0.67' THICK = 113.33 C.F. (CUBIC FOOT)
 SIDES: 2 SIDES X 10.00' LONG X 7.00' HIGH X 0.50' WIDE = 70.00 C.F.
 2 SIDES X 17.00' LONG X 7.00' HIGH X 0.50' WIDE = 119.00 C.F.
 BOTTOM: 10.00' WIDE X 17.00' LONG X 0.50' THICK = 85.00 C.F.
 TOTAL VOLUME OF CONCRETE FOR TANK = 407.33 C.F.
 EARTH: 10.00' WIDE X 17.00' LONG X 1.50' THICK = 255.00 C.F.

CONSTANTS (HEIGHTS)

CONCRETE: 150 POUNDS/C.F.
 EARTH: 100 POUNDS/C.F.
 WATER: 62.4 POUNDS/C.F.
 COUNTER HEIGHT: N/A

HEIGHT OF TANK AND EARTH COVER

CONCRETE: 407.33 C.F. X 150 POUNDS/C.F. = 61,100 POUNDS (EMPTY TANK)
 COUNTER HEIGHT: = 0 POUNDS
 EARTH: 255.00 C.F. X 100 POUNDS/C.F. = 25,500 POUNDS (EARTH COVER)
 TOTAL HEIGHT OF TANK SET IN PLACE = 86,600 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL

BOTTOM SLAB AREA: 10.00' WIDE X 17.00' LONG = 170.00 S.F. (SQUARE FEET)
 TANK: 170.00 S.F. X BP X 62.4 POUNDS/C.F. = 51,050 POUNDS (EMPTY TANK)
 BP = 51,050 POUNDS / 62.4 POUNDS/C.F. + 1,170.00 S.F.
 BP = 5.37' - 5'-4" (ELEV. 10.20)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE

BP = 86,600 POUNDS / 62.4 POUNDS/C.F. + 1,170.00 S.F.
 BP = 10.44' - 10'-5" (ELEV. 15.82)

AREAS

TOP: 17.0' X 17.0' = 44.89 S.F. - (11 X 12.5) = 4.81 S.F. = 44.08 S.F. (SQUARE FEET)

VOLUMES

TOP SLAB: 44.08 S.F. X 0.50' THICK = 22.04 C.F. (CUBIC FOOT)
 SIDES: 2 SIDES X 17.0' LONG X 1.00' HIGH X 0.50' THICK = 44.00 C.F.
 2 SIDES X 6.0' LONG X 1.00' HIGH X 0.50' THICK = 42.00 C.F.
 BOTTOM: 10.00' WIDE X 17.00' LONG X 0.50' THICK = 85.00 C.F.
 TOTAL VOLUME OF CONCRETE FOR TANK = 193.04 C.F.
 EARTH: 44.08 S.F. X 0.75' THICK = 33.07 C.F.

CONSTANTS (HEIGHTS)

CONCRETE: 150 POUNDS/C.F.
 EARTH: 100 POUNDS/C.F.
 WATER: 62.4 POUNDS/C.F.

HEIGHT OF TANK AND EARTH COVER

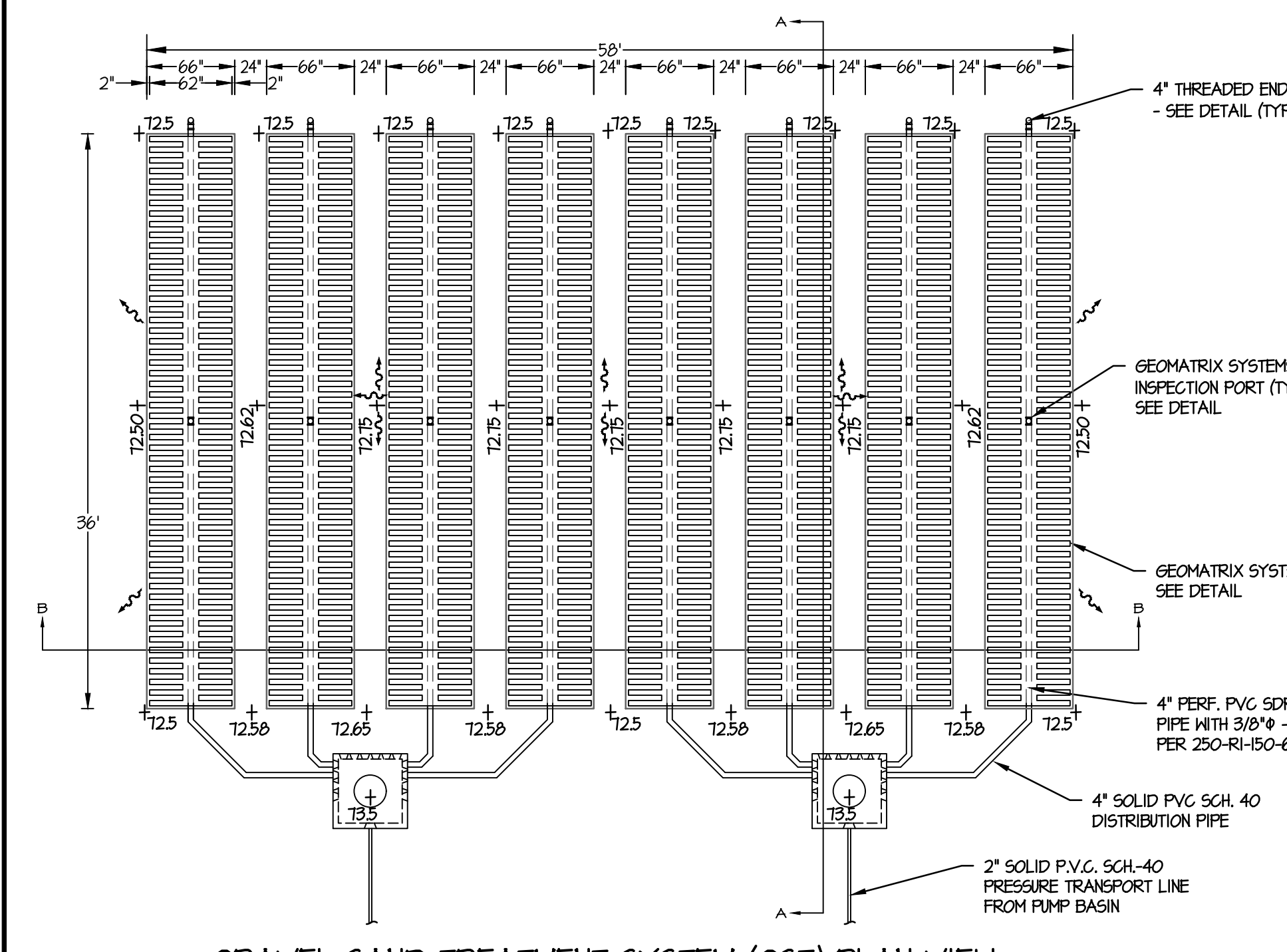
CONCRETE: 193.04 C.F. X 150 POUNDS/C.F. = 28,956 POUNDS (EMPTY TANK)
 EARTH: 33.07 C.F. X 100 POUNDS/C.F. = 3,307 POUNDS (EARTH COVER)
 TOTAL HEIGHT OF TANK SET IN PLACE = 32,263 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL

BOTTOM SLAB AREA: 10.00' WIDE X 17.00' LONG = 170.00 S.F. (SQUARE FEET)
 CHAMBER: 44.08 S.F. X BP X 62.4 POUNDS/C.F. = 20,633 POUNDS (EMPTY TANK)
 BP = 20,633 POUNDS / 62.4 POUNDS/C.F. + 1,170.00 S.F.
 BP = 6.19' - 6'-4" (ELEV. 10.25)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE

BP = 32,263 POUNDS / 62.4 POUNDS/C.F. + 1,170.00 S.F.
 BP = 7.83' - 7'-10" (ELEV. 11.93)



GRAVEL SAND TREATMENT SYSTEM (GST) PLAN VIEW
SCALE 1" = 8'

DESCRIPTION	ELEVATION
INVERT AT FOUNDATION - TO SEPTIC TANK	14.00
INVERT IN - SEPTIC TANK	13.50
LIQUID LEVEL IN SEPTIC TANK	13.25
INVERT IN - ANOXIC TANK	13.15
INVERT OUT - ANOXIC TANK	12.90
INVERT IN RECIRC. TANK	11.50
BOTTOM OF RECIRCULATION TANK	64.23
TOP OF ADVANTEK AX-100	11.50
INVERT OUT - RECIRCULATION TANK TO PUMP BASIN	13.50
INV. IN PUMP BASIN	10.00
TOP OF PUMP BASIN RIM	13.50
ELEVATION HIGH LEVEL ALARM/ALT. PUMP	61.23
ELEVATION PUMP ON	61.61
ELEVATION PUMP OFF	65.83
ELEVATION LOW LEVEL ALARM	65.61
INV. 2" OUT PUMP BASIN	63.50
BOTTOM OF PUMP BASIN	63.50
INVERT INTO DISTRIBUTION BOX	11.50
INVERT OUT OF DISTRIBUTION BOX	11.42
ELEV. TOP OF COVER STONE ABOVE DISTRIBUTION PIPE	11.15
INV. 4" PERF. DISTRIBUTION PIPE GST	11.25
BOTTOM OF GST STONE	10.25
BASE OF GST SAND	10.00
EST. SEASONAL HIGH GW	62.6 (TH-4C)
MAX FINISHED GRADE AT GST	14.08
MIN FINISHED GRADE AT GST	12.08

PUMPING AND SYSTEM SPECIFICATIONS/DATA:

PUMP CHAMBER PUMP MODEL:
 MYERS SRM4 SUBMERSIBLE SEWAGE PUMP
 HORSEPOWER - 0.4; SINGLE PHASE
 2" INCH DISCHARGE; 230 VOLTS; 60 HZ 6 AMPS
 LIFT OUT (2)
 MYERS SRA 200 WITH STAINLESS STEEL BRACKETS

CONTROL PANEL MODEL
 MYERS GE-21DW ALTERNATING
 ENCLOSURE - NEMA 1 (NEMA 4X IF EXPOSED TO WEATHER)
 VOLTAGE - 230
 HIGH LEVEL ALARM - VISUAL AND AUDIO

FLOATS MODEL
 MYERS MODEL 20VM S/E OR EQUAL

PUMP CHAMBER DISCHARGE VOLUME PER CYCLE:
 6' X 6' INTERIOR @ 1' - 10" = 66 CUBIC FEET X 7.48 GALLONS/CF = 494 GAL./CYCLE
 2" PIPE DRAIN BACK: APPROXIMATELY 8 GAL.
 494 GALLONS/CYCLE - 8 GALLONS = 486 GAL./CYCLE
 7500 GPD/ 2 GST SYSTEMS = 3750 GPD/486 GAL./CYCLE = 7.7 - 8 CYCLES/DAY/GST

FLOATS - ON, OFF, HIGH AND LOW WATER:
 HIGH WATER - ELEVATION 67.83
 PUMP ON - ELEVATION 67.67
 PUMP OFF - ELEVATION 65.83
 LOW WATER - ELEVATION 65.67

ORENCO AX-100 TREATMENT SYSTEM DATA REVIEWED AND PROVIDED BY ATLANTIC SOLUTIONS (CONTROL PANEL - TIME DOSED)

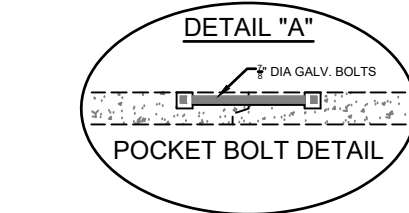
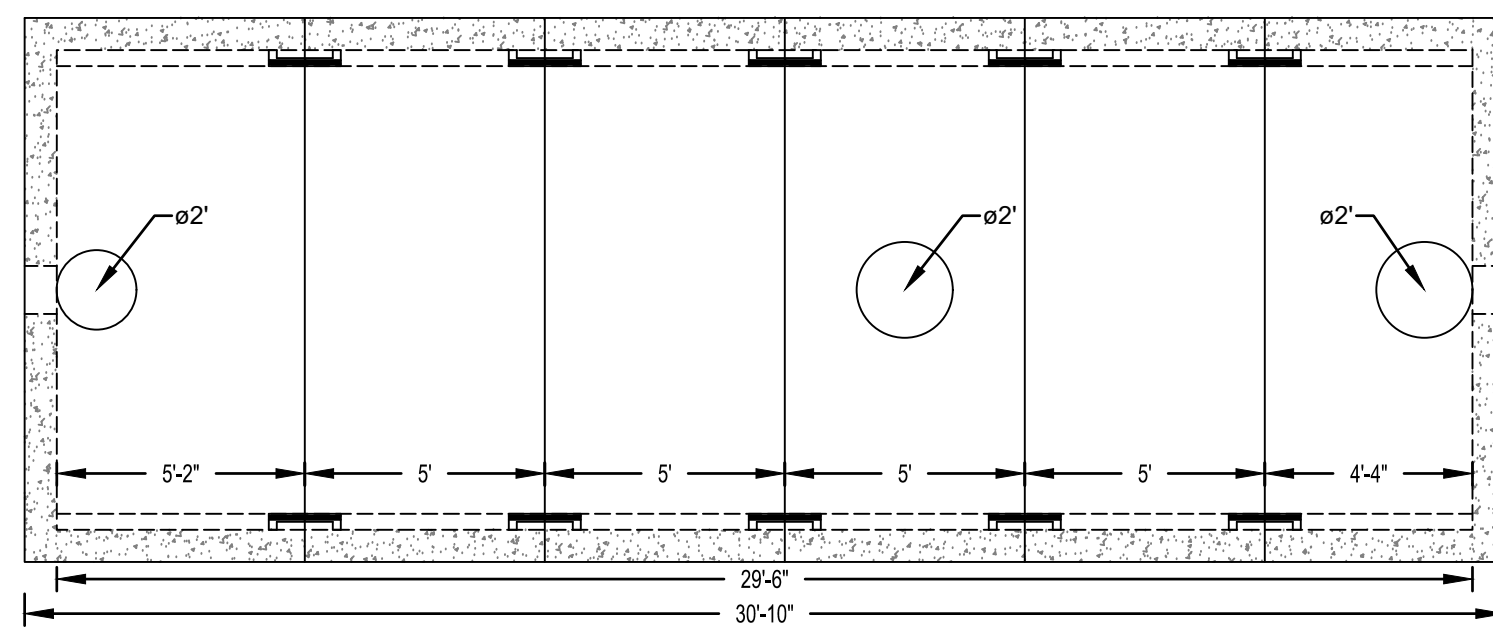
GRAVEL SAND TREATMENT (GST) SYSTEM DATA REVIEWED BY GEOMATRIX SYSTEMS LLC.

STATE OF RHODE ISLAND
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
 DIVISION OF PLANNING AND DEVELOPMENT

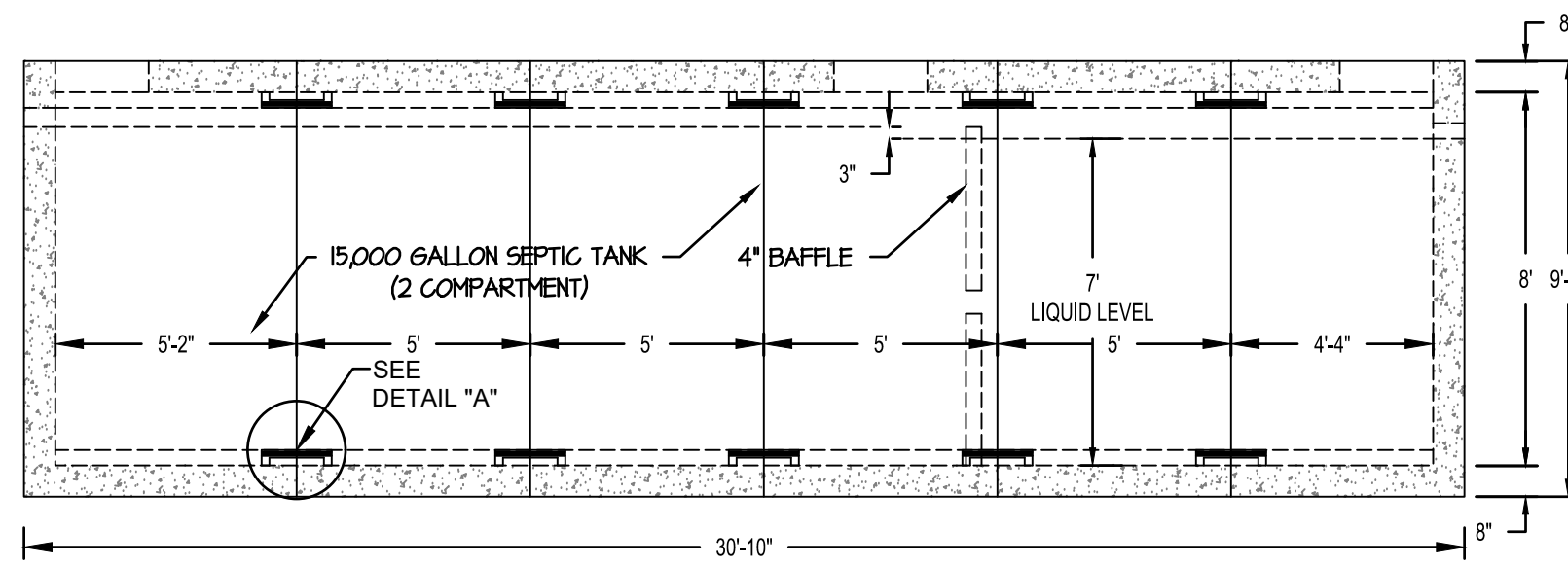
DEMOLITION AND REBUILD OF BATHHOUSES
 BURLINGAME STATE PARK AND CAMPGROUND
 CHARLESTOWN, RHODE ISLAND

BATHHOUSE "B" - OWTS DETAILS

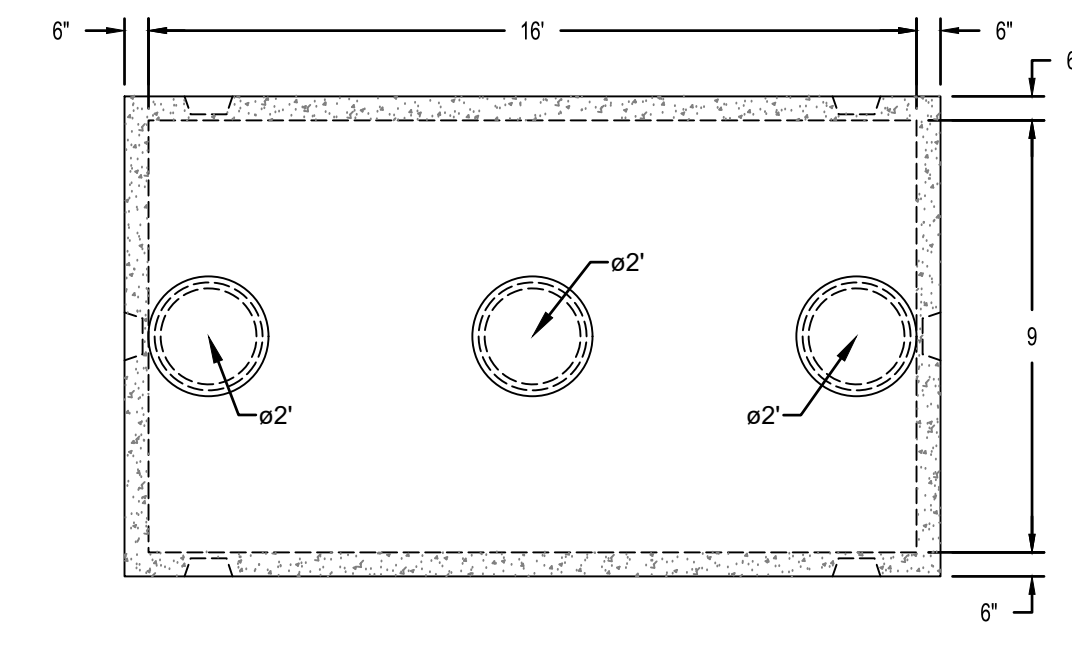
Dwg: Scale: 1" = 20'
 Contract No. x Date: FEBRUARY, 2023



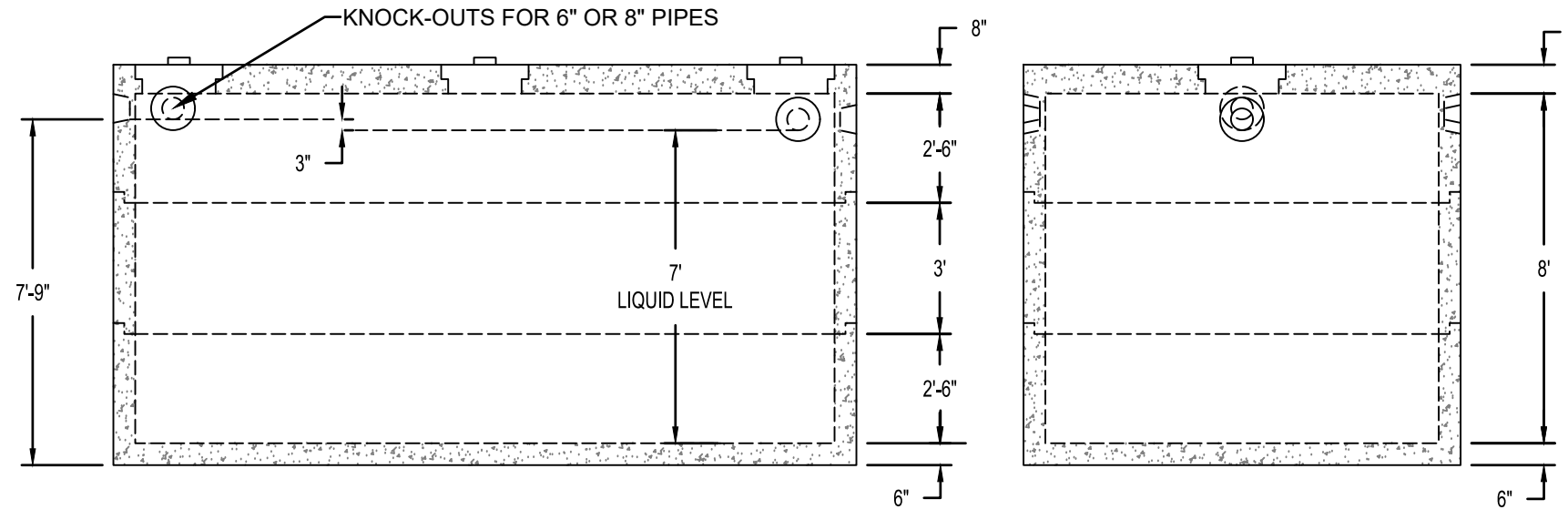
- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.



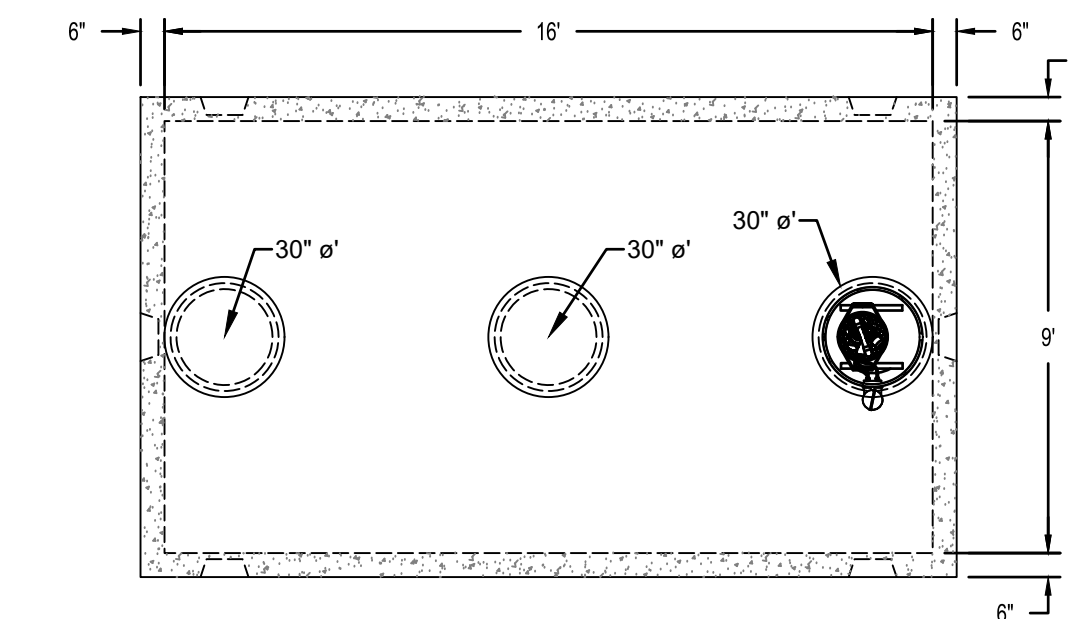
15,000 GALLON TWO COMPARTMENT SEPTIC TANK
SCALE 1" = 4"



- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

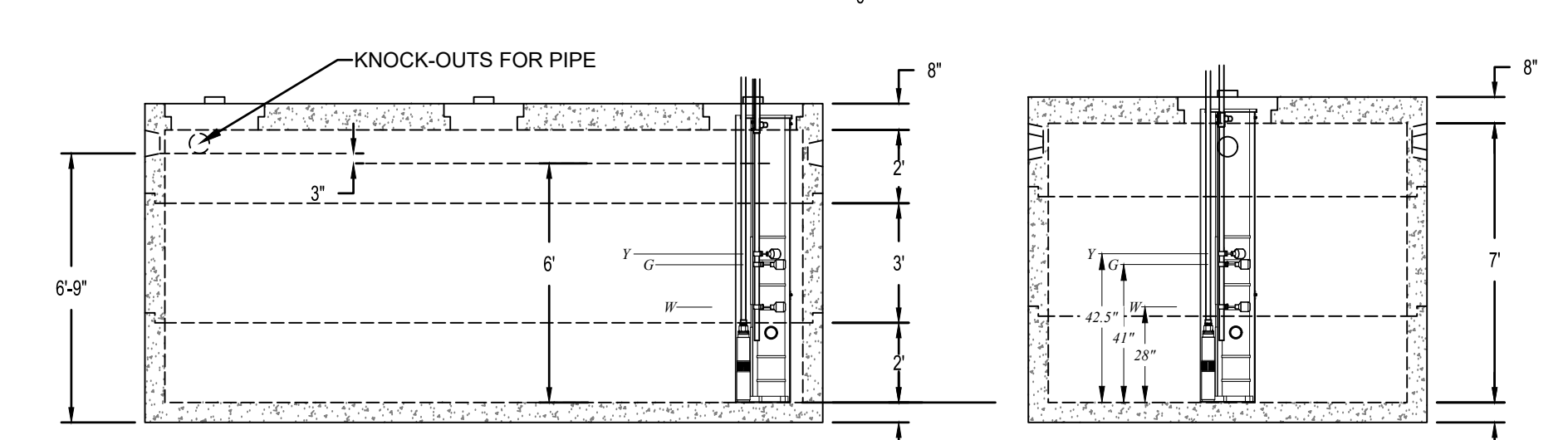


7,500 GALLON ANOXIC TANK
SCALE 1" = 4"



Float Functions	
Y	High Level Alarm & Alternate Pump On
G	Overload Timer ON/OFF
W	LL/RR

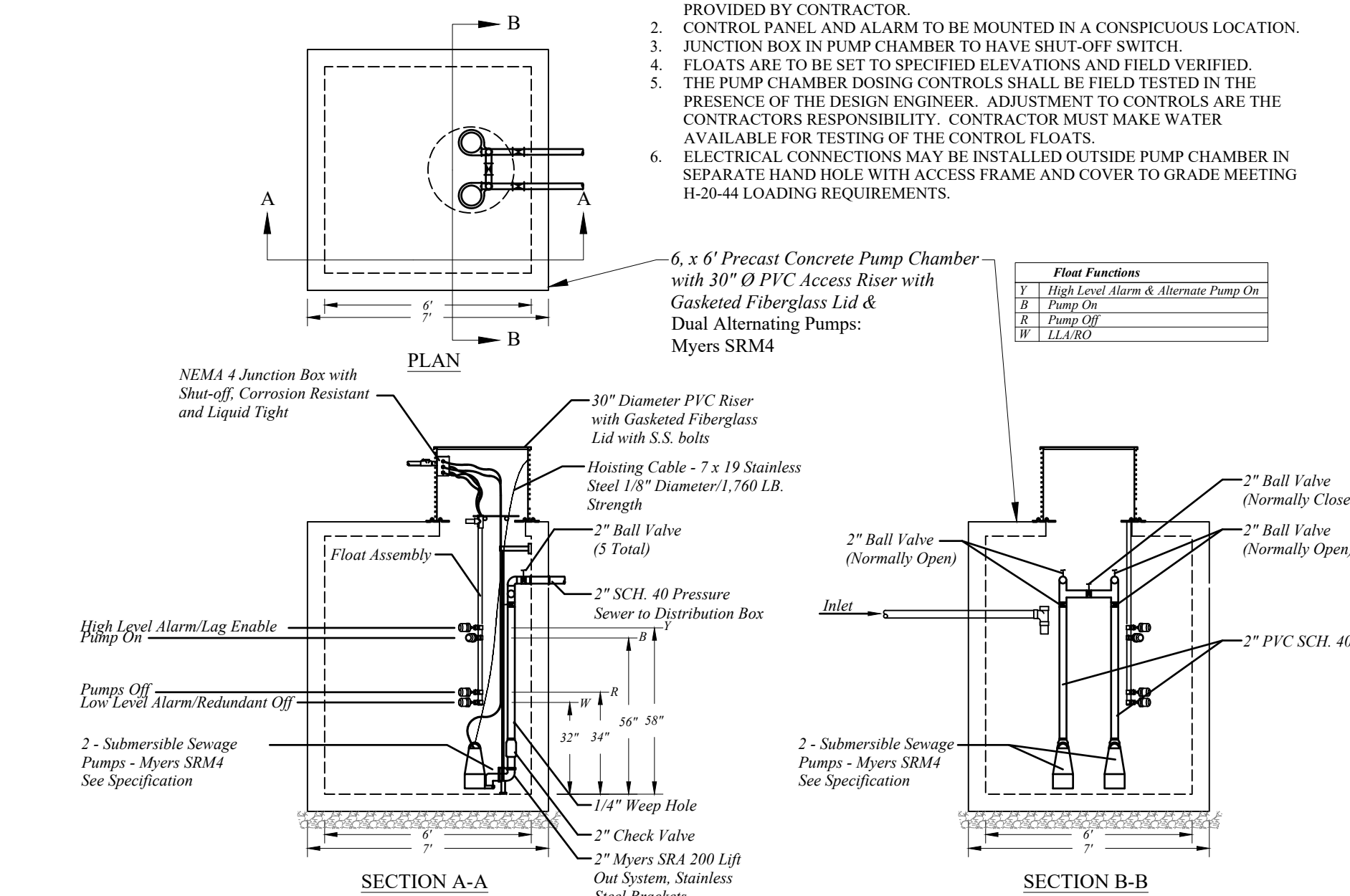
- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.



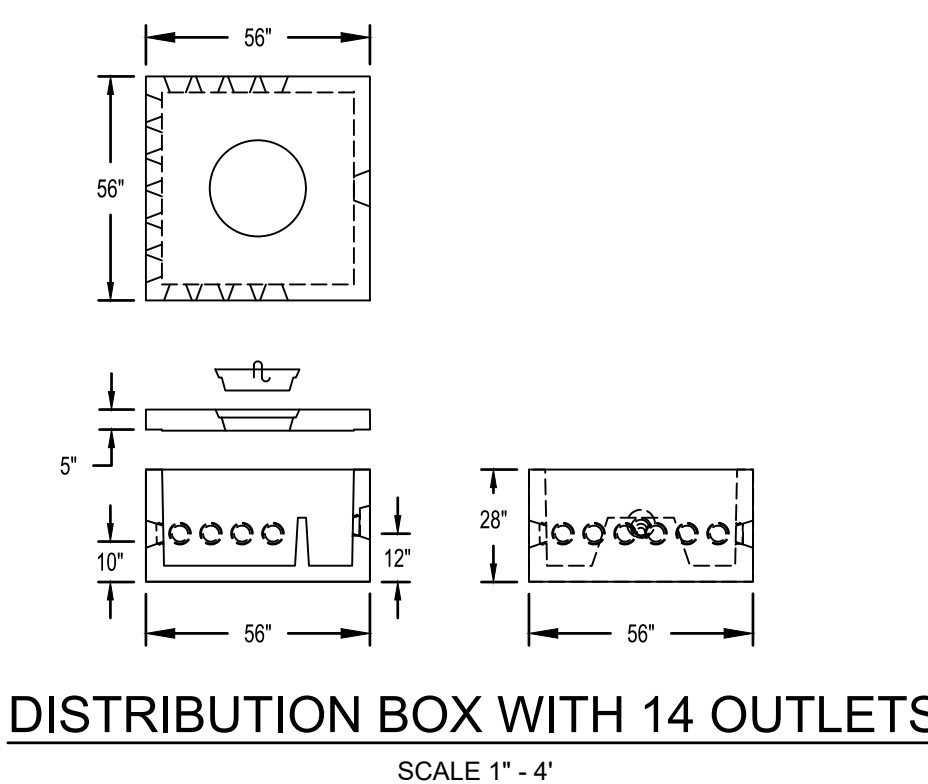
6,000 GALLON RECIRCULATION TANK
SCALE 1" = 4"

PUMPING NOTES:

1. EQUIPMENT FROM OTHER MANUFACTURERS MAY BE USED IF EQUAL APPROVAL FOR ALTERNATE EQUIPMENT REQUIRED FROM ENGINEER PRIOR TO CONSTRUCTION. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY CONTRACTOR.
2. CONTROL PANEL AND ALARM TO BE MOUNTED IN A CONSPICUOUS LOCATION.
3. JUNCTION BOX IN PUMP CHAMBER TO HAVE SHUT-OFF SWITCH.
4. FLOATS ARE TO BE SET TO SPECIFIED ELEVATIONS AND FIELD VERIFIED.
5. THE PUMP CHAMBER DOSING CONTROLS SHALL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
6. ELECTRICAL CONNECTIONS MAY BE INSTALLED OUTSIDE PUMP CHAMBER IN SEPARATE HAND HOLE WITH ACCESS FRAME AND COVER TO GRADE MEETING H-20-44 LOADING REQUIREMENTS.



PUMP CHAMBER DETAIL
SCALE 1" = 4"



DISTRIBUTION BOX WITH 14 OUTLETS
SCALE 1" = 4"

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS PRECAST STRUCTURES DETAILS

Dwg:	Scale: 1" = 20'	C-3.1
Contract No. x	Date: FEBRUARY, 2023	

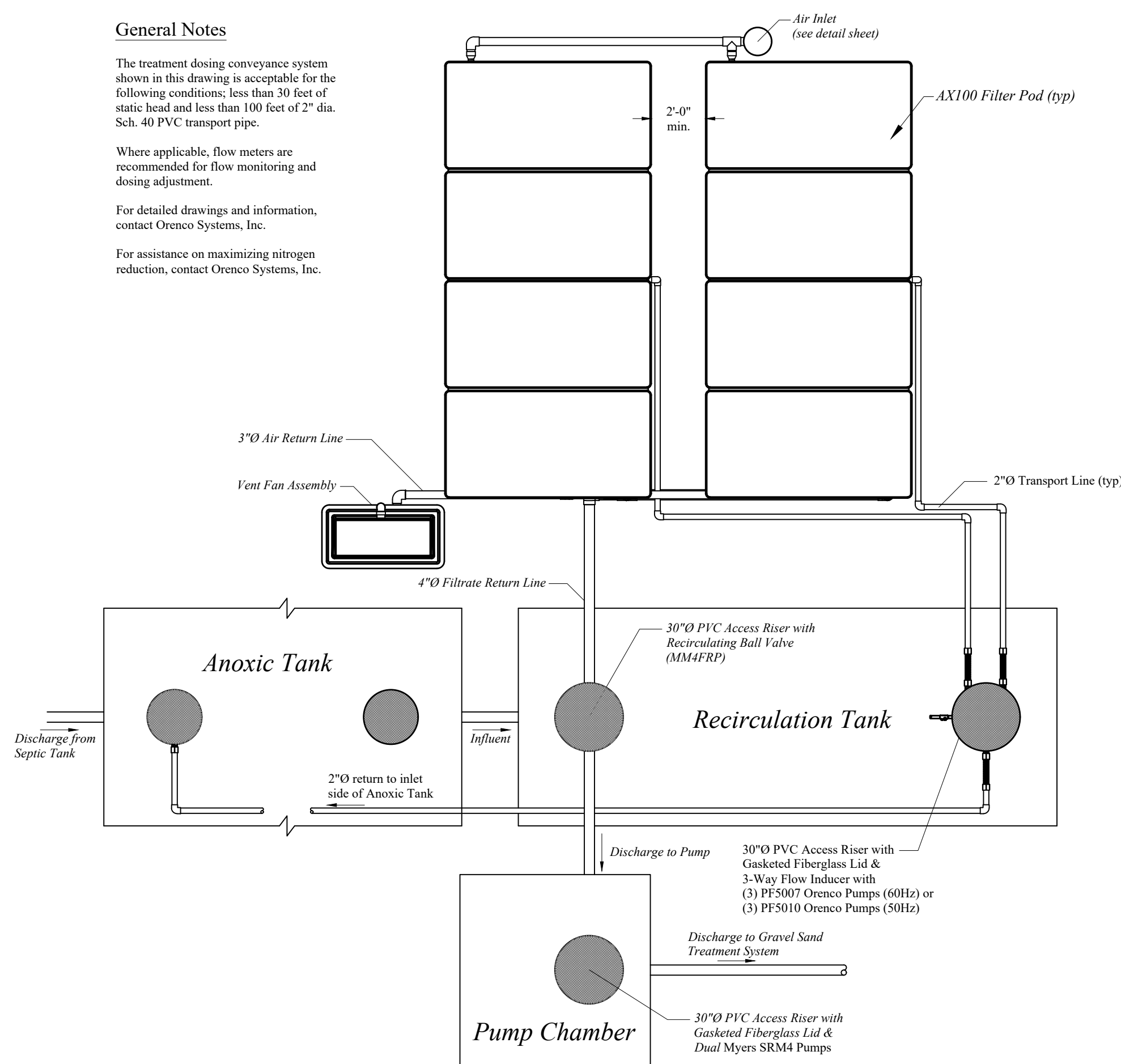
General Notes

The treatment dosing conveyance system shown in this drawing is acceptable for the following conditions: less than 30 feet of static head and less than 100 feet of 2" dia. Sch. 40 PVC transport pipe.

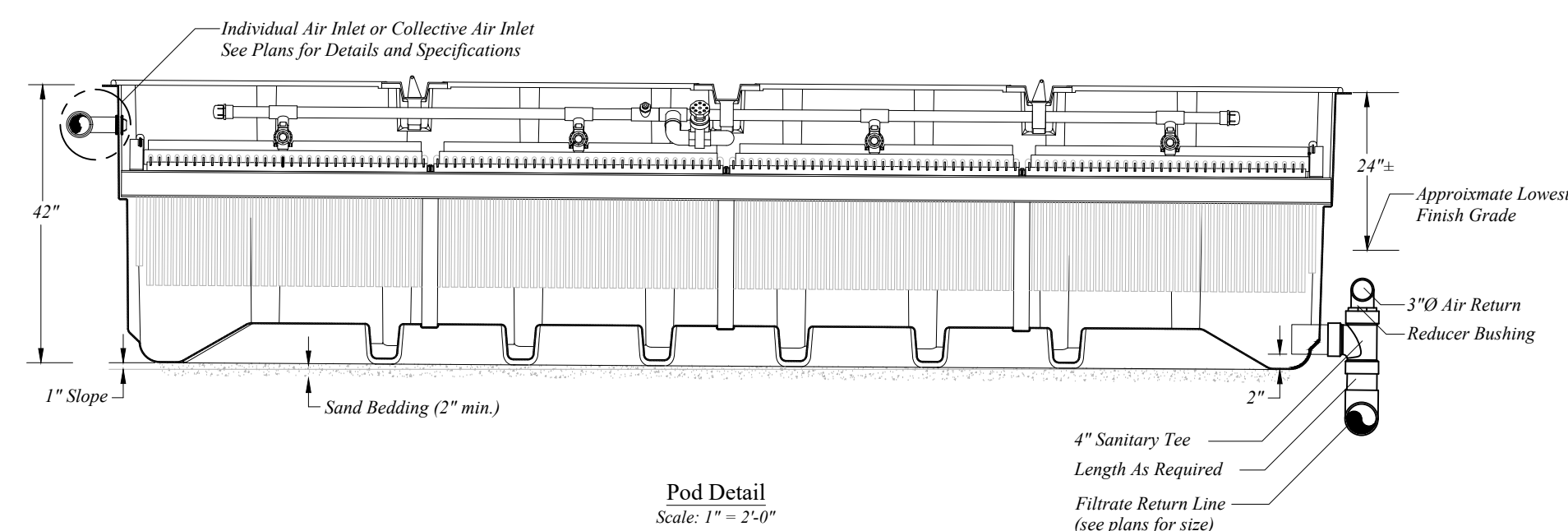
Where applicable, flow meters are recommended for flow monitoring and dosing adjustment.

For detailed drawings and information, contact Orenco Systems, Inc.

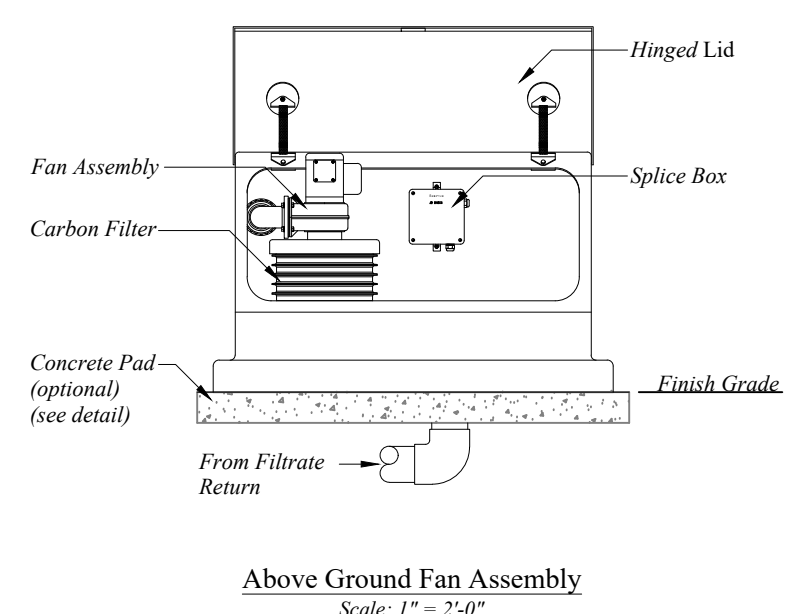
For assistance on maximizing nitrogen reduction, contact Orenco Systems, Inc.



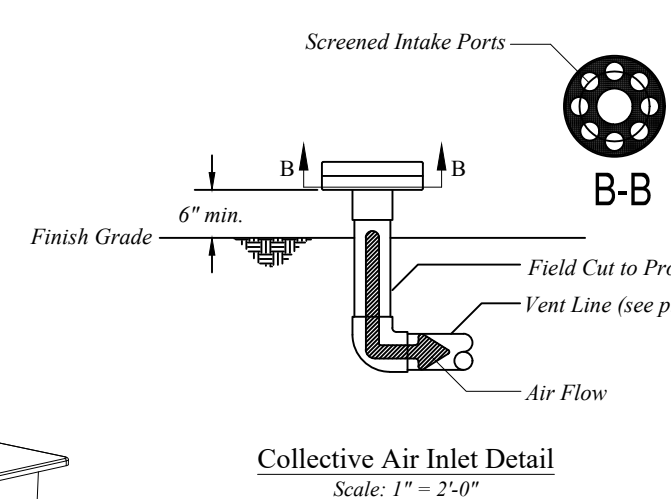
**AdvanTex AX100 SYSTEM - MANIFOLDED VENT INLET
2 POD CONFIGURATION**
SCALE 1" = 4'



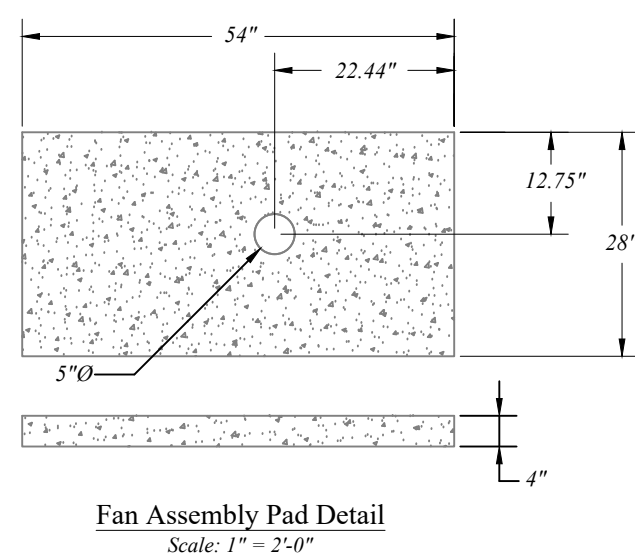
Pod Detail
Scale: 1" = 2'-0"



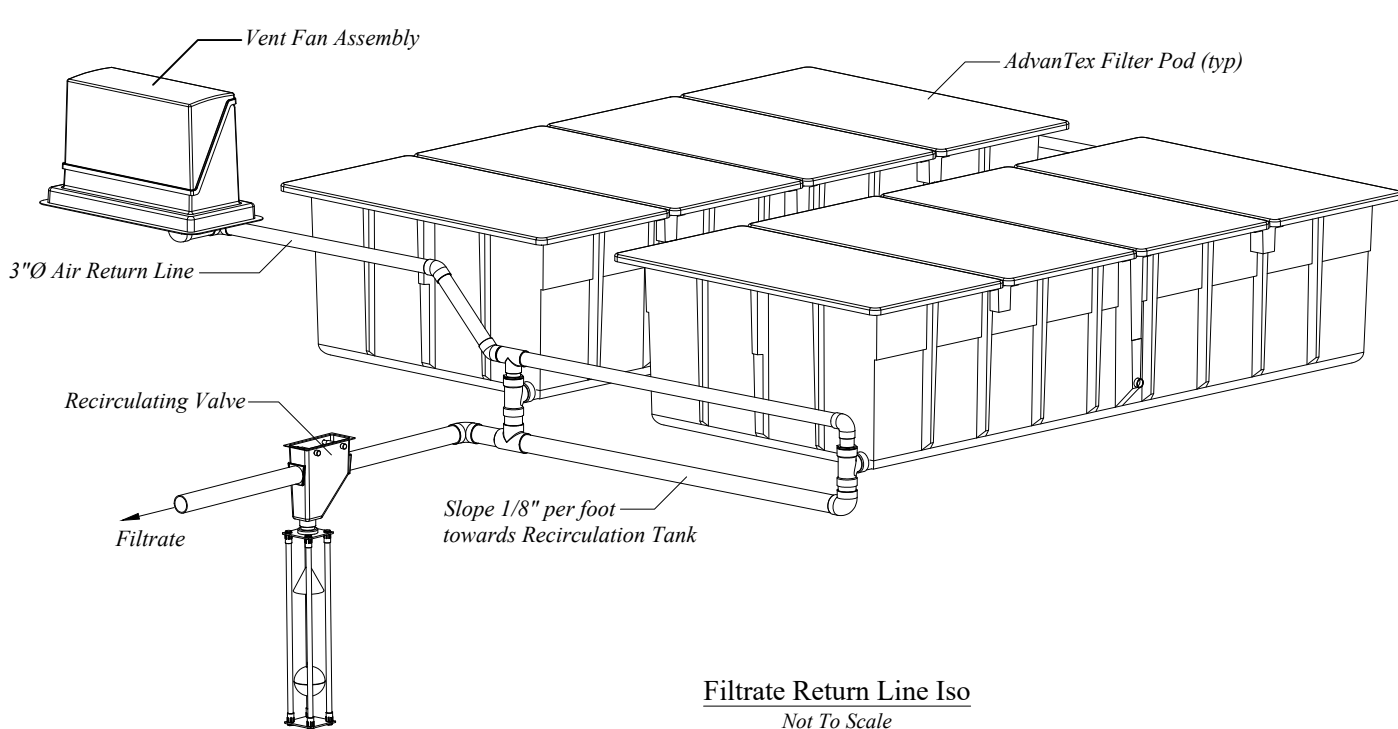
Above Ground Fan Assembly
Scale: 1" = 2'-0"



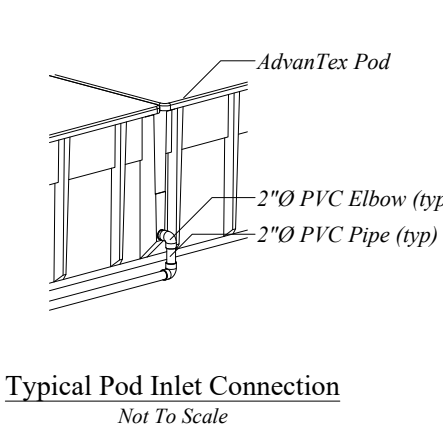
Collective Air Inlet Detail
Scale: 1" = 2'-0"



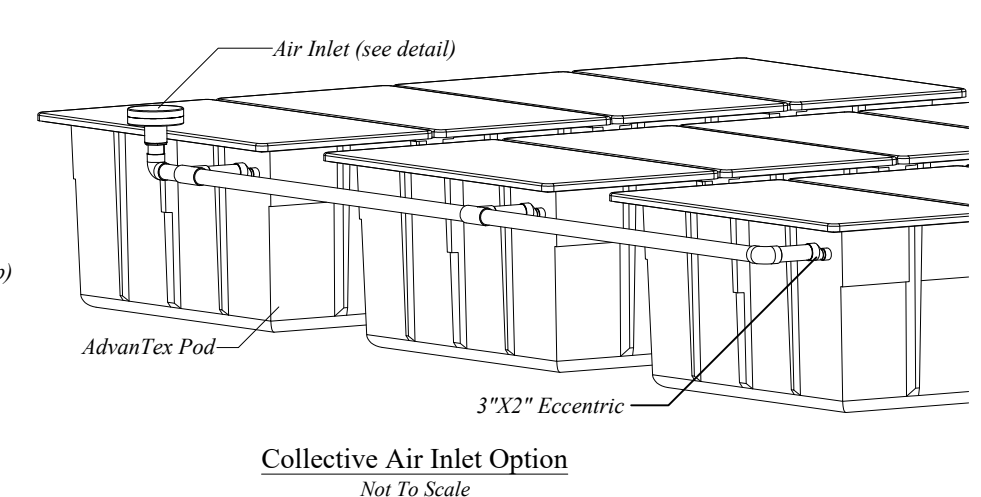
Fan Assembly Pad Detail
Scale: 1" = 2'-0"



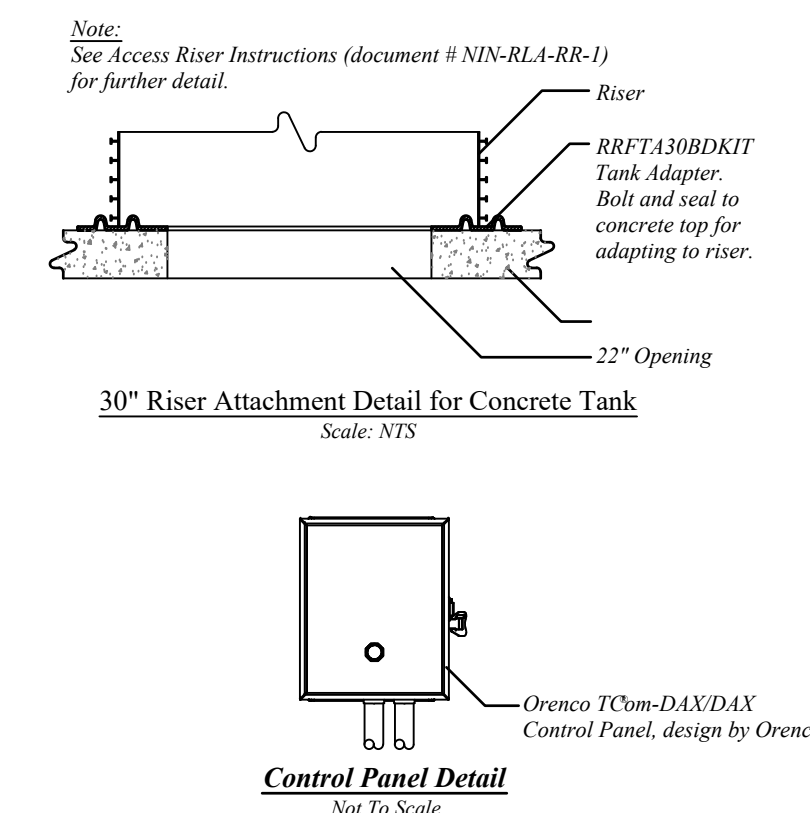
Filtrate Return Line Iso
Not To Scale



Typical Pod Inlet Connection
Not To Scale

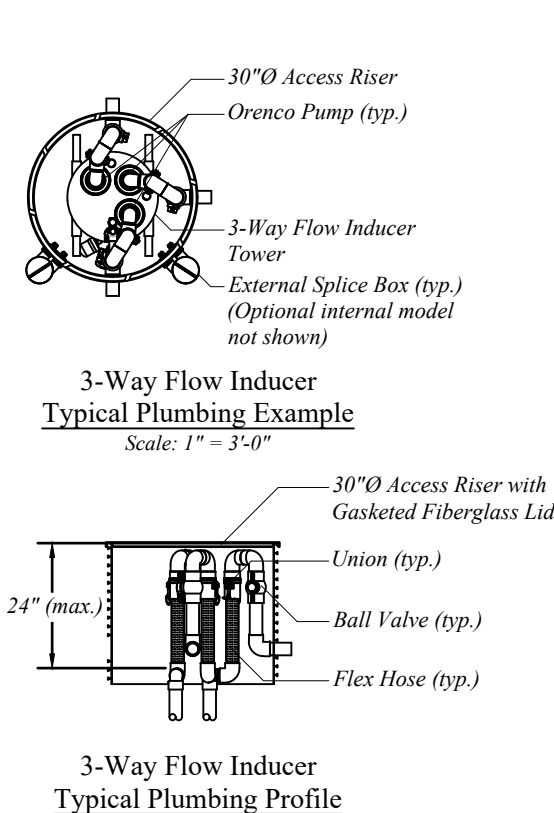


Collective Air Inlet Option
Not To Scale



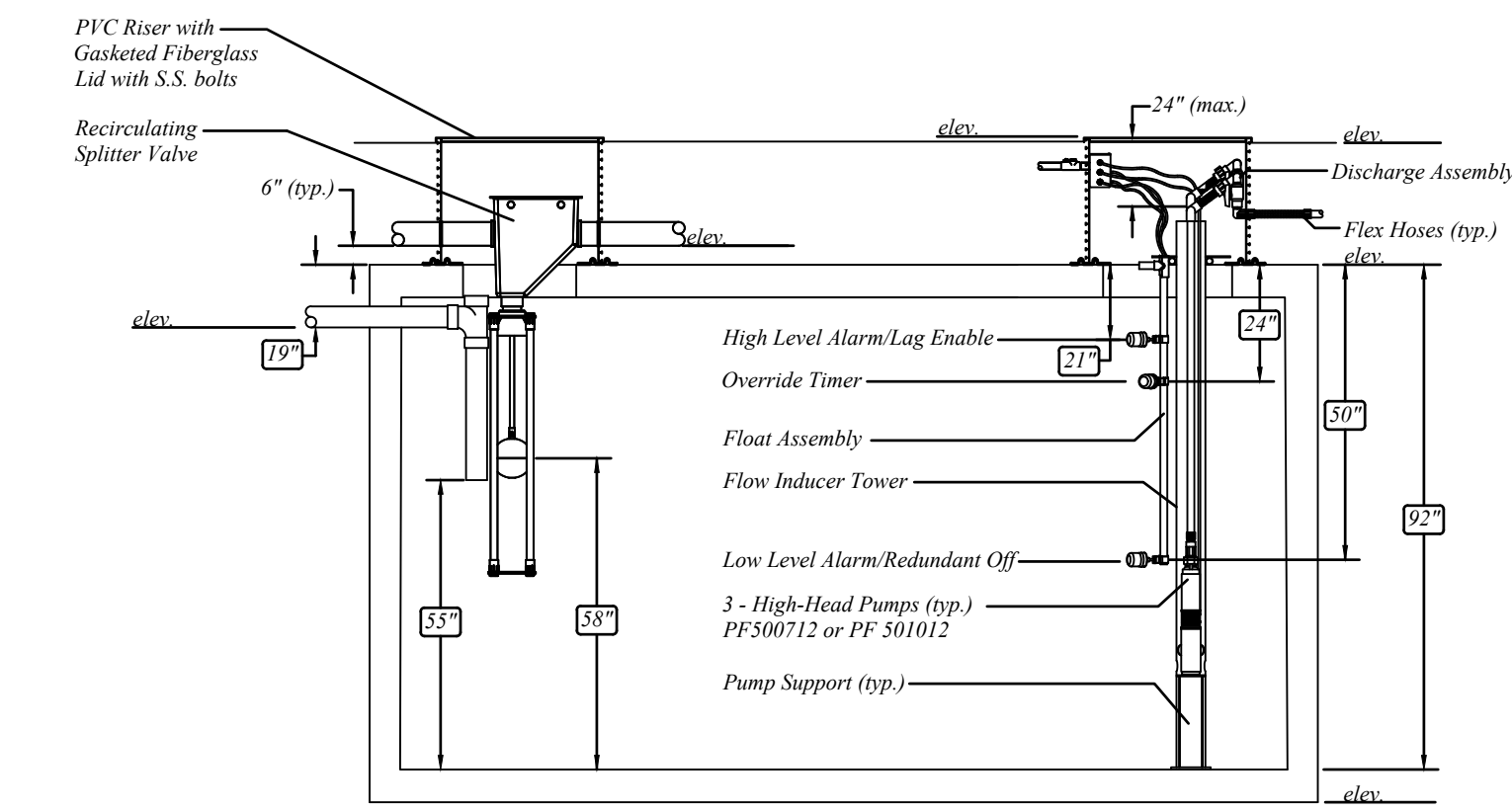
30" Riser Attachment Detail for Concrete Tank
Scale: NTS

Control Panel Detail
Not To Scale



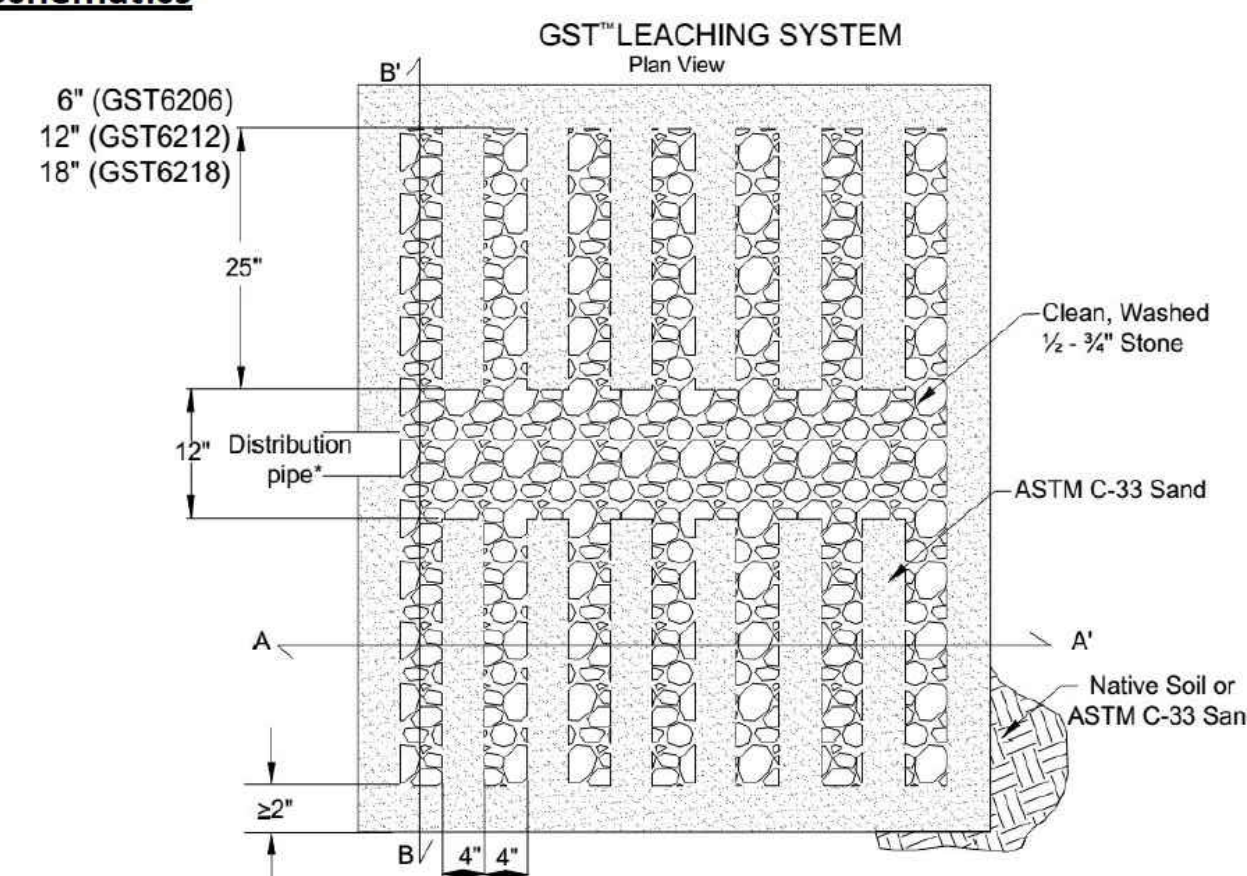
Typical Plumbing Example
Scale: 1" = 3'-0"

3-Way Flow Inducer Typical Plumbing Profile
Scale: 1" = 3'-0"



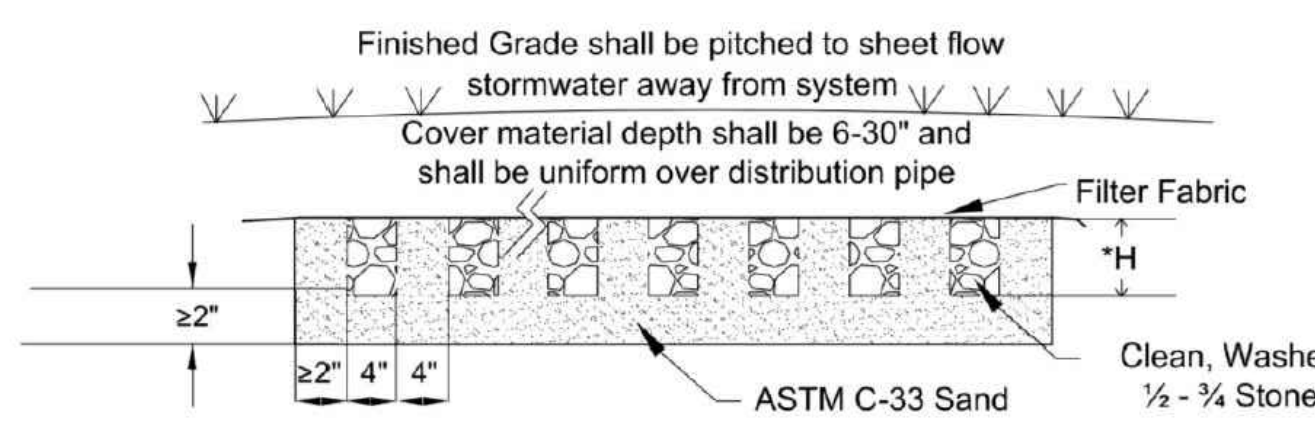
RECIRCULATION TANK FLOAT AND RSV SETTINGS
NOT TO SCALE

GST Schematics

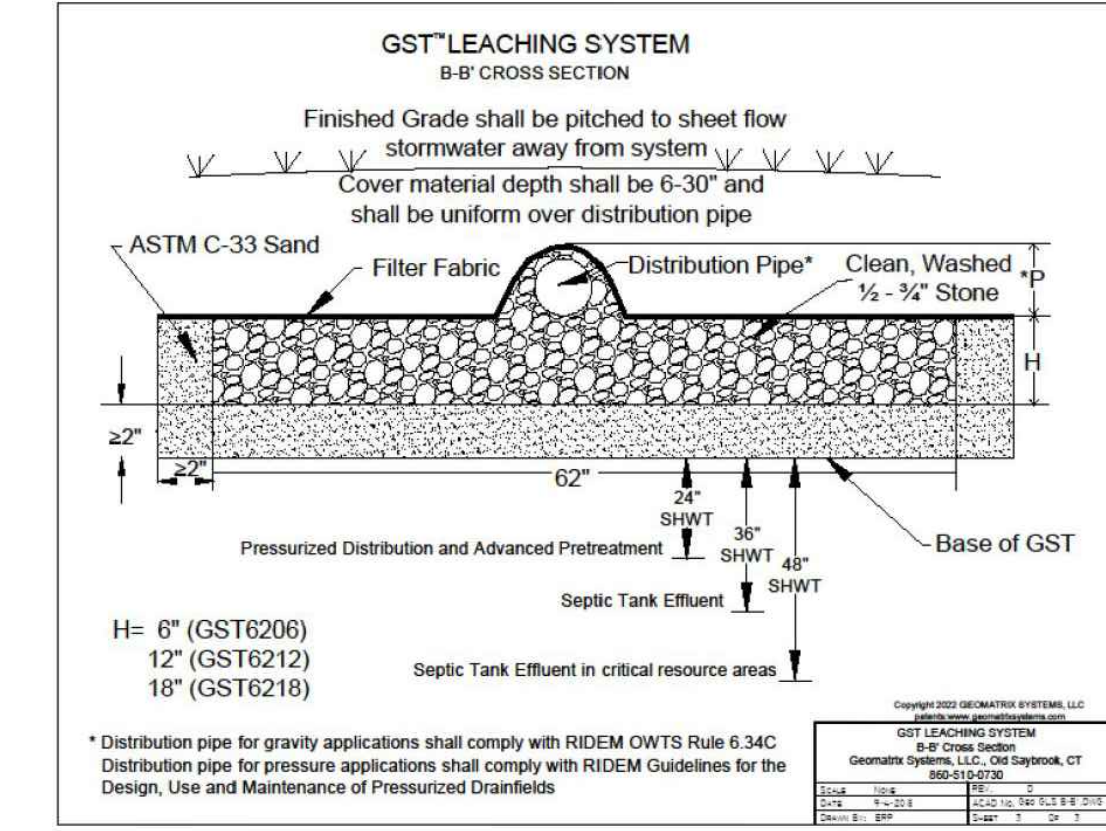


* Distribution pipe for gravity systems shall comply with RIDEM DWTS Rule 6.34C. Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

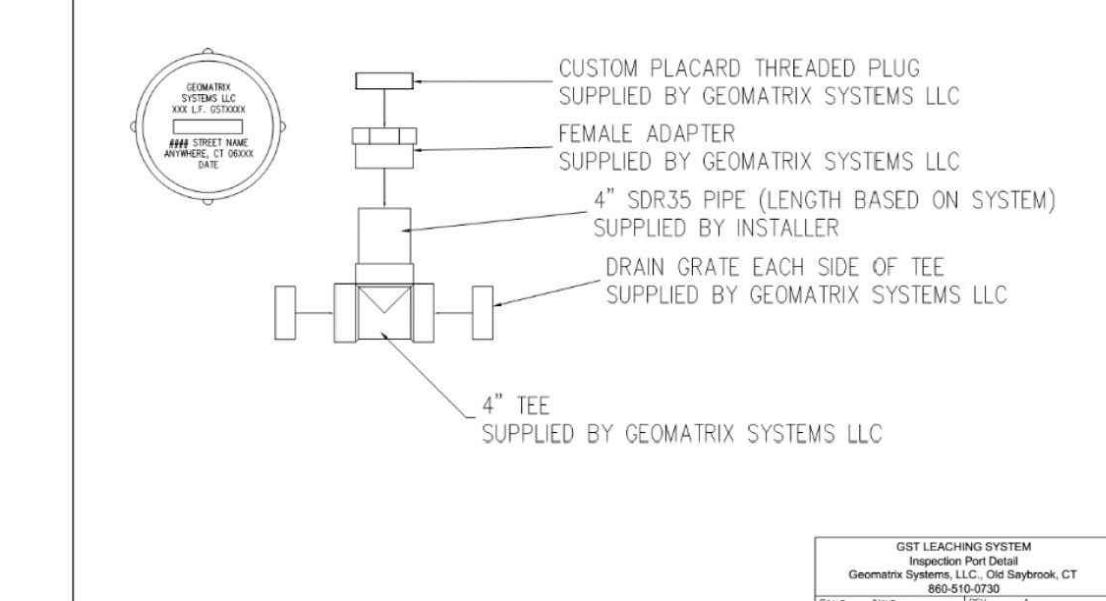
GEOMATRIX GST LEACHING SYSTEM
A-A' CROSS SECTION



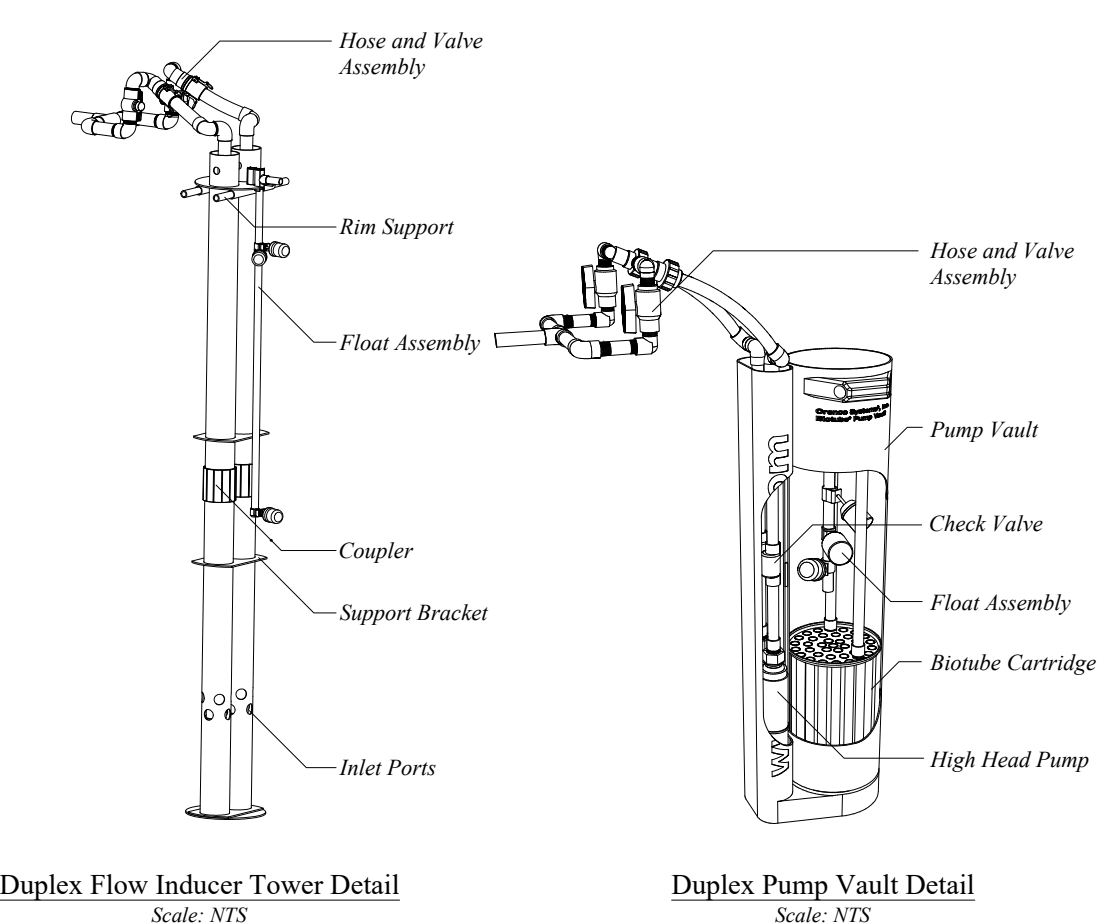
*H= 6" (GST6206)
12" (GST6212)
18" (GST6218)



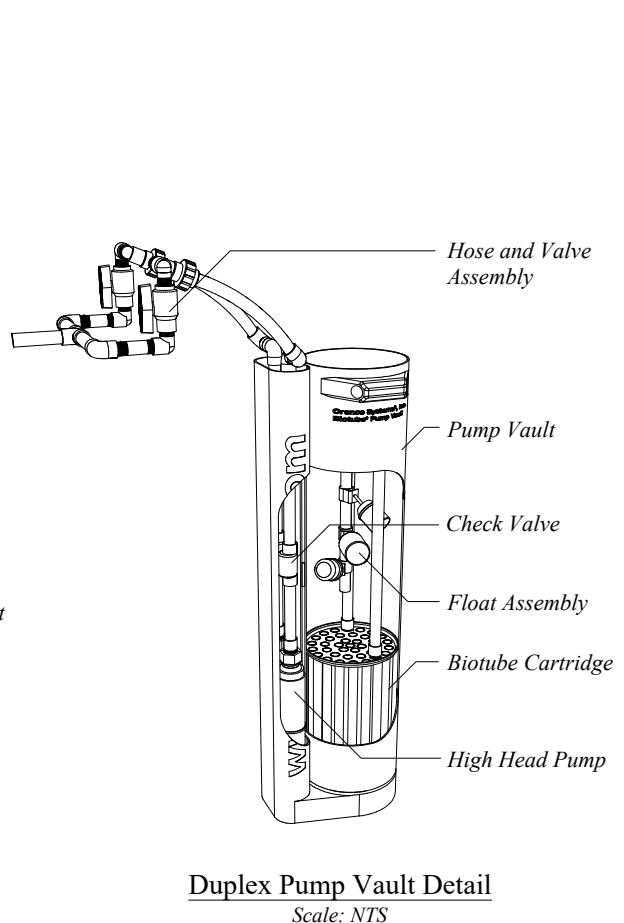
GEOMATRIX GST LEACHING SYSTEM
INSPECTION PORT DETAIL



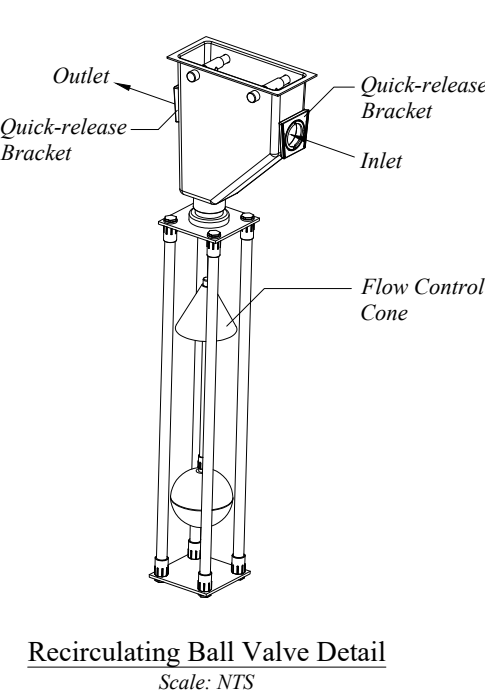
GEOMATRIX GST LEACHING SYSTEM Inspection Port Detail
Scale: 1" = 2'-0"



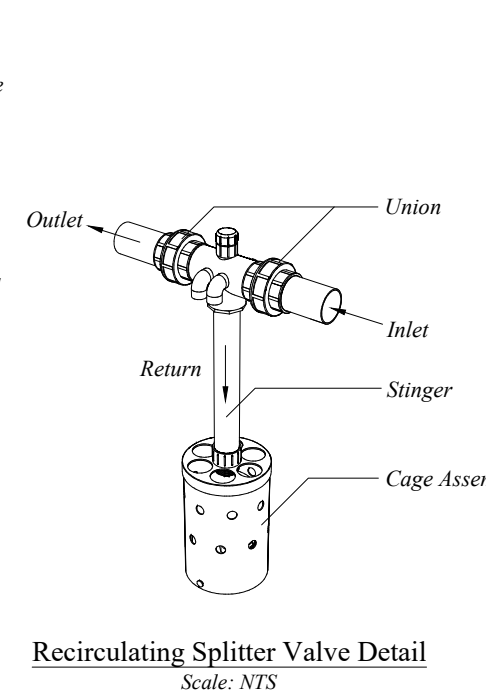
Duplex Flow Inducer Tower Detail
Scale: NTS



Duplex Pump Vault Detail
Scale: NTS



Recirculating Ball Valve Detail
Scale: NTS



Recirculating Splitter Valve Detail
Scale: NTS

COLLECTIVE AIR INLET DETAIL

SCALE: VARIES

AdvanTex AX100 SYSTEM - MISCELLANEOUS DETAILS

SCALE: VARIES

CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

BURLINGAME STATE PARK AND CAMPGROUND

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS DETAILS

Dwg: C-3.2
Contract No. x
Scale: 1" = 20'
Date: FEBRUARY, 2023

J:\RhodeIsland\Charlestown\RIDEM - Burlingame\009 - 025 - and S-6 Site Design\2023.02.10.dwg

OWTS SUBMISSION - FEBRUARY 16, 2023



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

20.0179 4A, 4B, 4C
SHEET 1-3



Site Evaluation Form
Part A - Soil Profile Description

Application Number

Property Owner: RHODE ISLAND STATE OF (DEM) DIVISION OF PARKS

Property Location: 1-100 BURLINGAME PARK RD, CHARLESTOWN, RI PLAT 15 LOT 10

Date of Test Hole: 8/18/21

Soil Evaluator: KAMAL HINGORANY License Number: D4005

Weather: CLOUDY Shaded: Yes No Time: 9:30AM

Table with 11 columns: TH Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Rows include TH 4A (Ap, Bw, C) and TH 4B (FILL, P, Bw, C).

TH 4A Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 120" (og)
TH 4B Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 120" (og)

Comments:



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

20.0179 4A, 4B, 4C
SHEET 2-3



Site Evaluation Form
Part A - Soil Profile Description

Application Number

Property Owner: RHODE ISLAND STATE OF (DEM) DIVISION OF PARKS

Property Location: 1-100 BURLINGAME PARK RD, CHARLESTOWN, RI PLAT 15 LOT 10

Date of Test Hole: 8/18/21

Soil Evaluator: KAMAL HINGORANY License Number: D4005

Weather: CLOUDY Shaded: Yes No Time: 9:30

Table with 11 columns: TH Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Contains data for horizons Ap, Bw, and C.

TH 4C Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 120" (og)

TH Soil Class Total Depth Impervious/Limiting Layer Depth (og) GW Seepage Depth SHWT (og)

Comments:

Part B

Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer





20.0179 4A, 4B, 4C
SHEET 3-3

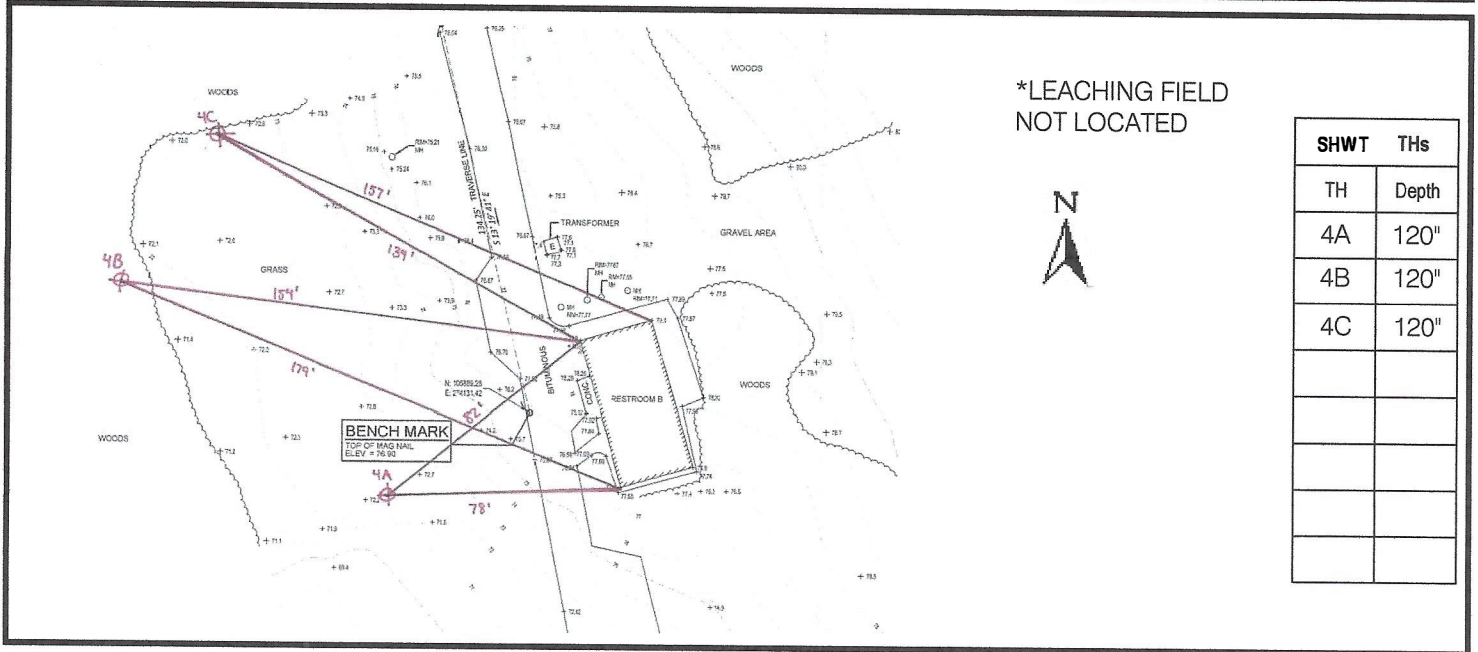
Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*

***OFFSETS MUST BE SHOWN**

Key:

-  Approximate location of test holes
-  Approximate location of bedrock test holes
-  Estimated gradient and direction of slope
-  Approximate direction of due north



1. Relief and Slope: _____
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO YES
8. Site's potential for flooding or ponding: NONE SLIGHT MODERATE SEVERE
9. Landscape position: SHOULDER
10. Vegetation: GRASS
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site: _____

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: [Signature] D4005
Signature License #

Part B prepared by: [Signature] D4005
Signature License #

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur Inconclusive Disclaim
Unwitnessed Soil Evaluations Decision: Accept Inconclusive Disclaim

Wet Season Determination required Additional Field Review Required

Explanation: _____

Signature Authorized Agent _____

Date _____



Bathhouse "B" and System Replacement Project
Burlingame State Park and Campground
Charlestown, Rhode Island

DESIGN NARRATIVE

RIDEM is in the process of replacing the Bathhouse and Onsite Wastewater System (OWTS) at this location. Soil logs can be found on Sheet C-1.2 together with the proposed site layout and System Design Data and Notes. Details for the system are on Sheets C-2.2, C-3.1 and C-3.2.

Soil evaluations for this OWTS location were conducted on August 18, 2021, soils are Category 3 and the Estimated Seasonal High Water Table depth at the OWTS is 120" or at elevation 62.6±.

In total the six bathhouses for the overall campground accommodate approximately 720 campsites. Utilizing the RIDEM wastewater design flow for a campground with washroom and toilets of 50 gallons per day we determine a daily flow for the entire campground to be approximately 36,000 gallons per day (GPD). The average daily flow per acre of the campground is (36,000 GPD / 847 Acres) 42.5 GPD/Acre. The average daily flow for each bathhouse is approximately 6,000 GPD. In calculating an estimated daily flow for the Bathhouse "B" OWTS we took a conservative approach utilizing 150 campsites at 50 GPD/campsite to determine a design flow for the Bathhouse "B" to be 7,500 GPD which is greater than the 6,000 GPD average. Please see the attached campsite map which depicts the campsites (as highlighted) chosen to be included within the 150 sites utilized for sizing the OWTS. Please note that sites throughout the campground overlap to agree with the conservative estimate. The system as sized is oversized and is considered a large system. The system is used on a seasonal basis between the months of April and October.

The OWTS will utilize Two (2) Orenco AdvanTEX AX100 Pods for advanced treatment. This system is a Category 1 advanced treatment technology. The system will treat the wastewater and reduce the biochemical oxygen demand (BOD) and comply with the latest Orenco system design criteria and thus the RIDEM OWTS criteria. See attached Final Design Review Letter from Orenco.

The systems drainfield is designed as a Geomatrix Gravel Sand Treatment (GST) System. The Loading Rate for Category 1 Technology for the GST is 3.5 GPD/square feet (SF). The minimum size drainfield is 7,500 GPD/3.5 GPD/SF which equals 2,143 SF. We propose to use the GST 6212 and the minimum size drainfield requirement for this application is 123 lineal feet (LF). We propose to use the 288 lineal feet (LF) of GST 6212 which provides 17.5 S.F. per LF, which equals 5,040 SF. and is greater than 2,143 SF (minimum size). The GST system has been divided into two equal drainfields and the GST are spaced 7'6" on center. The two drainfields consist of 4 rows each 36 feet long and 62" wide with a stone depth of 12" below the 4" perforated distribution pipe. See pump selection and system specifications on Sheet C-2.2 for additional information. Please see the attached review letter from Geomatrix.

WATCHAUG POND



FISH CAMP AREA
150

400 AREA

MAIN CAMP AREA
146

150

B 150

LEGIONTOWN
CAMP AREA
156

500 AREA

MILLS CAMP AREA
150

- CHECK STATION
- PERMITS
- COMFORT STATION

TO WESTERLY TO WAKEFIELD & PROVIDENCE



BURLINGAME STATE PARK RHODE ISLAND DEPT. OF ENVIRONMENTAL MANAGEMENT

DEVELOPED BY:
PARE
PARE CORPORATION
1000 W. ACADIA BLVD.
BLACKSTONE VALLEY PLACE
LITCHFIELD, CT 06259
401-254-1100

LEGEND

- | | |
|---------------------------------|--------------------------|
| A TENTS ONLY | ⊙ WATER |
| B SMALL TRAILERS | ▨ RESTROOMS WITH SHOWERS |
| C LARGE TRAILERS AND MOTORHOMES | ★ DUMPING STATIONS |
| M MOTORHOMES | ▣ CABIN |
| P PORTAJONS | D DUMPSTERS |

01/19/2023

Kevin Harrop
Caputo & Wick
1150 Pawtucket Ave
Rumford, RI 02916

Subject: Final Design Review of Burlingame Park/Bathhouse B

Kevin,

Orenco Systems, Inc. (“Orenco”) has received the Plans with all required fields completed (attached to this letter), a copy of the plan set showing the designed site layout and configuration plans, and other documents that comprise the Final Design for the Burlingame Park project. Orenco staff reviews the Final Design of all wastewater collection and treatment systems for commercial applications to ensure that the design is compliant with the most current version of the system’s applicable design criteria published by Orenco for the specified parameters provided by the system’s designer in the Plans. The findings and conclusions of my review of this Final Design are as follows:

Design Basis

The system has been designed for a Type 2, Park application. Influent flow and constituent concentrations and effluent constituent concentration requirements have been provided by the system’s designer on the attached Plans and were used in my review of the Final Design.

The influent flow on the Plans were not extrapolated from the metered flows from the subject site, but in our experience, they are consistent with influent flows from other, similar Type 2, Park systems that Orenco has previously observed. As such, I have no reason to doubt the accuracy of the designer’s findings and assumptions as to the influent flow, and find that it was reasonable for the designer to use them as the design basis for the system.

System Design

The proposed Final Design of the system consists of a park. Influent will enter a 15,000 gallon Primary Tank, which will then flow into a 7,500 gallon Pre-Anoxic Tank. From here, flow will gravity discharge into a 6,000 gallon Recirculation Tank. The recirc-filtrate blend in this tank will pump into (2) AX100 pods and the filtrate will enter a splitter valve in the front of the Recirculation Tank where it will either be recirculated again or siphon to a drain field.

Design Criteria

The applicable design criteria for this system, which I used to conduct the review of its Final Design, is revision 8.0 of document NDA-ATX-1, titled *Orenco[®] AdvanTex[®] Design Criteria, Commercial Treatment Systems*, which was published by Orenco in October, 2020. A copy of the design criteria can be downloaded from Orenco’s online document library at www.orenco.com/corporate/doclibrary.cfm.

Findings

The findings of my review as to whether the Final Design complies with Orenco’s design criteria for treating wastewater to the effluent constituent concentration requirements provided in the Plans are as follows:

Primary Treatment

The Final Design specifies the use of 1 - 15,000 U.S. Gallon Primary concrete and 1 - 7,500 U.S. Gallon Primary concrete tanks in series for primary treatment. Using the flow data specified on the Plans the hydraulic retention times for grease capture and primary treatment calculate as follows:

Primary Tank(s) Hydraulic Retention Time (HRT)¹				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Effective Combined Primary Tankage (gpd)	Avg HRT (days)	Max Day HRT (days)
3,500	7,500	22,500	6.4	3.0

¹ Design Max Day Flow is the maximum daily flow a facility is expected to receive no more than one day within any week’s time.

The Primary Tank Sizing Recommendations states that the recommended primary tankage for a Park treatment system should be sized to at a minimum of 3 days of hydraulic retention time at the Design Max Day Flow. Therefore, the configuration and specifications of the primary treatment tanks in the Final Design satisfy Orenco’s recommendation for primary tankage for this Park application. This pre-anoxic tank should be sized equal to one day at maximum day design flow and is considered part of the overall primary tank volume.

Recirculation Tank — Standard Stage

The Final Design further specifies the use of 1 - 6,000 U.S. Gallon concrete tank for recirculation and blending of the AdvanTex-treated effluent with primary tank effluent. Using the flow data specified on the Plans the tank is sized to be equal to 80% of the Maximum Day Design Flow. The recirculation tank for the standard stage should be sized at a minimum of 75% of the Maximum Day Design Flow. Therefore, the specification of the recirculation-blend tank in the Final Design satisfies Orenco’s design criteria.

Hydraulic Load — Standard Stage

The Final Design specifies the use of 2 - AX100 pods, which contain a nominal surface area of 200 square feet of treatment media. Using the flow data specified on the Plans the hydraulic loading rate for the system calculates as follows:

Hydraulic Loading Rate (HLR) — Standard Stage				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Nominal Textile Area (sq. ft.)	Average HLR (gal. per day/sq. ft.)	Peak HLR (gal. per day/sq. ft.)
3,500	7,500	200	17.5	37.5

According to the AdvanTex System Loading Chart in the applicable design criteria, the standard AdvanTex treatment system (Stage 1) should not be hydraulically loaded more than 25 gpd/square foot at Design Average Flow or 50 gpd/square foot at Design Max Day Flow. Therefore, the specified type and number of AdvanTex pods in the Final Design satisfy Orenco’s design criteria to achieve the effluent quality listed in the design criteria at a 95% confidence level for this Type 2, Park application.

Organic Load — Standard Stage

The following influent characteristics provided on the Plans were estimated and not derived from direct sampling. Even though the influent characteristics were not derived from direct sampling, the values provided are consistent with values we have seen in other, similar Type 2, Park applications.

Influent (Primary Tank Effluent) Characteristics — Loading to Textile	
Average BOD ₅ (mg/L)	Average TSS (mg/L)
250	200

Based on the average influent biochemical oxygen demand (BOD₅) concentration and flow data specified on the Plans, the system will receive approximately 7.3 pounds of BOD₅ per day at Design Average Flow, and 15.6 pounds of BOD₅ per day at Maximum Day Design Flow. Using this information, the organic loading rate of the system calculates as:

Organic Loading Rate (OLR) — Standard Stage				
Average Organic Load (lbs/day)	Maximum Organic Load (lbs/day)	Nominal Treatment Area (sq. ft.)	Average OLR (lbs BOD/sq. ft./day)	Maximum OLR (lbs BOD/sq. ft./day)
7.3	15.6	200	0.04	0.08

Conclusions

I have reviewed the Final Design of the Burlingame Park wastewater treatment system, and have found that the design is compliant with the most current version of the system's applicable design criteria published by Orenco for the specified parameters provided by the system's designer in the Plans. In addition, I noted no anomalies in the site layout or configuration of the system during my review.

Compliance Table — Meets Minimum Design Standards	
	Standard Stage
Recirc Tank Size	Yes
Hydraulic Load	Yes
Organic Load	Yes

As such, the system as designed satisfactorily complies with Orenco's design criteria to meet the following effluent limits specified in the Plans at a 95% confidence level, provided that all influent flows and constituent concentrations specified in the Plans are not exceeded:

Expected Effluent Quality	
Constituent	Average (mg/L)
BOD ₅	20
TSS	20

It is important to note that even though the AdvanTex Treatment System has the capability to meet or exceed the required treatment parameters, there is no way that Orenco can guarantee that a particular system will be operated or maintained in a manner consistent with the Final Design reviewed. Once the facility is placed into operation, the influent flows and constituent concentrations to the facility should be monitored, and if flow or any of the influent constituent concentrations exceed those listed in the Plans, measures should be taken to reduce the flow or constituent concentration to those listed. However, if additional treatment capacity becomes necessary, the system is designed to have the capability to expand to account for the new flow or constituent concentration.

Proper air ventilation is a critical feature of all commercial AdvanTex Treatment Systems, and as such, adequate active ventilation is required for all systems. In addition, please note that disposing of toxics or chemicals into the system is strictly prohibited. Examples of toxics include restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo, waste products, or any other toxins. Furthermore, water softener brine discharge is prohibited from being discharged into the AdvanTex Treatment System. Failure to adhere to these policies will void Orenco's limited product warranties.

If you have any questions about my review process, findings, or conclusions, please feel free to call or e-mail me.

Sincerely,



Caleb Castleman
Systems Engineering
Orenco Systems Inc.
(800) 348-9843 ext. 548
ccastleman@orencocom

Project: Burlingame State Park and Camp Ground
 Location: Bathhouse "B"

Description	Input values	Units
Finish Grade	76.50	Elevation
Water Table Elevation	66.00	Elevation
Bottom of Tank Elevation	65.58	Elevation
Lowest Pipe Invert	73.25	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	19.00	Inches
Length of Tank	30.83	Feet
Width of Tank	11.33	Feet
Depth of Tank	9.33	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	8.00	Inches
Sides Concrete Thickness	8.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	4.00	Inches
Compartment Wall Height	87.00	Inches
Computed Value		
Submerged Depth	0.42	Feet
Top/Bottom Surface Area of Tank	349.43	SF
Displaced Volume	146.76	CF
Volume of Tank Top	232.96	CF
Volume of Tank Sides	435.53	CF
Volume of Tank Bottom	232.96	CF
Volume of Baffle	24.17	CF
Weight of Tank Top	34,943.38	lbs
Weight of Tank Sides	65,330.02	lbs
Weight of Tank Bottom	34,943.38	lbs
Weight of Baffle	3,624.88	lbs
Total Weight of Tank	138,841.66	lbs
Volume of Soil	553.27	CF
Weight of Soil Above Tank	55,327.02	lbs
Uplift Created by Submerged Tank	9,157.96	lbs
Total Weight of Tank, Counter Weight and Soil	194,168.68	lbs
Exceeds Displaced Volume by	185,010.72	lbs
Buoyance Point for Empty Tank	6.37	Feet (above bottom)
Buoyance Point for Empty Tank	71.95	Elev
Buoyance Point for Tank in Place	8.90	Feet (above bottom)
Buoyance Point for Tank in Place	74.48	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Bathhouse "B"

Description	Input values	Units
Finish Grade	76.50	Elevation
Water Table Elevation	66.00	Elevation
Bottom of Tank Elevation	65.40	Elevation
Lowest Pipe Invert	72.90	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	23.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	9.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
Computed Value		
Submerged Depth	0.60	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	102.00	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	208.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	31,199.74	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	60,949.74	lbs
Volume of Soil	325.83	CF
Weight of Soil Above Tank	32,583.33	lbs
Uplift Created by Submerged Tank	6,364.80	lbs
Total Weight of Tank, Counter Weight and Soil	93,533.07	lbs
Exceeds Displaced Volume by	87,168.27	lbs
Buoyance Point for Empty Tank	5.75	Feet (above bottom)
Buoyance Point for Empty Tank	71.15	Elev
Buoyance Point for Tank in Place	8.82	Feet (above bottom)
Buoyance Point for Tank in Place	74.22	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
Location: Bathhouse "B"

Description	Input values	Units
Finish Grade	76.50	Elevation
Water Table Elevation	66.00	Elevation
Bottom of Tank Elevation	64.83	Elevation
Lowest Pipe Invert	71.58	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	42.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	8.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
Computed Value		
Submerged Depth	1.17	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	198.90	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	182.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	27,300.13	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	57,050.13	lbs
Volume of Soil	595.00	CF
Weight of Soil Above Tank	59,500.00	lbs
Uplift Created by Submerged Tank	12,411.36	lbs
Total Weight of Tank, Counter Weight and Soil	116,550.13	lbs
Exceeds Displaced Volume by	104,138.77	lbs
Buoyance Point for Empty Tank	5.38	Feet (above bottom)
Buoyance Point for Empty Tank	70.21	Elev
Buoyance Point for Tank in Place	10.99	Feet (above bottom)
Buoyance Point for Tank in Place	75.82	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Building "B"

Description	Input values	Units
Finish Grade	72.25	Elevation
Water Table Elevation	63.50	Elevation
Bottom of Chamber Elevation	63.50	Elevation
Lowest Pipe Invert	70.00	Elevation
Counter Weight	0.00	lbs
Soil Above Chamber	9.00	Inches
Chamber Length	7.00	Feet
Chamber Width	7.00	Feet
Diameter of Opening	2.50	Feet
Chamber Interior Height	7.00	Feet
Top of Concrete Thickness	6.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Concrete Wall Thickness	6.00	Inches
	Computed Value	
Submerged Depth	0.00	Feet
Top Surface Area of Chamber	44.09	SF
Surface Area of Chamber Sides	182.00	SF
Bottom Surface Area of Chamber	49.00	SF
Displaced Volume	0.00	CF
Volume of Chamber Top	22.05	CF
Volume of Chamber Sides	91.00	CF
Volume of Chamber Bottom	24.50	CF
Weight of Chamber Top	3,306.84	lbs
Weight of Tank Side	13,650.00	lbs
Weight of Chamber Bottom	3,675.00	lbs
Total Weight of Chamber	20,631.84	lbs
Volume of Soil	33.07	CF
Weight of Soil Above Chamber	3,306.84	lbs
Uplift Created by Submerged Chamber	0.00	lbs
Total: Chamber, Counter Weight and Soil	23,938.69	lbs
Exceeds Displaced Volume by	23,938.69	lbs
Buoyance Point for Empty Chamber	6.75	Feet (above bottom)
Buoyance Point for Empty Chamber	70.25	Elev
Buoyance Point for Chamber in Place	7.83	Feet (above bottom)
Buoyance Point for Chamber in Place	71.33	Elev

(Soil friction has not been taken into account)

Duplex Control Panels

Applications

Orenco Duplex Control Panels are used to control dual pumps, alarms, and other equipment as specified in pressure sewers and onsite septic systems.



Orenco[®] DAX2 Control Panel



General

Orenco Duplex Control Panels are specifically engineered for pressure sewer (STEP) systems and onsite septic treatment systems that require the use of two alternating pumps. Standard features include circuit breakers, an automatic/manual/off motor control toggle for each pump, an audio/visual high level alarm, an alarm reset, and a duplex alternator. Other standard features and options are listed on page 2. Orenco panels are designed for use with mechanical and/or mercury float switches. Listed per UL 508 in the US and Canada.

Standard Models

DAX1, DAX2

Product Code Diagram



Standard options (list in order):
 PT = programmable timer
 RO = redundant off relay
 CS = current sensor
 ETM = elapsed time meter
 CT = event counter
 HT = heater
 SA = surge arrester
 PRL = pump run light
 PL = power light

Intrinsically safe relays:
 Blank = standard, no IR relays
 IR = intrinsically safe relays

Pump voltage:
 1 = 120 VAC
 2 = 120 VAC or 240 VAC

DAX series duplex control panel

Materials of Construction

Enclosure	UV-resistant fiberglass, UL Type 4X
Hinges	Stainless steel

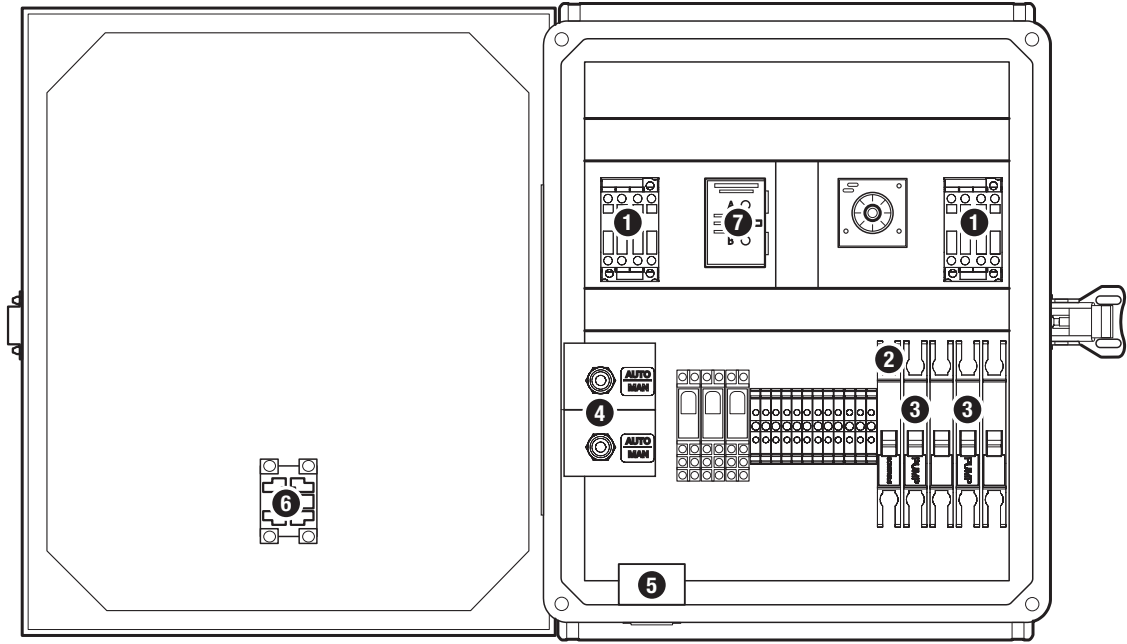
Specifications

Panel Ratings

DAX1:	120 V, 1 hp, 16 amps, single phase, 60 Hz.
DAX2:	240 V, 3 hp, 16 amps, single phase, 60 Hz.

Dimensions

Height, in. (mm)	15.5 (394)
Width, in. (mm)	13.5 (343)
Depth, in. (mm)	6.7 (170)



Orenco® DAX2PTR0 240 V panel

Standard Components

Feature	Specification(s)
1. Motor-Start Contactor	120 V, 16 FLA, 1 hp (0.75 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA). 240 V, 16 FLA, 3 hp (2.24 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).
2. Controls Circuit Breaker	10 A, OFF/ON switch. Single-pole 120 V. DIN rail mounting with thermal magnetic tripping characteristics.
3. Pump Circuit Breakers	20 A, OFF/ON switch. Single-pole 120 V or double-pole 240 V. DIN rail mounting with thermal magnetic tripping characteristics.
4. Toggle Switches	20 A, 1hp (0.75 kW). Single-pole, double-throw HOA switch,
5. Audible Alarm	95 dB at 24 in. (610 mm), warble-tone sound.
6. Visual Alarm	7/8-in. (22-mm) diameter red lens, "Push-to-silence." UL Type 4X rated, 1 W LED light, 120 V.
7. Duplex Alternator	120 V. Cross-wired style for independent lag pump function. Selector switch for locking one pump into lead position.
Audible Alarm Silence Relay (Not shown)	120 V. Automatic reset. DIN rail mount.

Optional Features

Feature	Specification(s)	Code Adder
Intrinsically Safe Control Relays	Listed per UL 698A, for Class 1 Div. 1, groups A, B, C, D hazardous locations (requires larger enclosure).	IR
Programmable Timer	120 V. Repeat cycle from 0.05 seconds to 30 hours. Separate variable controls for OFF & ON time periods.	PT
Redundant Off Relay	120 V. Provides a secondary off. Sounds alarm on low level condition. DIN rail mount.	RO
Elapsed Time Meter	120 V, 7-digit, non-resettable. Limit of 99,999 hours; accurate to 0.01 hours.	ETM
Event Counter	120 V, 6-digit, non-resettable.	CT
Heater	Anti-condensation heater. Self-adjusting: radiates additional wattage as temperature drops.	HT
Surge Arrestor	Status light on unit; protects incoming power supply from electrical surges.	SA
Pump Run Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PRL
Power Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PL

PF-Series Submersible Effluent Pumps: 1-Phase, 60-Hz, 4-inch (100-mm)

Applications

Our PF-Series 4-inch (100-mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or dosing tanks. These pumps are constructed of light-weight, corrosion-resistant stainless steel and engineered plastics, and are field-serviceable and repairable with common tools. They're also CSA- and UL-certified to U.S. and Canadian safety standards for effluent pumps.

PF-Series pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.



Features/Specifications

To specify this pump for your installation, require the following:

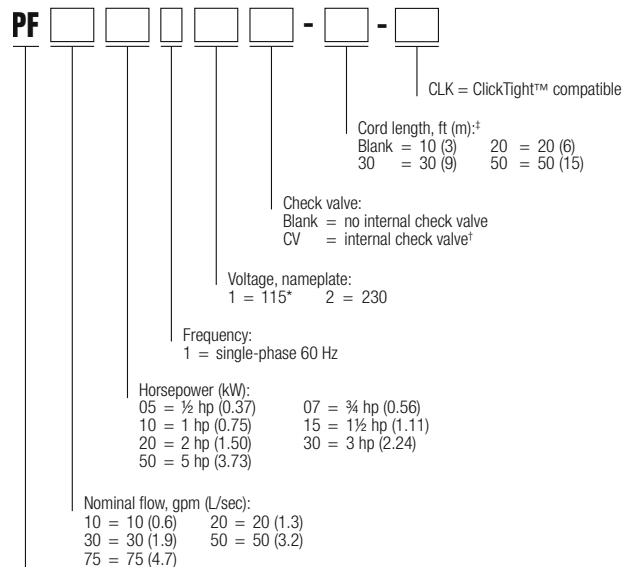
- Minimum 24-hour run-dry capability (liquid end) with no deterioration in pump life or performance*
- 1/8-inch (3-mm) bypass orifice to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid-end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10, 20, and 30 gpm (0.6, 1.3, and 1.9 L/sec) models; floating stack design on 50 and 75 gpm (3.2 and 4.7 L/sec) models
- Franklin Electric Super Stainless motor, rated for continuous use and frequent cycling
- Type SOOW 600-V motor cable (model PF751512 uses 14 AWG, SJ00W, 300-V cord)

* Not applicable for 5-hp (3.73 kW) models

Standard Models

See specifications chart on page 2 for a list of standard pumps. For a complete list of available pumps, call Orenco.

Product Code Diagram



Pump, PF Series

* ½-hp (0.37 kW) only

[†] Available for 10 gpm (0.6 L/sec), 1/2 hp (0.37 kW)

[‡] Note: 20-ft cords are available only for pumps through 1½ hp



C US
LR80980
LR2053896



Powered by
Franklin Electric

Specifications

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Discharge size and material ¹	Length in. (mm)	Min. liquid level in. (mm)	Weight lb (kg)	Rated cycles per day
PF100511 ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100511CV ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512 ⁹	10 (0.6)	0.50 (0.37)	1	230	240	6.3	6.3	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712 ^{4,5,9}	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	1 ¼ in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF101012 ^{5,6,9}	10 (0.6)	1.00 (0.75)	1	230	240	9.6	9.6	1 ¼ in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF200511 ⁹	20 (1.3)	0.50 (0.37)	1	115	120	12.3	12.5	1 ¼ in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512 ⁹	20 (1.3)	0.50 (0.37)	1	230	240	6.4	6.5	1 ¼ in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF201012 ^{4,5,9}	20 (1.3)	1.00 (0.75)	1	230	240	10.5	10.5	1 ¼ in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF201512 ^{4,5}	20 (1.3)	1.50 (1.11)	1	230	240	12.4	12.6	1 ¼ in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF300511 ⁹	30 (1.9)	0.50 (0.37)	1	115	120	11.8	11.8	1 ¼ in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512 ⁹	30 (1.9)	0.50 (0.37)	1	230	240	6.2	6.2	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712 ⁹	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	1 ¼ in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF301012 ^{4,9}	30 (1.9)	1.00 (0.75)	1	230	240	10.4	10.4	1 ¼ in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF301512 ^{4,5}	30 (1.9)	1.50 (1.11)	1	230	240	12.6	12.6	1 ¼ in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF302012 ^{5,6,7}	30 (1.9)	2.00 (1.49)	1	230	240	11.0	11.0	1 ¼ in. SS	35.5 (902)	26 (660)	44 (20)	100
PF303012 ^{5,6,7,8}	30 (1.9)	3.00 (2.23)	1	230	240	16.8	16.8	1 ¼ in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF305012 ^{5,6,7,8}	30 (1.9)	5.00 (3.73)	1	230	240	25.6	25.8	1 ¼ in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF500511 ⁹	50 (3.2)	0.50 (0.37)	1	115	120	12.1	12.1	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512 ⁹	50 (3.2)	0.50 (0.37)	1	230	240	6.2	6.2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500712 ⁹	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501012 ⁹	50 (3.2)	1.00 (0.75)	1	230	240	10.1	10.1	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF501512 ⁴	50 (3.2)	1.50 (1.11)	1	230	240	12.5	12.6	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF503012 ^{4,5,7,8}	50 (3.2)	3.00 (2.23)	1	230	240	17.7	17.7	2 in. SS	43.0 (1092)	37 (940)	55 (25)	100
PF505012 ^{5,6,7,8}	50 (3.2)	5.00 (3.73)	1	230	240	26.2	26.4	2 in. SS	65.4 (1661)	55 (1397)	64 (29)	100
PF751012 ⁹	75 (4.7)	1.00 (0.75)	1	230	240	9.9	10.0	2 in. SS	27.0 (686)	27 (686)	34 (15)	100
PF751512	75 (4.7)	1.50 (1.11)	1	230	240	12.1	12.3	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

1 GFP = glass-filled polypropylene; SS = stainless steel. The 1 ¼-in. NPT GFP discharge is 2 7/8 in. octagonal across flats; the 1 ¼-in. NPT SS discharge is 2 1/8 in. octagonal across flats; and the 2-in. NPT SS discharge is 2 7/8 in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

2 Minimum liquid level is for single pumps when installed in an Orenco Biotube® Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

3 Weight includes carton and 10-ft (3-m) cord.

4 High-pressure discharge assembly required.

5 Do not use cam-lock option (Q) on discharge assembly.

6 Custom discharge assembly required for these pumps. Contact Orenco.

7 Capacitor pack (sold separately or installed in a custom control panel) required for this pump. Contact Orenco.

8 Torque locks are available for all pumps and are supplied with 3-hp and 5-hp pumps.

9 ClickTight™ compatible.

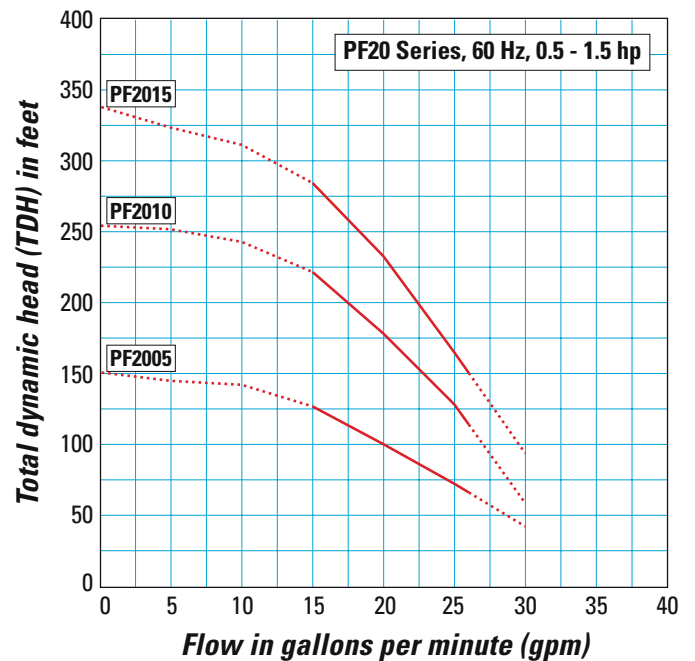
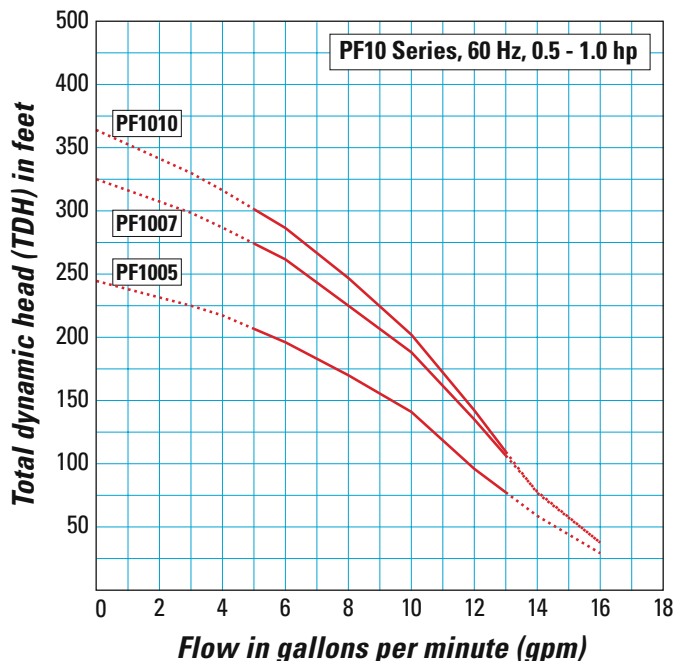
Materials of Construction

Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (Noryl GFN3)
Impellers	Celcon® acetal copolymer on 10-, 20-, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	7/16-in. hexagonal stainless steel, 300 series
Coupling	Sintered stainless steel, 300 series
Shell	Stainless steel, 300 series
Motor	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing ensures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Single-phase motors are equipped with surge arrestors for added security. Single-phase motors through 1.5 hp (1.11 kW) have built-in thermal overload protection, which trips at 203-221° F (95-105° C).

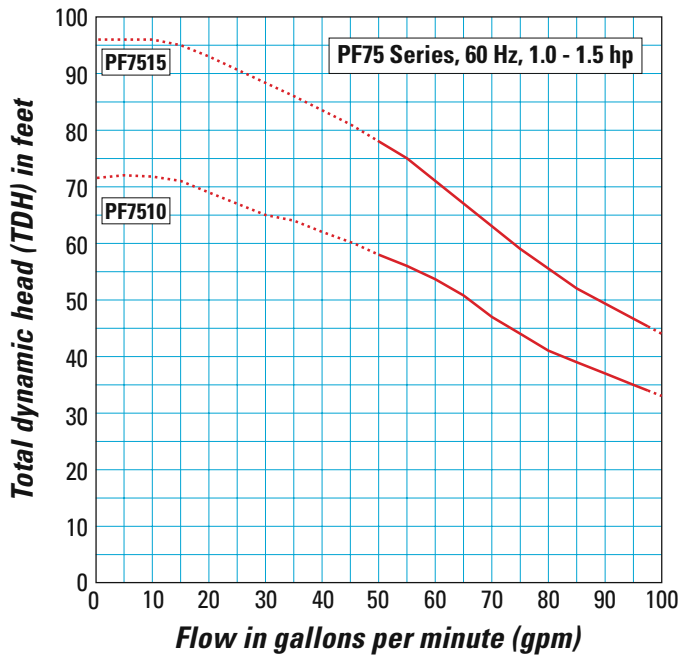
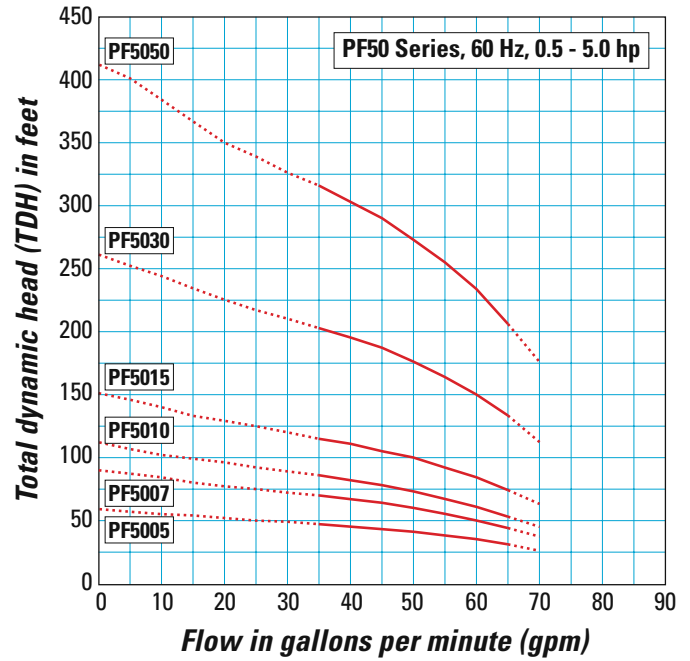
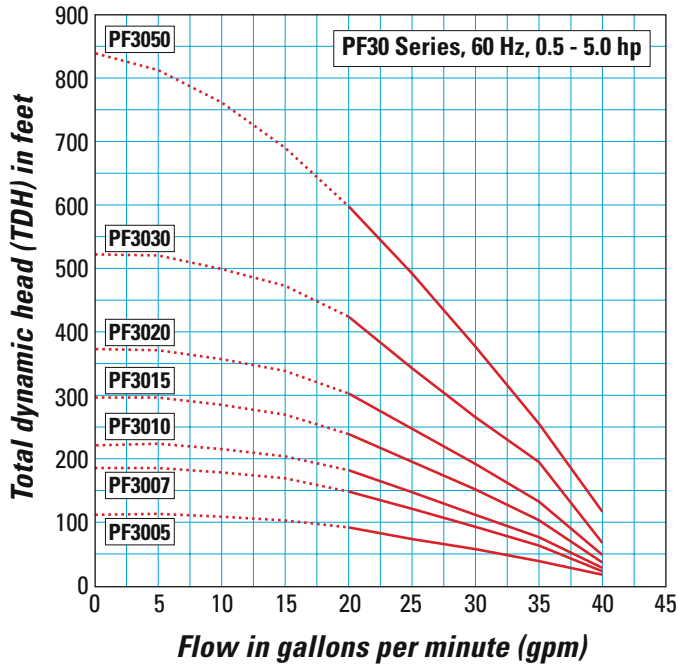
Using a Pump Curve

A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow and pressure (total dynamic head or “TDH”), providing a graphical representation of a pump’s optimal performance range. Pumps perform best at their nominal flow rate. These graphs show optimal pump operation ranges with a solid line and show flow rates outside of these ranges with a dashed line. For the most accurate pump specification, use Orenco’s PumpSelect™ software.

Pump Curves



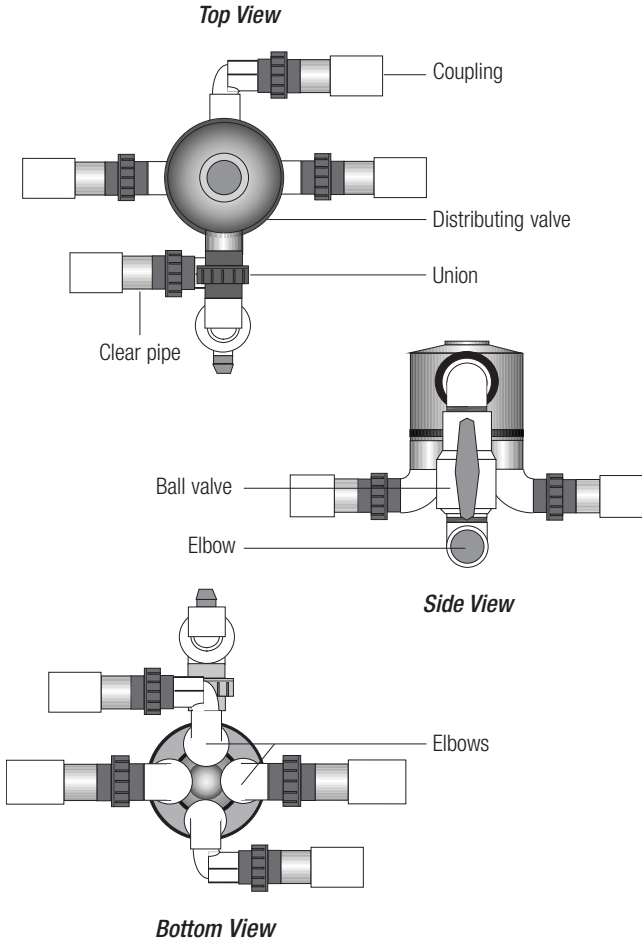
Pump Curves, cont.



Distributing Valves

Applications

Automatic Distributing Valve Assemblies are used to pressurize multiple zone distribution systems including textile filters, sand filters and drainfields.



General

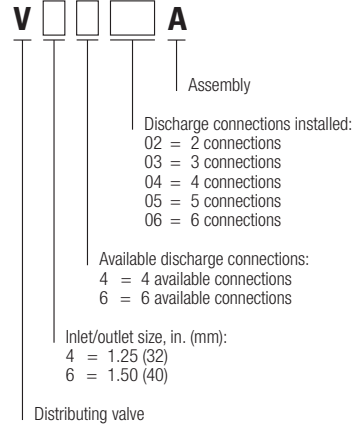
Orenco's Automatic Distributing Valve Assemblies are mechanically operated and sequentially redirect the pump's flow to multiple zones or cells in a distribution field. Valve actuation is accomplished by a combination of pressure and flow. They allow the use of smaller horsepower pumps on large sand filters and drainfields. For example, a large community drainfield requiring 300 gpm (18.90L/sec) can use a six-line valve assembly to reduce the pump flow rate requirement to only 50 gpm (3.14L/sec).

Orenco only warrants Automatic Distributing Valves when used in conjunction with High-Head Effluent Pumps with Biotube[®] pump vaults to provide pressure and flow requirements, and to prevent debris from fouling valve operation. An inlet ball valve, a section of clear pipe, and a union for each outlet are provided for a complete assembly that is easy to maintain and monitor. Ideal valve location is at the high point in the system. Refer to Automatic Distributing Valve Assemblies (NTP-VA-1) for more information.

Standard Models

V4402A, V4403A, V4404A, V4605A, V4606A, V6402A, V6403A, V6404A, V6605A, V6606A.

Product Code Diagram



Materials of Construction

All Fittings	Sch. 40 PVC per ASTM specification
Unions	Sch. 80 PVC per ASTM specification
Ball Valve	Sch. 40 PVC per ASTM specification
Clear Pipe	Sch. 40 PVC per ASTM specification

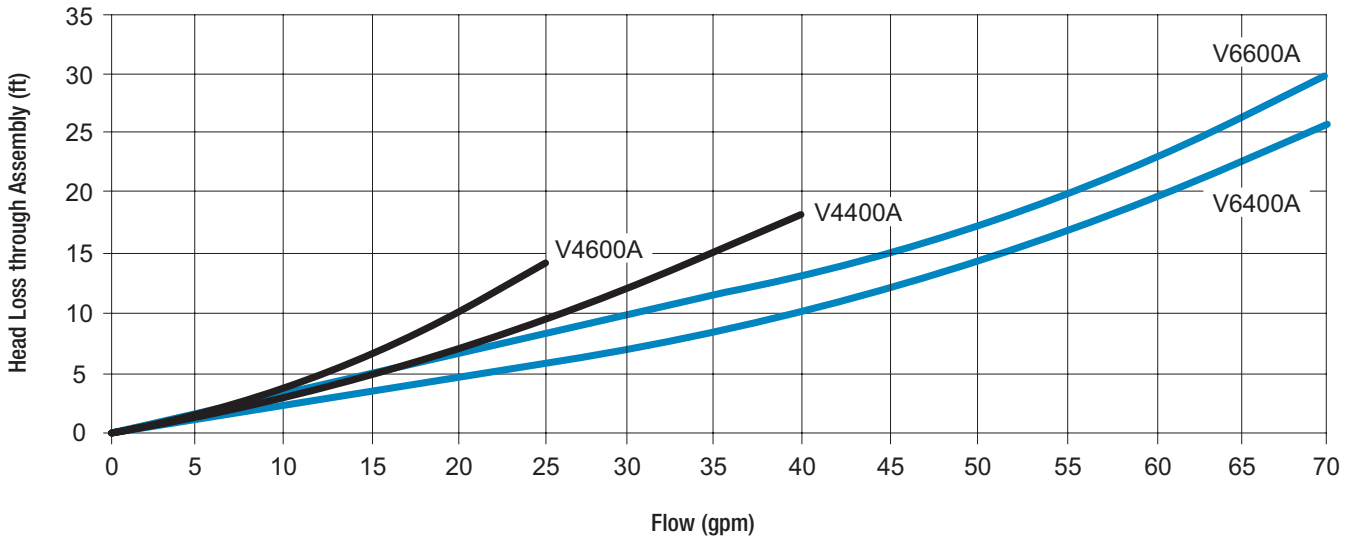
Specifications

Model	Inlet Size, in. (mm)	Outlets Size, in. (mm)	Flow Range, gpm (L/sec)	Max Head, ft (m)	Min. Enclosure*
V4402A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4403A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4404A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4605A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V4606A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V6402A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6403A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6404A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6605A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6606A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418

* When using an enclosed basin, choose the next larger-sized diameter.

Table 1. Automatic Distributing Valve Assembly Headloss Equations

Model Series	Equation	Operating Range, gpm (L/sec)
V4400A	$H_L = 0.085 \times Q^{1.45}$	10 - 40 (0.63 – 2.52)
V4600A	$H_L = 0.085 \times Q^{1.58}$	10 - 25 (0.63 – 1.57)
V6400A	$H_L = 0.0045 \times Q^2 + 3.5 \times (1 - e^{-0.06Q})$	15 - 70 (0.95 – 4.42)
V6600A	$H_L = 0.0049 \times Q^2 + 5.5 \times (1 - e^{-0.1Q})$	15 - 70 (0.95 – 4.42)



AdvanTex® AX100 Textile Filter

Applications

Orenco's AdvanTex® AX100 Treatment System is an innovative technology for onsite treatment of domestic-strength wastewater. The heart of the system is the AdvanTex Filter, a sturdy, watertight fiberglass basin filled with an engineered textile material. This lightweight, highly absorbent textile material treats a tremendous amount of wastewater in a small space. AX100 Treatment Systems are ideal for:

- New construction
- System upgrades and repairs
- Small sites
- Poor soils
- Pretreatment
- Nitrogen reduction
- Price-sensitive markets

For sizing, see AdvanTex® Design Criteria (NDA-ATX-COMM-1-PKG).



The heart of the AdvanTex® AX100 Treatment System is this sturdy, watertight fiberglass basin filled with an engineered textile material.

Features/Specifications

To specify this product, require the following:

- Wastewater treatment to better than secondary treatment standards
- Consistent treatment, even during peak flows
- Timer operation for flow monitoring, flow modulation, and surge control
- Fixed-film, engineered textile media, operated in an unsaturated condition
- Consistent media quality
- Low energy consumption
- Low maintenance requirements
- Complete pre-manufactured package, ready to install
- Watertight construction, corrosion-proof materials, and components
- Foam-core lid provides insulation value of R-6 (RSI-1.1)
- Quiet operation

Standard Model

AX100

Specifications**

Length, in. (mm)	191 (4851)
Width, in. (mm)	94 (2388)
Height, in. (mm)	42 (1067)
Area (footprint), ft ² (m ²)	128 (11.9)
Dry Weight, lb (kg)	1616 (733)

* Covered by U.S. patent numbers 6,540,920; 6,372,137; 5,531,894; 5,480,561; 5,360,556

** Nominal values provided. See AdvanTex® Treatment System drawings for exact dimensions.

AdvanTex[®] Vent Fan Assembly

Applications

Oreco's AdvanTex[®] Vent Fan Assembly consists of a water-proof fiberglass enclosure with equipment for venting onsite wastewater treatment systems. One enclosure can hold a vent fan with carbon filter and an optional heater.

The vent fan is used in commercial-sized AdvanTex Treatment Systems to gently pull air through the textile media, ensuring that adequate oxygen is available for biological treatment. The carbon filter scrubs the air that the system exhausts. An optional heater can be added where climate requires heating of the air that enters the AdvanTex textile filter pods.



Standard Models

AXVFACF — AX above ground Vent Fan Assembly with LMF-3 Fan

AXVFACF-HT — AX above ground Vent Fan Assembly with LMF-3 Fan and HT10 Heater

Enclosure

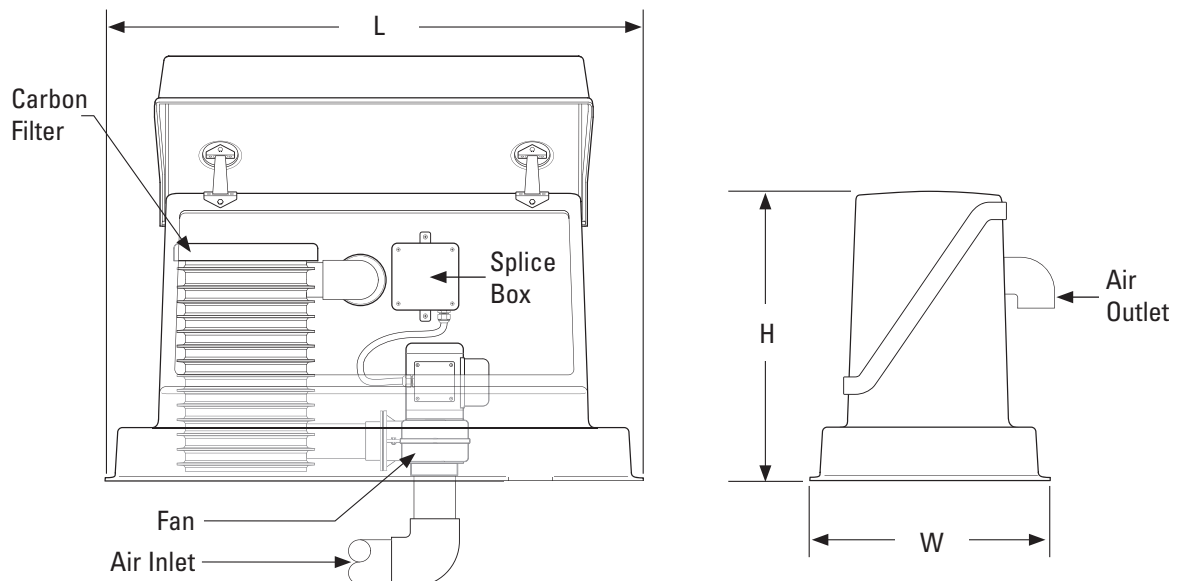
Physical Specifications

Materials of Construction

Shell	Fiberglass-reinforced polyester (FRP)
Hardware	Stainless steel
Exterior finish	Green, textured, UV resistant
Straps	Nylon

Dimensions

Length (L)	50 in. (1270 mm)
Width (W)	24 in. (610 mm)
Height (H)	30 in. (762 mm)
Volume	15.1 ft ³ (0.43 m ³)
Area (footprint)	8.3 ft ² (0.77 m ²)



AdvanTex® Vent Fan Assembly (continued)

Fan

Physical Specifications

Dimensions

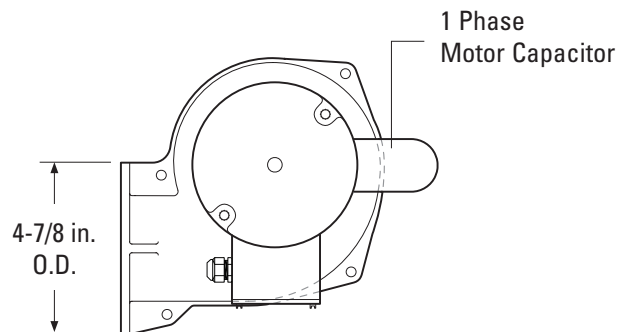
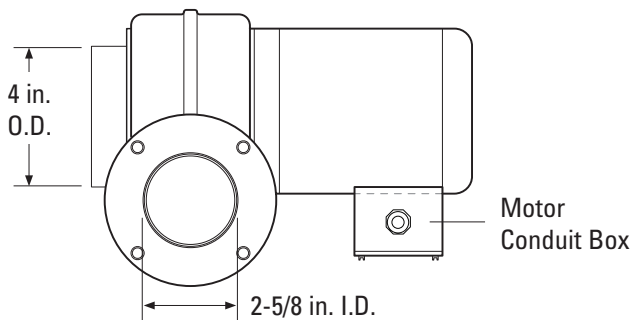
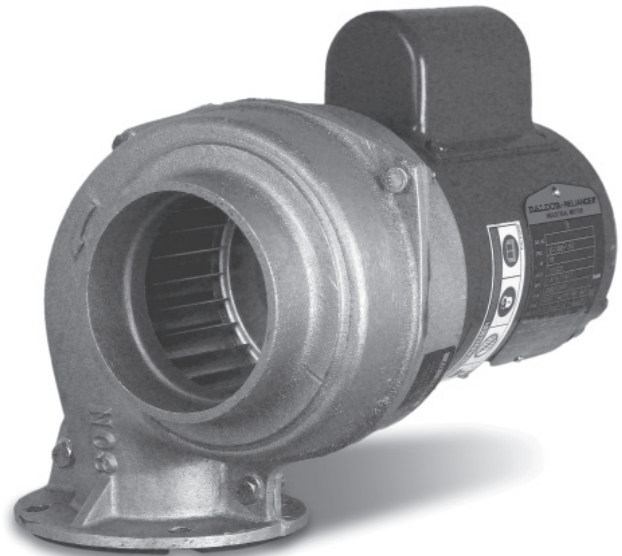
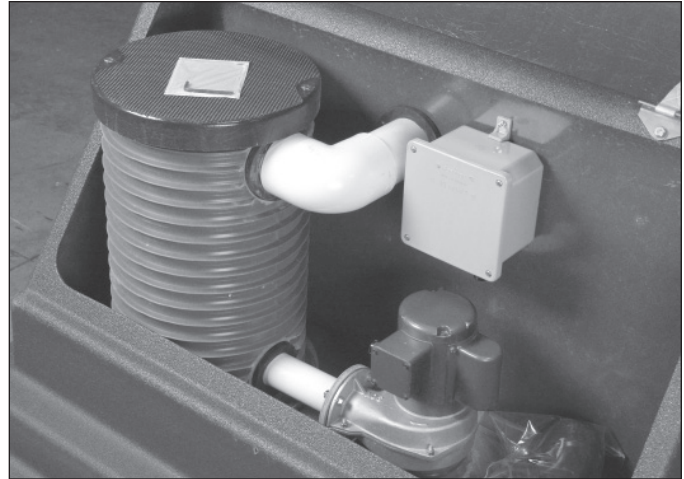
Inlet O.D.	4 in. (100 mm)
Inlet nominal pipe size	4 in. (100 mm)
Outlet I.D.	2-5/8 in. (67 mm)
Outlet Flange O.D.	4-7/8 in. (124 mm)

Materials of Construction

Housing	Aluminum
Wheel	Steel

Performance Data

	60 Hz	50 Hz
Horsepower (kW)	0.08 (0.06 kW)	0.08 (0.06 kW)
Phase	1 phase	1 phase
Volts	115/230	110/220
Amperage	1.4 A/0.7 A	1.8 A/0.9 A
RPM	3400	2900
CFM at 0" H ₂ O static pressure	245	205
CFM at 0.4" H ₂ O static pressure	220	170
CFM at 0.8" H ₂ O static pressure	190	130
CFM at 1.5" H ₂ O static pressure	120	N/A



AdvanTex® Vent Fan Assembly (continued)

Carbon Filter Basin

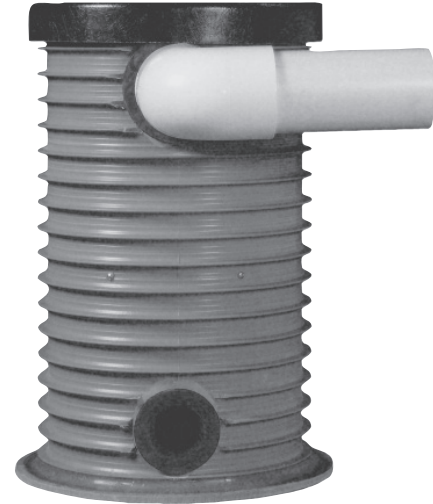
Physical Specifications

Dimensions

Outlet diameter	Accepts nominal 3-in. PVC pipe
Inlet diameter	Accepts nominal 2-in. PVC pipe
Height	21.5 in. (546 mm)
Diameter	12 in. (305 mm)

Materials of Construction

Housing	PVC
Bottom	Fiberglass-reinforced polyester (FRP)
Interior supports	Polypropylene grid and polyethylene screen
Support rings	PVC
Lid	Fiberglass
Fill material	Activated carbon



Heater (Optional)

Physical Specifications

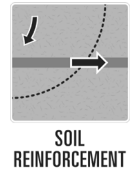
Dimensions

Outlet diameter	Fits nominal 3-in. Class 125 PVC pipe
Length (inlet to outlet)	11.75 in. (297 mm)
Width	11.25 in. (286 mm)
Depth	8.25 in. (210 mm)

Performance Data

Watts	1000
Volts	120
Amps	8.3





Miragrid® 22XT

Miragrid® 22XT geogrid is composed of high molecular weight, high tenacity polyester multifilament yarns woven in tension and finished with a PVC coating. Miragrid® 22XT geogrid is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Miragrid 22XT geogrid is used as soil reinforcement in MSE structures such as segmental retaining walls, precast modular block walls, wire faced walls, geosynthetic wrapped faced walls and steepened slopes. Miragrid 22XT is also used in MSE stabilized platforms for voids bridging, embankments on soft soils, landfill veneer stability, reducing differential settlement and for foundation seismic stability.

TenCate Geosynthetics Americas is accredited by Geosynthetic Accreditation Institute – Laboratory Accreditation Program ([GAI-LAP](#)).

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE
			MD
Tensile Strength @ Ultimate	ASTM D6637 (Method B)	lbs/ft (kN/m)	20559 (300.0)
Tensile Strength @ 5% strain	ASTM D6637 (Method B)	lbs/ft (kN/m)	6700 (97.8)
Mass/Unit Area ¹	(ASTM D5261)	oz/yd ² (g/m ²)	28.2 (956)
			MINIMUM ROLL VALUE
Creep Rupture Strength ²	ASTM D5262/D6992	lbs/ft (kN/m)	14277 (208.3)
Long Term Design Strength ³		lbs/ft (kN/m)	12361 (180.4)
PHYSICAL PROPERTIES		UNIT	ROLL CHARACTERISTIC
Roll Dimensions ⁴ (width x length)		ft (m)	12 x 200 (3.6 x 61)
Roll Area		yd ² (m ²)	267 (220)
Estimated Roll Weight		lbs (kg)	470 (213)
Label Roll Color			WHITE

¹ Typical Value

² 75-year design life based on NTPEP Report [REGEO-2016-01-069](#).

³ Long Term Design Strength for sand, silt, clay. $RF_{CR} = 1.44$; $RF_{ID} = 1.05$; $RF_D = 1.1$ (Installation damage reduction factor for other soils available upon request).

⁴ Special order roll lengths are available upon request

Disclaimer: TenCate assumes no liability for the accuracy or completeness of this information or for the ultimate use by the purchaser. TenCate disclaims any and all express, implied, or statutory standards, warranties or guarantees, including without limitation any implied warranty as to merchantability or fitness for a particular purpose or arising from a course of dealing or usage of trade as to any equipment, materials, or information furnished herewith. This document should not be construed as engineering advice. Mirafi™ is a registered trademark of Nicolon Corporation. Copyright © 2021 Nicolon Corporation. All Rights Reserved
FGS000105
ETQR19



MYERS[®]
MODEL SRM4
4/10 HORSEPOWER
RESIDENTIAL SEWAGE PUMP



MYERS® MODEL SRM4 Residential Sewage Pump

The Right Choice

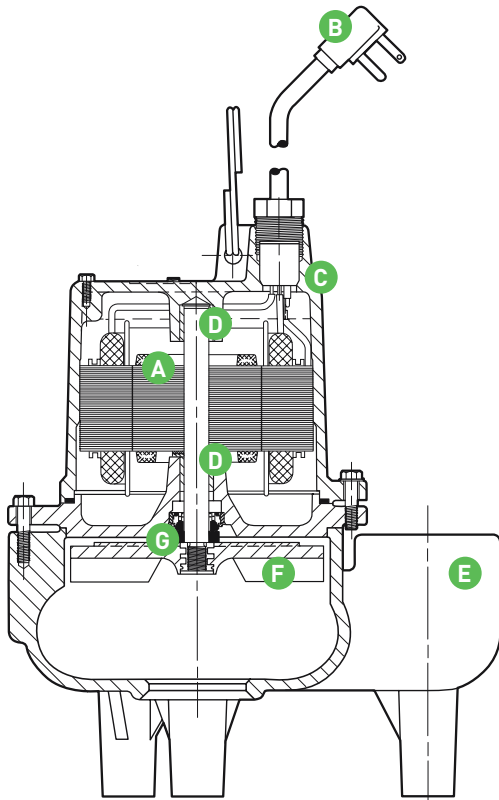
The SRM4 solids handling pump is the most reliable 4/10 horsepower residential sewage pump available today. The SRM4 is a plumbers/contractors dream! Its recessed impeller design allows 2" solids to pass freely through the volute without the chance of jamming the impeller. The SRM4 series pump has a national field-proven record of reliability. Look to your Myers distributor for the answer to your residential sewage handling needs ... and across the counter will be the Myers mini solids handling, the SRM4. It works for you! For more information, call your Myers distributor today, or the Myers Ohio sales office at 419-289-6898.



Product Capabilities		
Capacities To	95 gpm	360 lpm
Heads To	18 ft. 19 ft. shutoff	5.5 m 5.8 m
Pump Down Range Float Switch	7 to 14 in.	178 to 356 mm
Solids Handling Capacity	2 in.	50.8 mm
Liquids Handling	raw sewage, effluent, drain water	
Intermittent Liquid Temp.	up to 140°F	up to 60°C
Motor Electrical Data	4/10 HP shaded pole 1650 RPM	
Electrical	115V, 12A or 230V, 6A, 1Ø, 60 Hz.	
Acceptable pH Range	6 - 9	
Discharge, NPT	2 in.	50.8 mm
Min. Sump Diameter		
Simplex	18 in.	457 mm
Duplex	30 in.	762 mm

Note: Consult factory for applications outside these recommendations.

Pump Features and Applications



A. 4/10 HP Motor

Pressed in place and oil-filled for best alignment and heat transfer. Built-in overload protection.

B. Power Cord

Quick-disconnect watertight fitting.

C. Motor Housing

Heavy cast iron for efficient heat transfer.

D. Dual Thrust Washers, Sleeve Bearings

Oil lubricated, enhance smooth operation and extend pump life..

E. Cast Iron Volute

Passes 2" diameter solids.

F. Recessed Impeller

Operates out of volute passage, allowing maximum flow of liquids and solids.

G. Mechanical Shaft Seal

Carbon and ceramic faces, body is stationary, prevents string or trash from winding on seal..

Mechanical Float Switch

Mercury-free, 90° angle operation. (Piggyback models only).

Durable Motor Will Deliver Many Years Of Reliable Service.

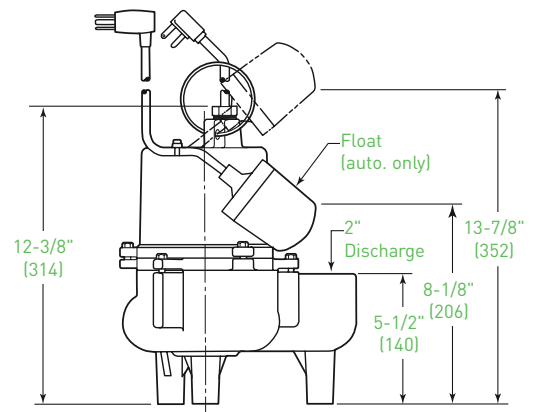
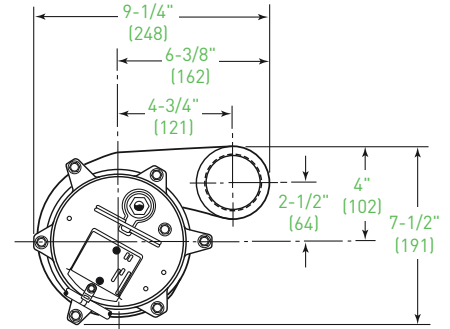
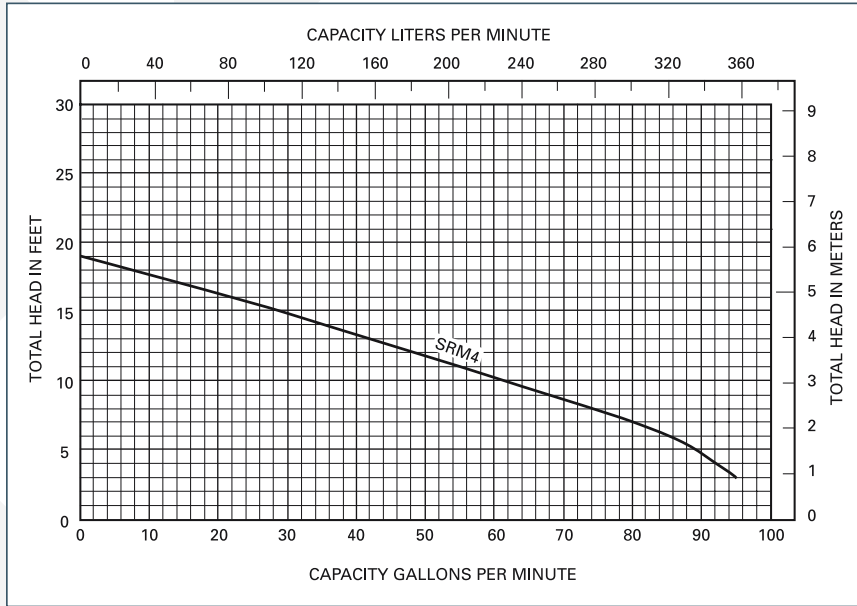
- Oil-filled motor for maximum heat dissipation and continuous bearing lubrication.
- Overload protected shaded pole motor eliminates starting switches.
- Recessed vortex impeller provides minimal radial loading for long bearing life.

The SRM4P Is Engineered For Many Years Of Maintenance-Free Operation.

- Wide-angle piggy-back float switch for maximum draw down. (Automatic models.)
- Pump can be operated manually by unplugging piggy-back switch and plugging pump directly into outlet (Automatic models).
- Recessed vortex impeller operates completely out of volute and provides free flow through passage for solids and liquids.

Performance Data and Dimensions [Dimensions in mm]

1650 RPM



740 EAST 9TH STREET,
ASHLAND, OHIO 44805
WWW.FEMYERS.COM

269 TRILLIUM DRIVE, KITCHENER,
ONTARIO, CANADA N2G 4W5
WWW.FEMYERS.COM

Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.
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January 13, 2023

David T. Bray, PLS
President
Caputo & Wick LTD
1150 Pawtucket Ave.
Rumford, RI 02916-1897
Phone: (401) 434-8880

RE: Burlingame State Park and Camp Ground, Charlestown, RI

Dear Mr. Bray:

This letter will confirm that you have been trained and certified to design GST™ Leaching Systems by Geomatrix Systems, LLC ("Geomatrix") in the State of Rhode Island.

This letter also confirms that Geomatrix has reviewed the design of the GST Leaching System proposed for installation at Burlingame State Park and Camp Ground, Charlestown, RI and found the site and design to be suitable and in compliance with the approved design manuals for the aforementioned product.

If you have any questions, please contact me.

Sincerely,
GEOMATRIX SYSTEMS, LLC

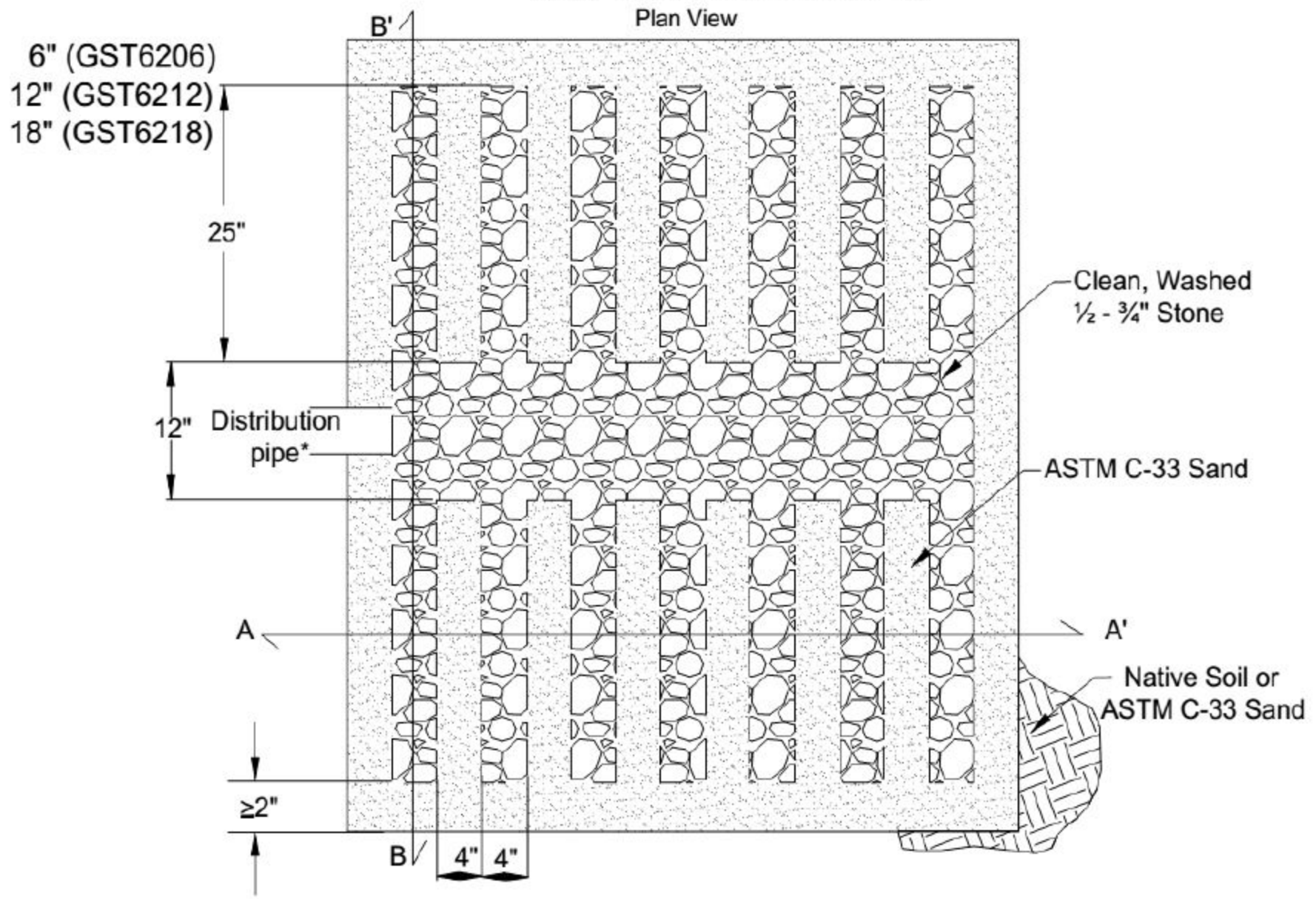
A handwritten signature in cursive script that reads "David Jewett".

David Jewett

Geomatrix Systems, LLC
114 Mill Rock Road East - Old Saybrook, CT 06475
Phone: 860-510-0730 – Fax: 860-510-0735

GST Schematics

GST™ LEACHING SYSTEM



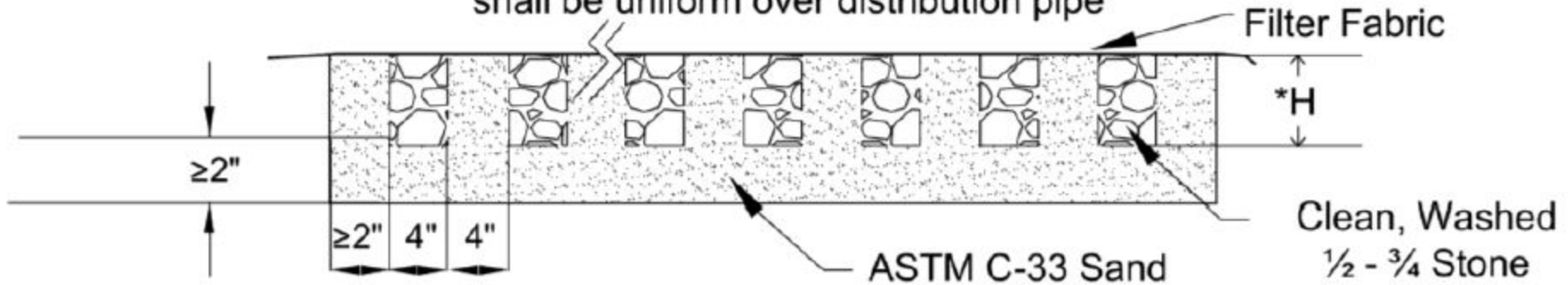
* Distribution pipe for gravity systems shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

GEOMATRIX GST™ LEACHING SYSTEM

A-A' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



*H= 6" (GST6206)

12" (GST6212)

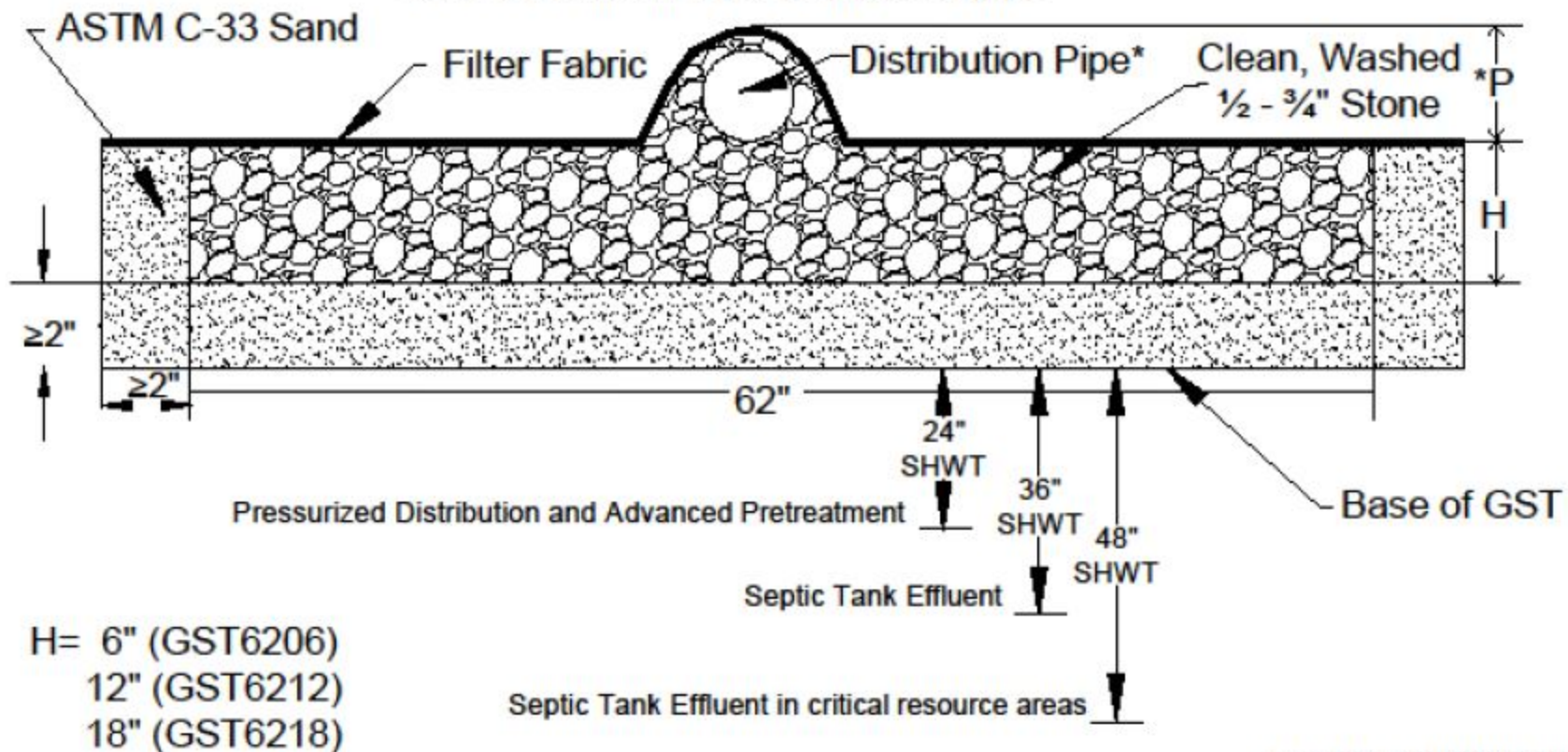
18" (GST6218)

GST™ LEACHING SYSTEM

B-B' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



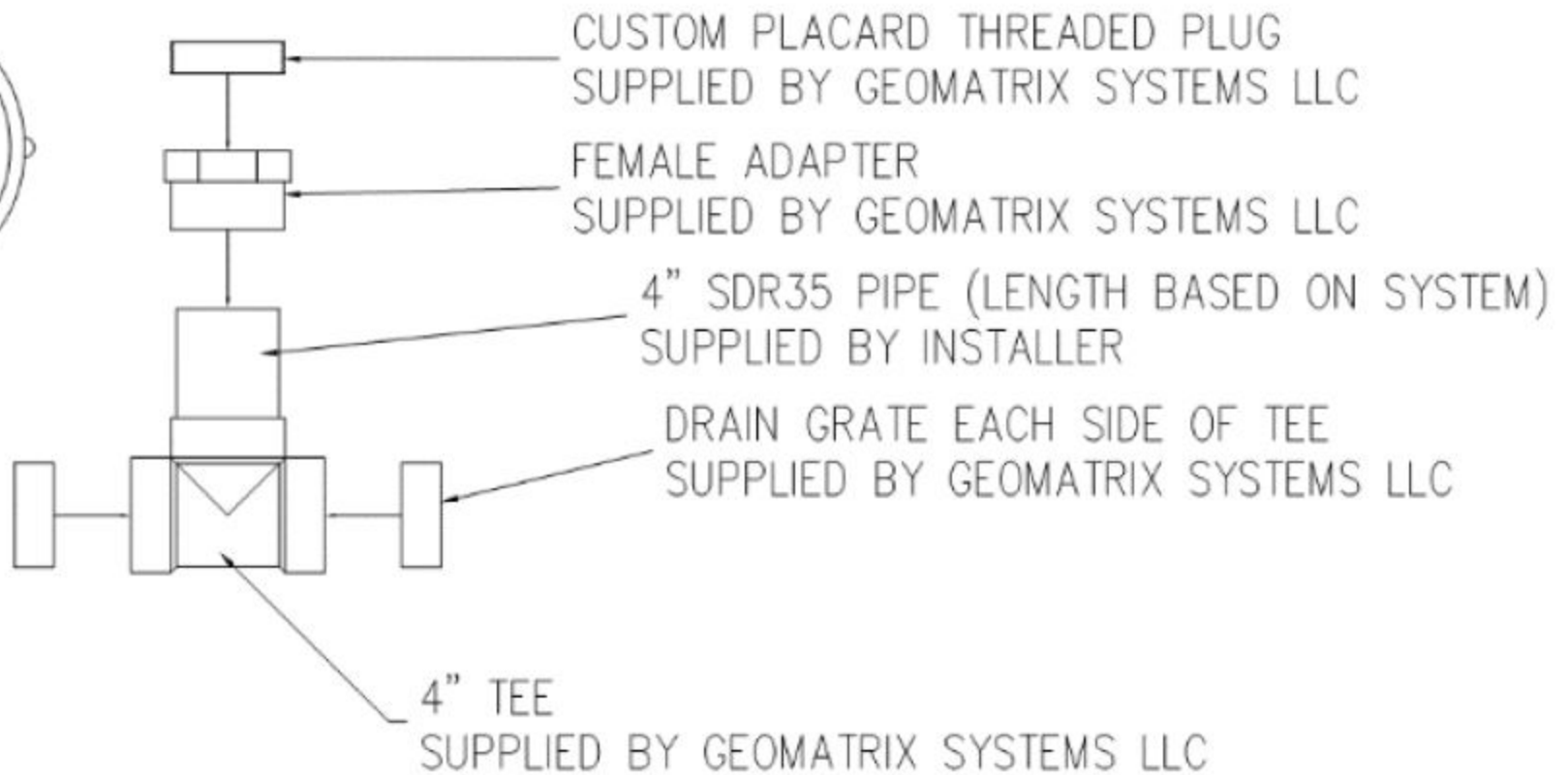
* Distribution pipe for gravity applications shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the
Design, Use and Maintenance of Pressurized Drainfields

Copyright 2022 GEOMATRIX SYSTEMS, LLC
patents: www.geomatrixsystems.com

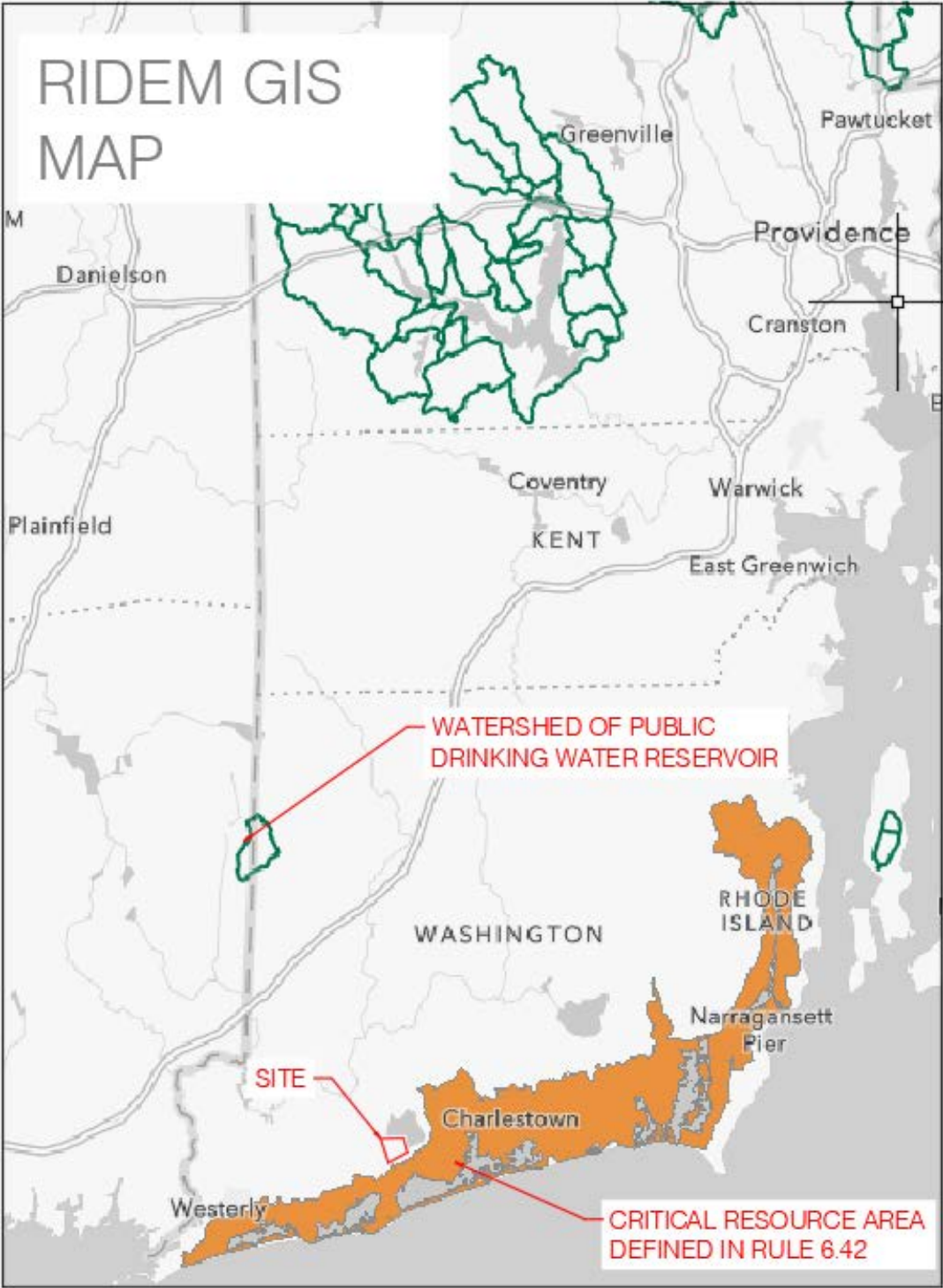
GST LEACHING SYSTEM
B-B' Cross Section
Geomatrix Systems, LLC., Old Saybrook, CT
860-510-0730

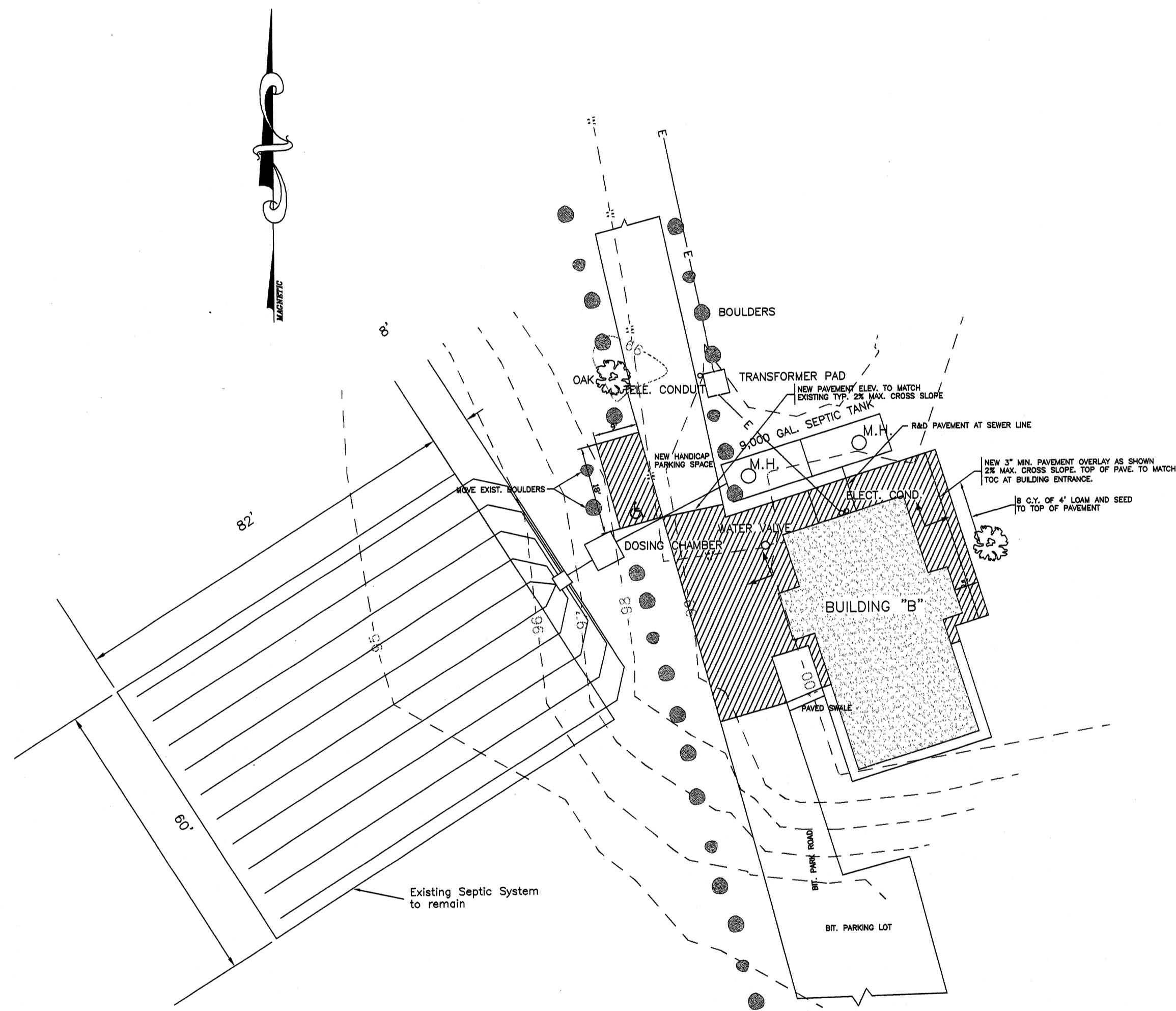
SCALE	None	REV.	0
DATE	9-4-2018	ACAD No.	040 GLS B-B'.DWG
DRAWN BY:	ERP	SHEET	3 Of 3

GEOMATRIX GST™ LEACHING SYSTEM INSPECTION PORT DETAIL



GST LEACHING SYSTEM Inspection Port Detail Geomatrix Systems, LLC., Old Saybrook, CT 860-510-0730		
SCALE	None	REV. A
DATE	6/2/2015	ACAD No. GSTIP.DWG
DRAWN BY:	ERP	SHEET 1 OF 1

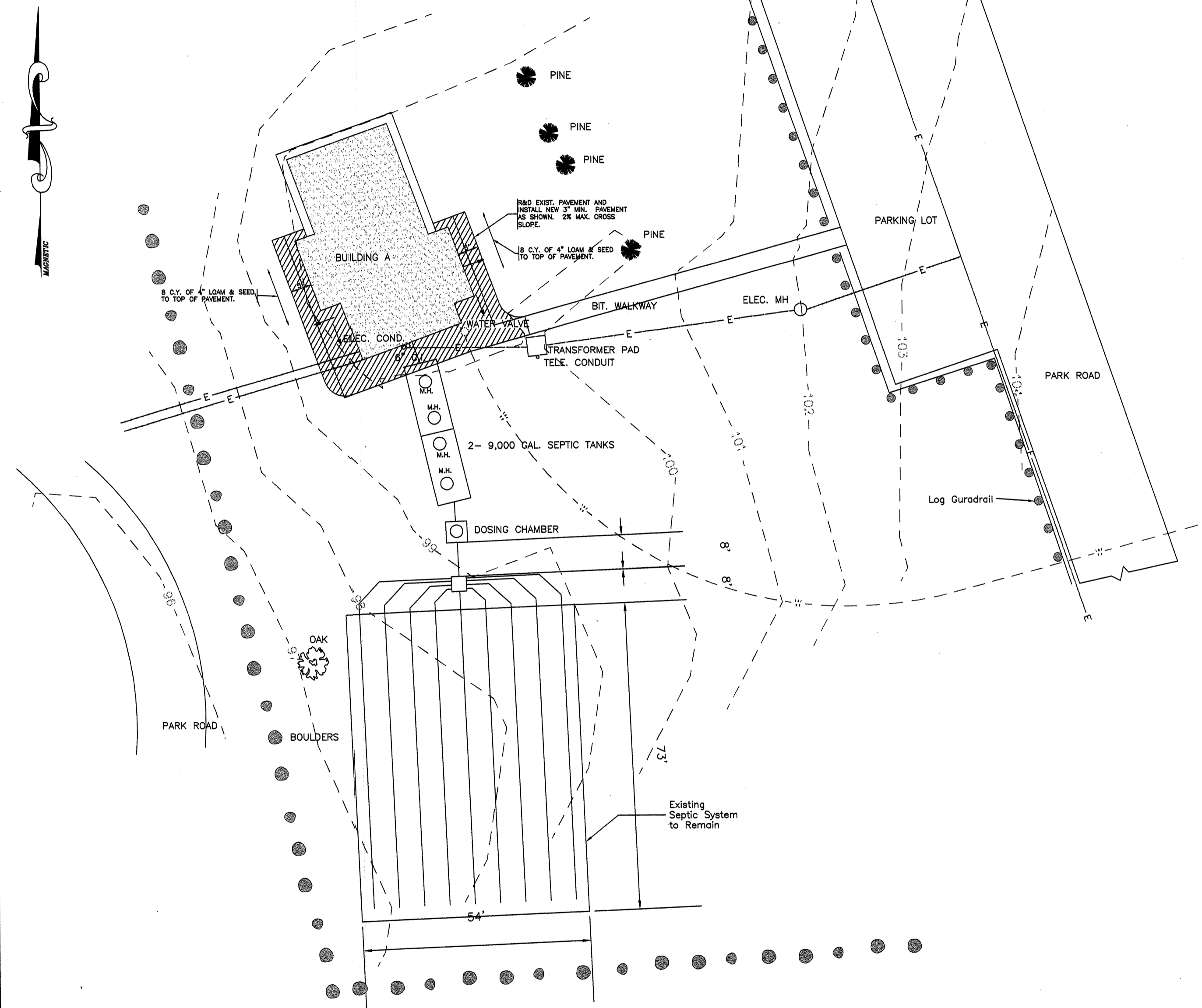




Site Plan Building "B"
Scale: 1" = 20'

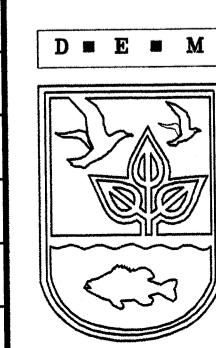
Notes:

1. All features shown are existing unless noted otherwise.
2. Locations of all utilities shown are approximate, Contractor to verify exact locations of all utilities in the field, both overhead and underground, with DIGSAFE. Any damage to utilities shall be the Contractor's responsibility.
3. Construction work area is 20' outside of building, walkway to parking area, and parking area.
4. Contractor must restore the site to it's original condition at the completion of all work. Any grassed areas to be loamed and seeded with 4" min. loam. Any pavement areas to be repaved per the specifications.
5. Each utility company is to be notified at least 24 hrs. before any work impacting their utilities begins.
6. adjust valve covers and M.H. covers to new grade as required.



Site Plan Building "A"
Scale: 1" = 20'

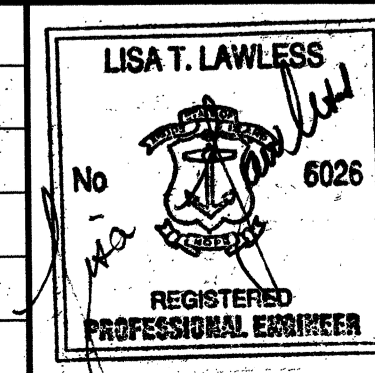
No.	Description	Date
REVISIONS:		



STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

RENOVATIONS TO A&B TOLIETS
BURLINGAME STATE PARK
CHARLESTOWN, RI

Design by: LL
Drawn by: CVP
Checked by: LL
Date: JUNE 2002
Scale: 1"=20'
Project No.:



SITE PLANS
BUILDINGS A & B

C2
SHEET OF



“Building “A” Bathhouse and Onsite Wastewater Treatment System Replacement”

For

Rhode Island Department of Environmental Management
Burlingame State Park and Campground

Burlingame Park Road
Charlestown, Rhode Island

Assessors Map 15 – Lot 10
Area: 847 Acres±

July 2022
Rev.: March 2023

Prepared by

Caputo & Wick Ltd.
1150 Pawtucket Avenue
Rumford, Rhode Island 02916-1897
401-434-8880



RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
 ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT

MAR - 8 2023



www.dem.ri.gov/septic

FOR RIDEM USE ONLY

Office of Water Resources

APPLICATION No. 2205-1138 DATE RECEIVED 03/09/23 AMOUNT RECEIVED \$ Unpaid CHECK # --- NOTE 1P1

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- NEW BUILDING CONSTRUCTION
- ALTERATION
- REPAIR
- TRANSFER
- A/E TECHNOLOGY TYPE EXISTING
- VARIANCE
- REDESIGN
- JOINT OWTS / WETLANDS PD

CERTIFICATION

I, Kevin Harriss (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

SITE INFORMATION

BURLINGAME GATE PARK AND CAMP ROUND BUILDING
1100 BURLINGAME LANE ROAD CHARLESTOWN
 NO. STREET CITY/TOWN POLE #
 PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.
 LOT SIZE 997 SF/ACRES
 SUBDIVISION NAME N.A.
 SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

Designer's Signature [Signature] License # D3155

Designer's Email kharriss@dem.ri.gov Phone # 404-424-9800

Business/Company Name CONSTRUCTION LINK LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

OWNER INFORMATION

STATE OF RI DEM
 LAST NAME FIRST NAME M.I.
225 PRIMEVALE ST PROVIDENCE 02104
 NO. STREET CITY/TOWN ZIP CODE

Owner's Phone Number (401)222-4700 ext. 2774307

Owner's Email MELAN DIRRETE@DEAL.RI.GOV

Owner(s) Signature [Signature]

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other

→ Per attached testing requirements

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1138
 DEPTH TO APPROVED WATER TABLE 24" HOW DETERMINED SOIL EXAMINATION
 TEST HOLE # 3E DATE EXCAVATED 3/17/21 WETLANDS within 200' OF OWTS YES NO
 WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE 1/1/
 LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial _____
 Other PATHHOUSE
 WATER SUPPLY: public water public well private well
 # OF DESIGN UNITS 150
 UNIT DESIGN FLOW 50 gallons per sqft (unit) TOTAL DAILY FLOW 7,500 gallons
 TANK SIZE 15,000 gallons DESIGN LOADING RATE 3.5 gpd/sf
 MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet
 LEACHFIELD TYPE GRAVEL SAND TREATMENT (LST)
 TOTAL AREA OF LEACHFIELD PROVIDED 1,100 square feet

Signature of RIDEM Official [Signature] Date of Approval 3/15/23 Date of Expiration 3/15/28

DESIGNER



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**

www.dem.ri.gov/septic



FOR RIDEM USE ONLY

APPLICATION No. _____ DATE RECEIVED ____/____/____ AMOUNT RECEIVED \$ _____ CHECK # _____ NOTE _____

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- NEW BUILDING CONSTRUCTION
- ALTERATION
- REPAIR
- TRANSFER

- A/E TECHNOLOGY TYPE ORENCO Ax.100/GST
- VARIANCE
- REDESIGN
- JOINT OWTS / WETLANDS PD

CERTIFICATION

I, KEVIN HARROP (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

Designer's Signature [Signature] License # D 3155

Designer's Email Kharrop@cwlltd.net Phone # 401-434-8880

Business/Company Name CAPUTO and WICK LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

Owner's Phone Number (401)222-4700 ext. 2774307

Owner's Email MEGAN.DIPRETE@DEM.RI.GOV

Owner(s) Signature _____

SITE INFORMATION

BURLINGAME STATE PARK AND CAMPGROUND (BUILDING "A")
1-100 BURLINGAME PARK ROAD CHARLESTOWN
 NO. STREET CITY/TOWN POLE #
 PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.
 LOT SIZE 847 -SF/ACRES
 SUBDIVISION NAME N.A.
 SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

OWNER INFORMATION

STATE OF RI DEM
 LAST NAME FIRST NAME M.I.
235 PROMENADE ST. PROVIDENCE 02908
 NO. STREET CITY/TOWN ZIP CODE

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1138
 DEPTH TO APPROVED WATER TABLE 24" HOW DETERMINED SOIL EVALUATION
 TEST HOLE # 3B DATE EXCAVATED 8/17/21 WETLANDS within 200' OF OWTS YES NO
 WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE ____/____/____
 LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial _____
 Other BATHHOUSE
 WATER SUPPLY: public water public well private well
 # OF DESIGN UNITS 150
 UNIT DESIGN FLOW 50 gallons per SITE (unit) TOTAL DAILY FLOW 7,500 gallons
 TANK SIZE 15,000 gallons DESIGN LOADING RATE 3.5 gpd/sf
 MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet
 LEACHFIELD TYPE GRAVEL SAND TREATMENT (GST)
 TOTAL AREA OF LEACHFIELD PROVIDED 4,900 square feet

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other

Signature of RIDEM Official	Date of Approval	Date of Expiration
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RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
235 Promenade Street, Providence, Rhode Island 02908

March 15, 2023

State of Rhode Island
Rhode Island Department of Environmental Management Division of Planning and Development
235 Promenade Street
Providence, RI 02908

RE: Bathhouse "A"
Burlingame State Park and Campground
Charlestown, RI
OWTS Application No. 2205-1138

Dear Applicant:

Attached herewith are revised monitoring and reporting requirements applicable to the above listed permit. As you are aware the above listed Onsite Wastewater Treatment System (OWTS) permit is granted based on a maximum daily design flow of **7,500** gallons per day and includes 1 - 15,000 gallon septic tank, 1 - 7,500 gallon anoxic tank, 1 - 6,000 gallon recirculation tank, 2 - Advantex AX 100 filter pods followed by a 6 x 6 pump chamber to a Gravel Sand Treatment (GST) type of leaching system.

Advanced treatment systems are utilized to mitigate against possible adverse impacts of residual onsite wastewater pollutants on groundwater quality and surface water quality. Owners of advanced OWTSs with design flows $\geq 2,000$ gallons per day are subject to regular monitoring and reporting. The following stipulations now apply to your permit:

1. The following discharge limits as measured at the 6 x 6 pump chamber shall apply:

<u>Orengo Systems, Inc. AdvanTex AX-100 – Mode 1</u>	
Biochemical Oxygen Demand (5 Day)	≤ 20 mg/L
Total Suspended Solids	≤ 20 mg/L
Oil & Grease	≤ 5 mg/L

2. Wastewater flow shall not exceed a maximum daily flow of **7,500** gallons per day. Wastewater flow shall be monitored and recorded to ensure compliance with this stipulation.
3. Sampling and testing shall be conducted quarterly at the compliance point specified in Item 1 above. Sampling and measurements shall be representative of the monitored activity. The Permittee shall sample and test the wastewater in each system as follows:

Dissolved Oxygen (mg/L) – *Field Test*
Effluent Temperature (°F) – *Field Test*
pH (s.u.) – *Field Test*
Biochemical Oxygen Demand (5-Day) (mg/L)
Total Suspended Solids (mg/L)
Oil and Grease (mg/L)
Alkalinity (mg/L)

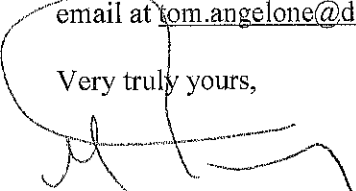
4. Corrective Action – Corrective action must be taken as soon as practicable following receipt of monitoring results which indicate that system modifications or maintenance is required. The system must be resampled no sooner than seven (7) days after any adjustment is made to the system and within thirty (30) days of the routine quarterly sample date. Samples must be analyzed for each of the parameters listed in Item 3 for any post corrective action sampling events.
5. Annual Report – All monitoring results including wastewater flow data shall be submitted to the DEM in the form of an annual report. The annual report is due **February 15th** of each year. The annual report must summarize all monitoring results and corrective actions implemented during the previous calendar year. A clear determination regarding the compliance status of the OWTS must be made as part of the annual report. The annual report must include a copy of the most recent Operation and Maintenance Contract as proof of compliance with this requirement.
6. The Permittee shall properly operate and maintain all facilities and equipment associated with the OWTS in accordance with the most recent operation and maintenance (O&M) plan. The O&M plan specifies procedures for operation, process control, record keeping, monitoring, weekly maintenance checks, other routine and periodic maintenance, safety and security. Also, the O&M plan includes a contingency plan to address emergency actions and procedures in the event of equipment failure and power loss.
7. Your permit approval is for the discharge of sanitary waste only. No toxic, hazardous or industrial processing waste may be discharged into the system.
8. All septage, sludges, screenings or other pollutants removed from the system shall be disposed in accordance with all applicable state and federal laws.
9. The permit may be automatically transferred by the Permittee to a new owner provided:
 - a. The current Permittee notifies the DEM by certified mail at least thirty (30) days in advance of the proposed transfer date;
 - b. The notice includes the name and address of the new Permittee and a written agreement between the existing and new Permittee containing a specific date for the transfer of permit responsibility, surety and liability between them and;
 - c. The DEM does not notify the existing Permittee and the proposed new Permittee of its intent to modify or reissue the permit.
10. The operator or person in responsible charge of the OWTS shall have at a minimum a Rhode Island Class 1 Wastewater Treatment Plant Operator Certification or an equivalent certification from another jurisdiction acceptable to the DEM. If the operator is not employed directly by the Permittee, a service agreement with the operator shall be entered into and continuously maintained, and a copy of the active service agreement shall be submitted to the DEM as part of the annual report.
11. The permit may be modified, suspended, or revoked for cause. The DEM reserves the right to revise the permit to ensure compliance with applicable state and federal regulations. Failure to comply with the conditions of this permit approval letter may result in an enforcement action.

12. The Permittee shall allow the DEM or their authorized representative to access the OWTS and work areas to inspect equipment, practices, records pertinent to this permit and stipulated compliance requirements, and to sample and monitor the wastewater for the purposes of determining compliance.
13. In the event of treatment interruption, bypass or sewage overflow, the Permittee shall notify the DEM verbally within twenty-four (24) hours. Such incident shall be reported in writing within five (5) days after it becomes known to the Permittee, the report shall include the date and time(s) of the incident, the duration of the incident, and actions taken to correct the problem and prevent a reoccurrence.
14. For purposes of notification, monitoring, compliance or inquiries pursuant to this permit, all correspondence, telephone calls and other contacts must reference the OWTS permit number and shall be directed to:

The Rhode Island Department of Environmental Management
Onsite Wastewater Treatment Systems Program
235 Promenade Street
Providence, RI 02908
Telephone: (401) 222-3961
www.dem.ri.gov/septic

Should you have any questions concerning these permit requirements, please contact Tom Angelone by email at tom.angelone@dem.ri.gov or by phone at 401-222-3961, extension 2777607.

Very truly yours,



Mohamed J. Freij, P.E., PLS
Supervising Sanitary Engineer

KF

Enclosure(s)

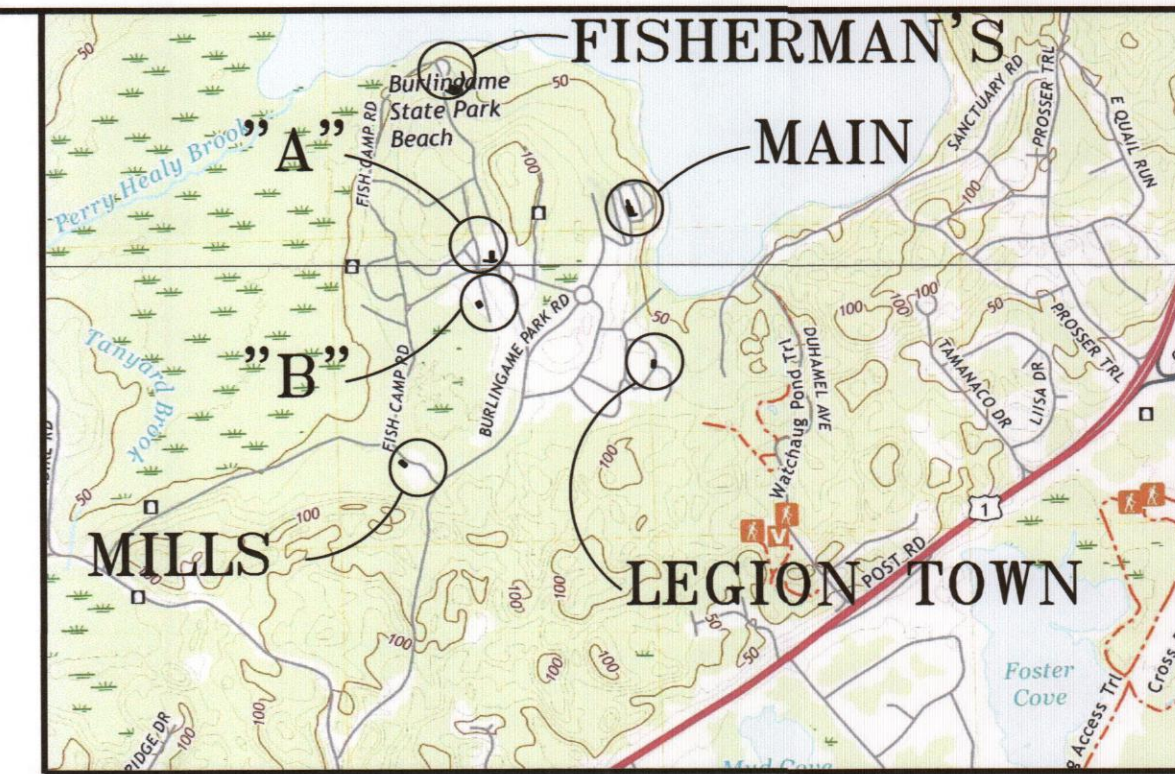
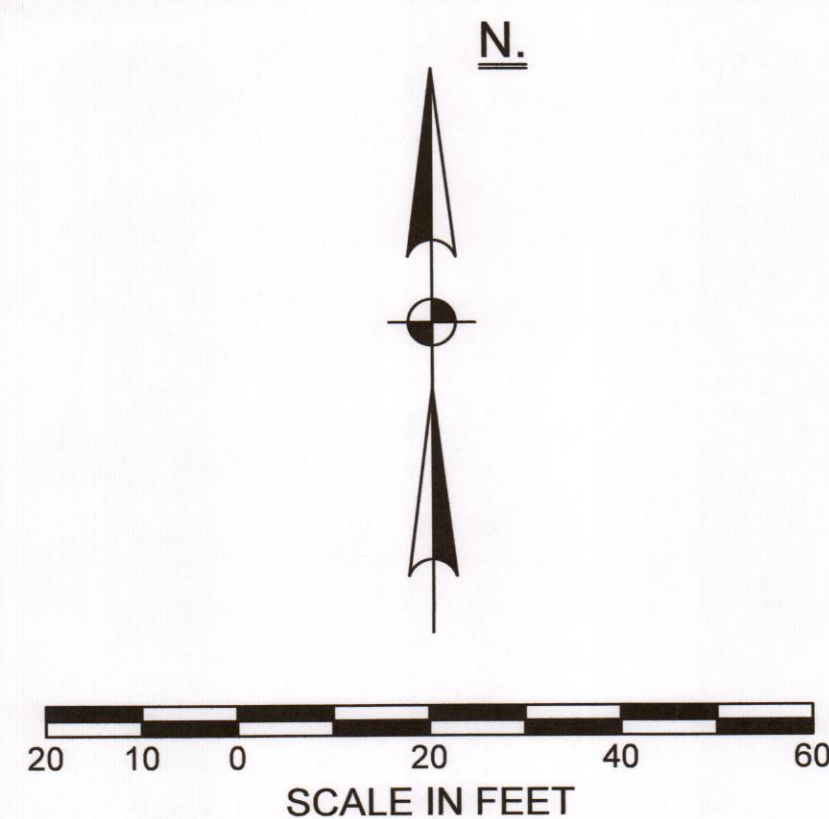
cc: Joseph L. Warner Jr., Charlestown Building Official

TH-3A - GROUND ELEV: 89.3 - AUGUST 17, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 1"	C	S	2.5YR 6/3			Lo	2gbd	Wfr	3
Bw	7" - 36"	C	W	10YR 5/6			Lo	2gbd	Fr	3
C	36" - 120"	C	S	2.5YR 7/3			Lo	2gbd	Fr	3

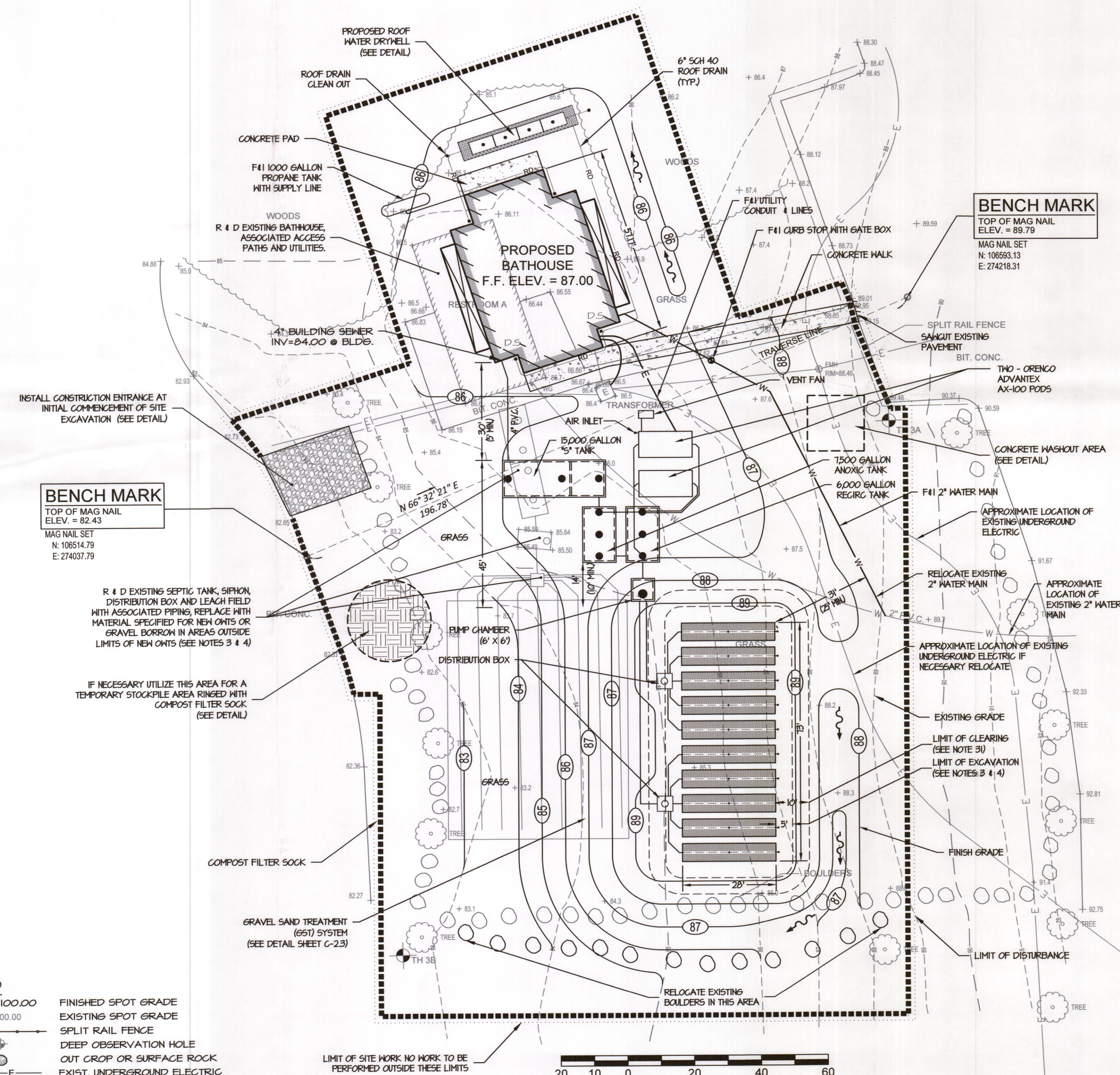
SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV: 79.3) PERFORMED BY: KAMAL HINGORANY

TH-3B - GROUND ELEV: 82.7 - AUGUST 17, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 6"	C	S	2.5YR 6/3			Lo	2gbd	Wfr	3
Bw	7" - 24"	C	W	10YR 5/6			Lo	2gbd	Fr	3
C1	24" - 28"	C	S	2.5YR 7/3			Lo	2gbd	Fr	3
C2	28" - 120"	-	-	2.5YR 7/3			Lo	2gbd	Fr	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 24" (ELEV: 80.7) PERFORMED BY: KAMAL HINGORANY



LOCUS MAP



NOTES:

- ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, OFFICE OF WATER RESOURCES 'RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION AND MAINTENANCE OF ONSITE WASTEWATER TREATMENT SYSTEMS', LATEST EDITION.
- THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL OF ALL PROPOSED CONSTRUCTION MATERIALS AND EQUIPMENT PRIOR TO ANY CONSTRUCTION.
- EXISTING ONSITE WASTEWATER TREATMENT SYSTEM (OWTS) PRECAST STRUCTURES ARE TO BE PUMPED OUT, RINSED WITH CLEAN WATER AND PUMPED OUT AGAIN. PUMPING MUST BE PERFORMED BY A STATE LICENSED SEPTIC HAULER AND THE CONTENTS OF THE TANK DISPOSED OF PROPERLY. AFTER PUMPING, THE EXISTING OWTS STRUCTURES MUST BE FILLED WITH FLOWABLE FILL OR REMOVED AND REPLACED WITH GRAVEL, BORROW AND 4" LOAM AND SEED.
- REMOVE ALL PORTIONS OF THE EXISTING OWTS WITHIN 5' OF THE GRAVEL SAND TREATMENT SYSTEM AND ALL FILL, A HORIZON SOIL, B HORIZON SOIL AND SCARIFY 3" OF THE C HORIZON SOIL BELOW THE GRAVEL SAND TREATMENT SYSTEM AND THOROUGHLY MIX WITH ASTM C-33 SAND (SEE NOTE 16) TO INTERFACE THE FILL WITH THE SOIL, AND REPLACE ALL REMOVED SOIL WITH ASTM C-33 SAND, A AND B SOIL HORIZON LAYERS ARE TO BE REMOVED IN THIS APPLICATION DUE TO COMPACTION CAUSED BY PREVIOUS SYSTEM INSTALLATION AND FILL BEING PLACED ABOVE.
- UNSATURABLE MATERIAL USED TO BACKFILL THE TEST HOLES SHALL BE REMOVED AND REPLACED WITH WITH ASTM C-33 SAND (SEE NOTE 16).
- ASTM C-33 SAND (SEE NOTE 16) MUST BE PLACED ON SCARIFIED, RELATIVELY DRY NATURAL SOIL. THE CONTRACTOR SHALL PROVIDE FOR DOWATERING AS REQUIRED AND ALL WORK SHALL BE PERFORMED UNDER DRY CONDITIONS.
- BUILDING SEWER PIPE TO BE 4" P. V. C. SCH. 40 UNLESS OTHERWISE NOTED.
- PLACE 6" MINIMUM COMPACTED CRUSHED STONE UNDER SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER, ADVANTEX TREATMENT TANKS AND SYSTEM STRUCTURES.
- INLET AND OUTLET TEES FOR SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK AND PUMP CHAMBER ARE TO BE LOCATED DIRECTLY BELOW ACCESS COVERS.
- SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
- IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION. IF IN DOUBT, ASK.
- NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6.27.
- INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
- IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
- MINIMUM PERIMETER INVERT ELEVATION = 86.50. NO FINISHED GRADE BELOW 86.50 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM.
- THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL DELIVERED TO THE SITE IS REQUIRED.
- OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEX PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEX INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL, AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
- INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEX INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR150-4. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEM LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE VENDORS TO INSTALL THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
- REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY AN INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEX TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
- THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-4.7 OF THE "REGULATIONS". FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE SYSTEM COMPONENTS FOR OBSERVATION.
- THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
- CONTRACTOR SHALL CONTACT "DIG-SAFE" PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
- THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
- NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
- I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
- ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO BE WATER TIGHT.
- PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR POCKETS.
- CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
- CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION, EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
- THE PUMP DOSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTORS RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOWS.
- ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
- THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STAKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
- NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
- MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
OWTS PROGRAM
PLAN # 2025-1138 DATE 3/15/23
APPROVED: [Signature] DATE 3/15/23
NO CHANGES ALLOWED WITHOUT PRIOR APPROVAL
APPROVED PLANS MUST BE KEPT AT CONSTRUCTION SITE

Copy of permit and approval
Maintenance contract must be filed in hand evidence record
after construction

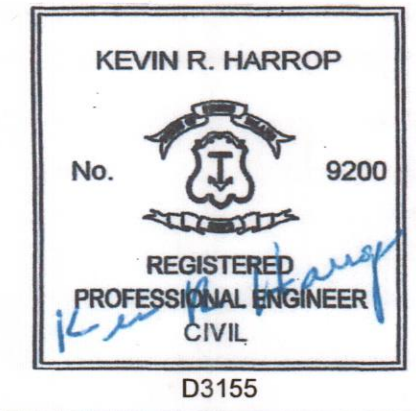
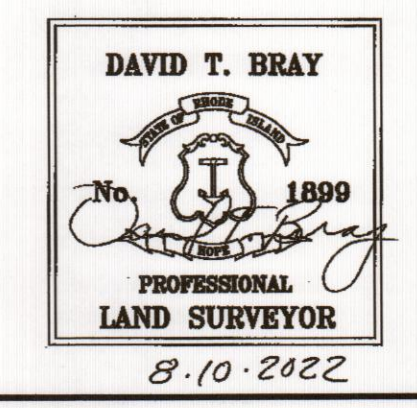
DESIGN DATA

DAILY SEWAGE FLOW:
50 GPD/CAMPSITE x 150 CAMPSITES = 7500 GALLONS PER DAY (G.P.D.)
GROUND WATER TABLE: 120"
DEPTH TO IMPERVIOUS: NOT ENCOUNTERED
SOIL CLASS: B, SOIL CATEGORY: 3, LOADING RATE: 0.70 GALS./S.F./DAY
SEPTIC TANK REQUIREMENTS VOLUME = 2 X 7,500 G.P.D. = 15,000 GALLONS
LEACHING AREA REQUIREMENTS:
GRAVEL SAND TREATMENT (GST) SYSTEM WITH CATEGORY 1 TREATMENT (ORENCO ADVANTEX TREATMENT AX100)
ASSIGNED EFFLUENT LOADING RATE = 3.5 GPD PER S. F.
SQUARE FOOTAGE OF GST REQUIRED = 7500 GPD / 3.5 GPD PER S.F. = 2,143 S.F.
LENGTH OF GST 6212 REQUIRED = 2,143 S.F. / 17.5 S.F./L.F. = 123 L.F.
LENGTH OF GST 6212 SPECIFIED: 280 L.F.
TOTAL GST SYSTEM CAPACITY = 280 L.F. X 17.5 S.F./L.F. X 3.5 G.P.D./S.F. = 17,150 GPD
17,150 GPD > 7,500 GPD - CAPACITY = 229% OF ANTICIPATED DESIGN FLOW

Environmental Management
MAR - 8 2023
Office of Water Resources

CERTIFICATION:

THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 8 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2016, AS FOLLOWS:
TYPE OF BOUNDARY SURVEY: LIMITED CENTER BOUNDARY SURVEY
MEASUREMENT SPECIFICATION: MET A BOUNDARY SURVEY
OTHER TYPE OF SURVEY: DATA ACCUMULATION SURVEY (LOCATIONS)
CLASS III
T-2 (IMMEDIATE AREA AROUND BATHHOUSE AND OWTS)
THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ONSITE WASTEWATER TREATMENT SYSTEM.
DAVID T. BRAY NO. 1899 DATE 3/10/2022
CAPUTO AND WICK LTD., COA NO. A177



SCALE IN FEET 20 10 0 20 40 60
CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

LEGEND

- 100 - EXISTING CONTOUR
- PROPOSED CONTOUR
- RI, STD. INV.
- P. V. C. S. D. R. CONC.
- BIT.
- TYP.
- + 100.00 FINISHED SPOT GRADE
- + 100.00 EXISTING SPOT GRADE
- SPLIT RAIL FENCE
- DEEP OBSERVATION HOLE
- OUT CROP OR SURFACE ROCK
- EXIST. UNDERGROUND ELECTRIC
- EXIST. WATER
- EXIST. UNDERGROUND TELEPHONE
- FINISH GRADE SURFACE FLOW DIRECTION

BURLINGAME STATE PARK AND CAMPGROUND

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

BATHHOUSE "A" - SITE PLAN

Dwg: Contract No. x Scale: 1" = 20' Date: MARCH, 2023

C-1.3 11

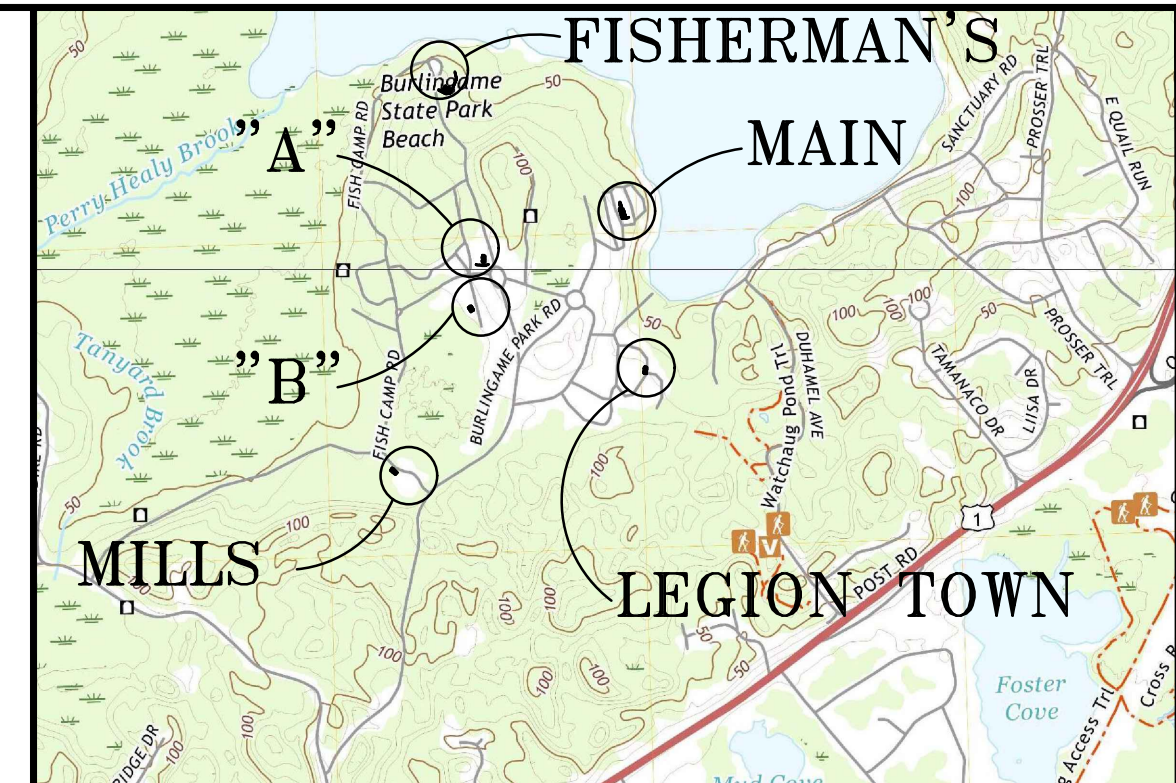
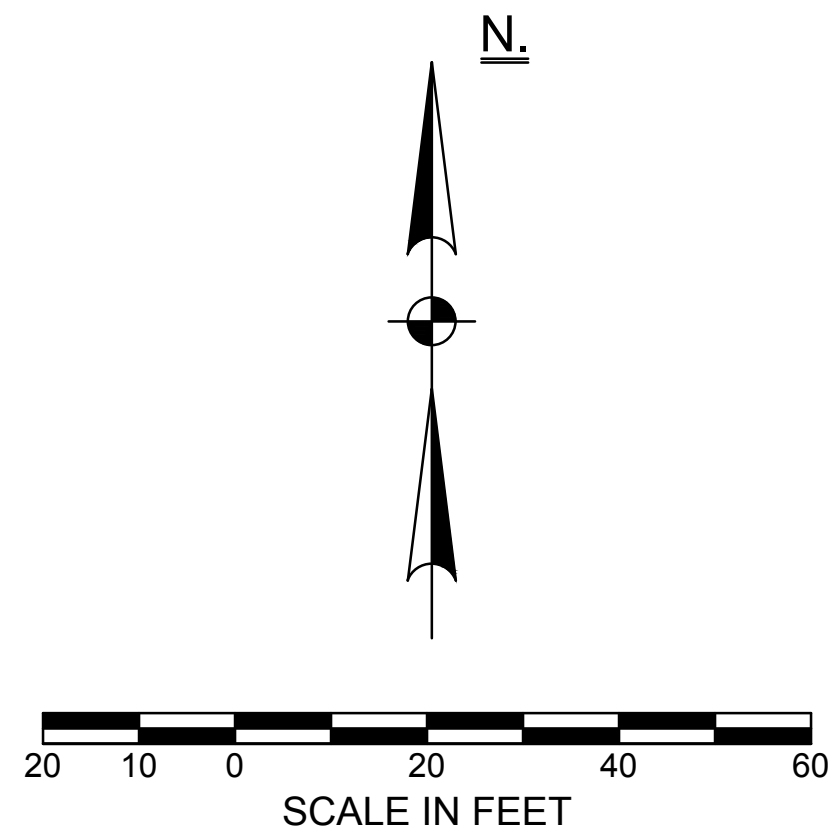
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TH-3A - GROUND ELEV: 89.3 - AUGUST 17, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
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B _w	7" - 36"	C	W	10YR 5/6			La	2gbd	Fr	3
C	36" - 120"	C	S	2.5YR 7/3			La	2gbd	Fr	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV: 79.3) PERFORMED BY: KAMAL HINGORARY

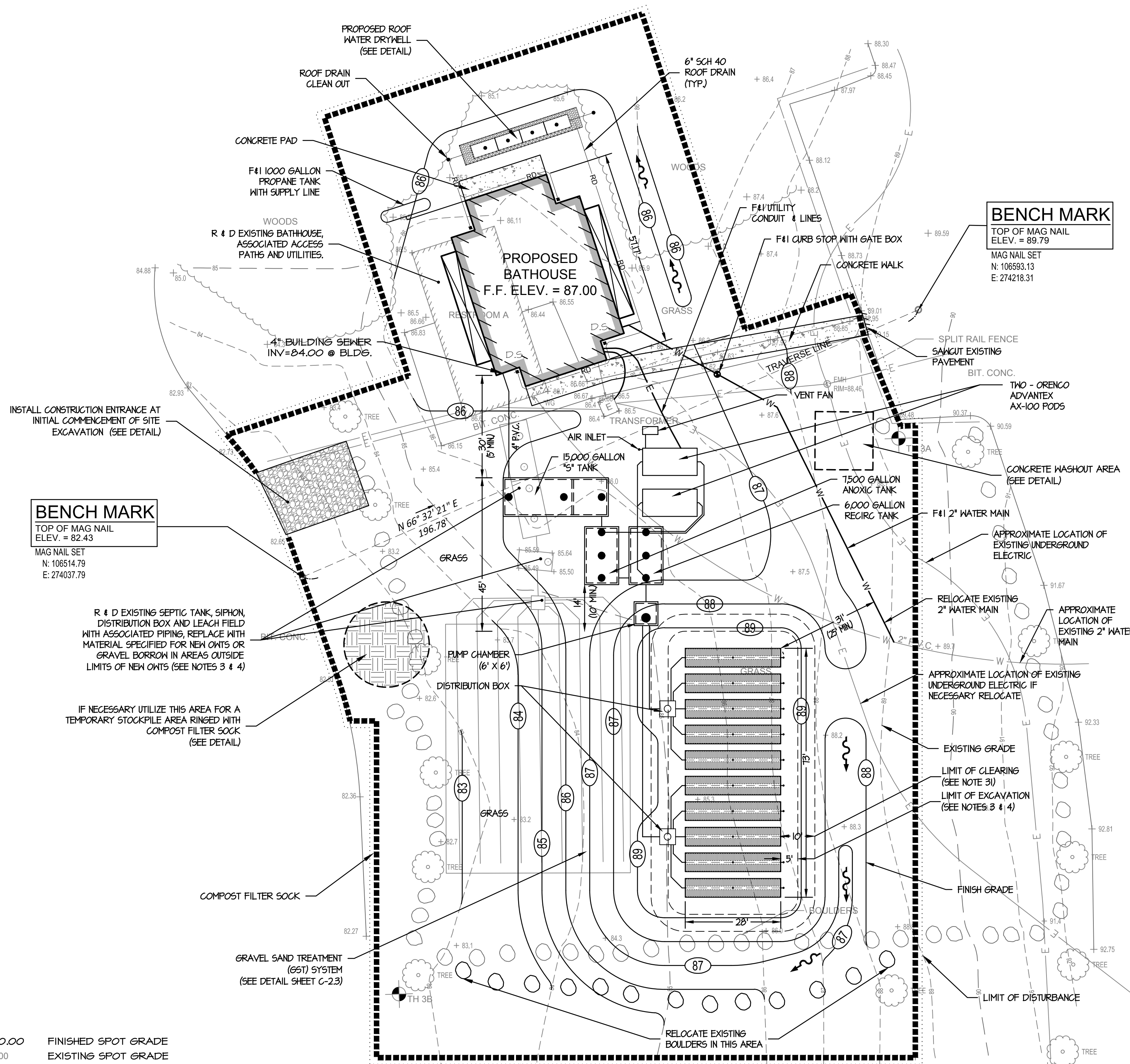
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SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
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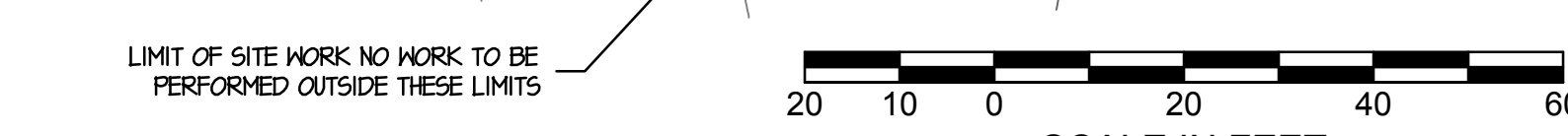
LOCUS MAP

- NOTES:**
- ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, OFFICE OF WATER RESOURCES "RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION AND MAINTENANCE OF ONSITE WASTEWATER TREATMENT SYSTEMS", LATEST EDITION.
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 - REMOVE ALL PORTIONS OF THE EXISTING OWTS WITHIN 5' OF THE GRAVEL SAND TREATMENT SYSTEM, AND ALL FILL, A HORIZON SOIL, B HORIZON SOIL AND SCARIFY 3" OF THE C HORIZON SOIL BELOW THE GRAVEL SAND TREATMENT SYSTEM AND THOROUGHLY MIX WITH ASTM C-33 SAND (SEE NOTE 16) TO INTERFACE THE FILL WITH THE SOIL, AND REPLACE ALL REMOVED SOIL WITH ASTM C-33 SAND. A AND B SOIL HORIZON LAYERS ARE TO BE REMOVED IN THIS APPLICATION DUE TO COMPACTION CAUSED BY PREVIOUS SYSTEM INSTALLATION AND FILL BEING PLACED ABOVE.
 - UNSATURABLE MATERIAL USED TO BACKFILL THE TEST HOLES SHALL BE REMOVED AND REPLACED WITH WITH ASTM C-33 SAND (SEE NOTE 16).
 - ASTM C-33 SAND (SEE NOTE 16) MUST BE PLACED ON SCARIFIED, RELATIVELY DRY NATURAL SOIL. THE CONTRACTOR SHALL PROVIDE FOR DEWATERING AS REQUIRED AND ALL WORK SHALL BE PERFORMED UNDER DRY CONDITIONS.
 - BUILDING SEWER PIPE TO BE 4" P. C. SCH. 40 UNLESS OTHERWISE NOTED.
 - PLACE 6" MINIMUM COMPACTED CRUSHED STONE UNDER SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER, ADVANTEX TREATMENT TANKS AND SYSTEM STRUCTURES.
 - INLET AND OUTLET TEES FOR SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK AND PUMP CHAMBER ARE TO BE LOCATED DIRECTLY BELOW ACCESS COVERS.
 - SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
 - IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION, IF IN DOUBT, ASK.
 - NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6-27.
 - INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
 - IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
 - MINIMUM PERIMETER INVERT ELEVATION = 88.50. NO FINISHED GRADE BELOW 88.50 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM.
 - THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL, DELIVERED TO THE SITE IS REQUIRED.
 - OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEX PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEX INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL, AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
 - INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEX INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR150-6. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEM LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE VENDORS TO INSTALL THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
 - REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY AN INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEX TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
 - THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-4-7 OF THE "REGULATIONS". FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE THE SYSTEM COMPONENTS FOR OBSERVATION.
 - THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
 - CONTRACTOR SHALL CONTACT "DIG-SAFE" PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
 - THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
 - NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
 - I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
 - ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO WATER TIGHT.
 - PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR POCKET.
 - CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
 - CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION. EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
 - THE PUMP DOSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
 - ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
 - THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STACKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
 - NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
 - MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.



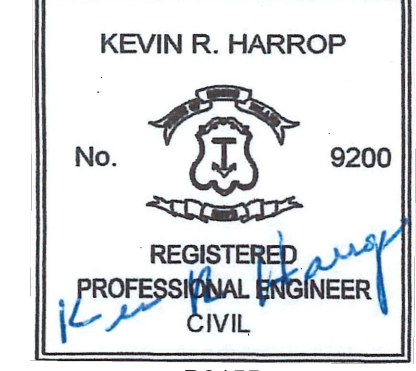
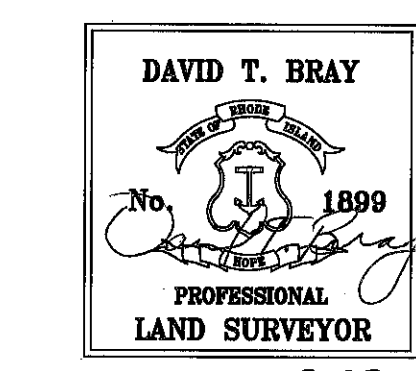
LEGEND

— 100 —	EXISTING CONTOUR	+ 100.00	FINISHED SPOT GRADE
— 100.00 —	PROPOSED CONTOUR	+ 100.00	EXISTING SPOT GRADE
RI, STD.	RHODE ISLAND STANDARD	—	SPLIT RAIL FENCE
INV.	INVERT OF PIPE	—	DEEP OBSERVATION HOLE
P. V. C.	POLYVINYL CHLORIDE PIPE	—	OUT CROP OR SURFACE ROCK
S. D. R.	STANDARD DIMENSION RATIO	— E —	EXIST. UNDERGROUND ELECTRIC
CONC.	CONCRETE	— W —	EXIST. WATER
BIT.	BITUMINOUS	— T —	EXIST. UNDERGROUND TELEPHONE
TYP.	TYPICAL	—	FINISH GRADE SURFACE FLOW DIRECTION



CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

CERTIFICATION:
THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 9 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2015, AS FOLLOWS:
TYPE OF BOUNDARY SURVEY: LIMITED CONTENT BOUNDARY SURVEY
MEASUREMENT SPECIFICATION: NOT A BOUNDARY SURVEY
OTHER TYPE OF SURVEY: DATA ACCUMULATION SURVEY (LOCATIONS)
CLASS II
TOPOGRAPHIC SURVEY ACCURACY: T2 (IMMEDIATE AREA AROUND BATHHOUSE AND OWTS)
THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ONSITE WASTEWATER TREATMENT SYSTEM.
David T. Bray 8/10/2022
DAVID T. BRAY PLS NO. 1899 DATE
CAPUTO AND WICK LTD., COA NO. A177



STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

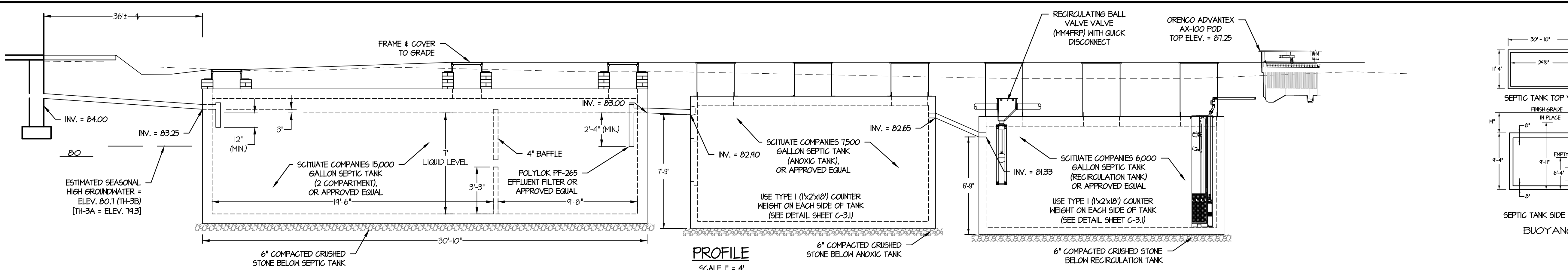
DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

BATHHOUSE "A" - SITE PLAN

Dwg: Scale: 1" = 20'
Contract No. x Date: MARCH, 2023
C-1.3
11

BURLINGAME STATE PARK AND CAMPGROUND

D:\RhodeIsland\Charlestown\RIDEM - Burlingame\009 - 025 - and S-6 Site Design\2023\03.06.dwg



VOLUMES

TOP SLAB: 11.83' WIDE X 30.03' LONG X 0.67' THICK = 232.96 C.F. (CUBIC FOOT)
 SIDES: 2 SIDES X 10.00' LONG X 8.00' HIGH X 0.67' WIDE = 106.67 C.F.
 BOTTOM: 11.83' WIDE X 30.03' LONG X 0.67' THICK = 232.96 C.F.
 Baffle: 12.00' LONG X 1.20' HIGH X 0.39' WIDE = 28.82 C.F.
 TOTAL VOLUME OF CONCRETE FOR TANK = 425.40 C.F.
 EARTH: 11.83' WIDE X 30.03' LONG X 1.50' THICK = 551.40 C.F.

CONSTANTS (HEIGHTS)

CONCRETE: 150 POUNDS/C.F.
 EARTH: 100 POUNDS/C.F.
 WATER: 62.4 POUNDS/C.F.
 CONCRETE HEIGHT: 22350.0 POUNDS (TYPE 2 - SEE SCHEDULE SHEET C-3J)

HEIGHT OF TANK IN PLACE

CONCRETE: 125.40 C.F. X 150 POUNDS/C.F. = 18810 POUNDS (EMPTY TANK)
 CONCRETE HEIGHT: 22350 POUNDS
 EARTH: 35160 C.F. X 100 POUNDS/C.F. = 35160 POUNDS (EARTH COVER)
 TOTAL HEIGHT OF TANK SET IN PLACE = 21630 POUNDS (EMPTY)

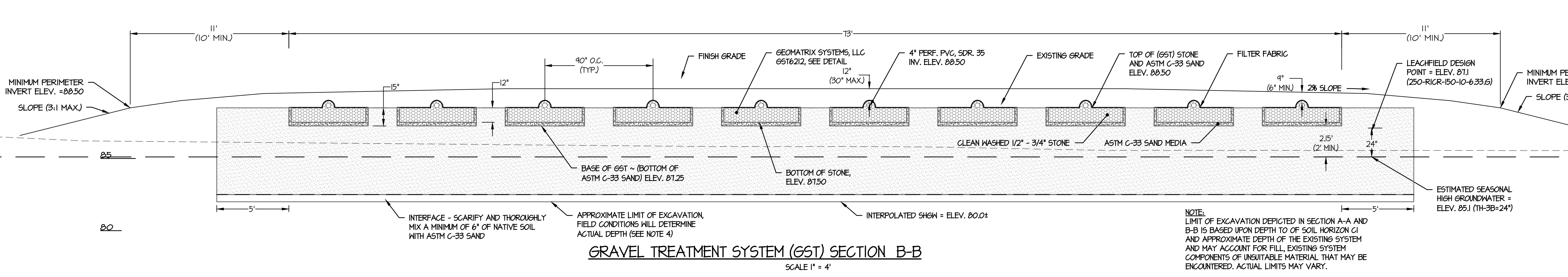
DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL

BOTTOM SLAB AREA: 11.83' WIDE X 30.03' LONG = 344.44 S.F. (SQUARE FEET)
 TANK: 344.44 S.F. X 62.4 POUNDS/S.F. = 21485 POUNDS (EMPTY TANK)
 BP = 18810 POUNDS + 62.4 POUNDS/S.F. X 344.44 S.F.
 BP = 6.37' - 6'-4" (ELEV. 81.10)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE

BP = 21630 POUNDS + 62.4 POUNDS/S.F. X 344.44 S.F.
 BP = 10.45' - 10'-1" (ELEV. 80.25)

BUOYANCY CALCULATIONS FOR 15,000 GALLON SEPTIC TANK
 MUST SET IN DRY CONDITIONS



VOLUMES

TOP SLAB: 10.00' WIDE X 17.00' LONG X 0.67' THICK = 113.33 C.F. (CUBIC FOOT)
 SIDES: 2 SIDES X 4.00' LONG X 8.00' HIGH X 0.50' WIDE = 12.00 C.F.
 BOTTOM: 10.00' WIDE X 17.00' LONG X 0.50' THICK = 85.00 C.F.
 TOTAL VOLUME OF CONCRETE FOR TANK = 406.33 C.F.
 EARTH: 10.00' WIDE X 17.00' LONG X 2.00' THICK = 370.00 C.F.

CONSTANTS (HEIGHTS)

CONCRETE: 150 POUNDS/C.F.
 EARTH: 100 POUNDS/C.F.
 WATER: 62.4 POUNDS/C.F.
 CONCRETE HEIGHT: 122644 POUNDS (TYPE 2 - SEE SCHEDULE SHEET C-3J)

HEIGHT OF TANK

CONCRETE: 406.33 C.F. X 150 POUNDS/C.F. = 60950 POUNDS (EMPTY TANK)
 CONCRETE HEIGHT: 37000 C.F. X 100 POUNDS/C.F. = 37000 POUNDS (EARTH COVER)
 TOTAL HEIGHT OF TANK SET IN PLACE = 102624 POUNDS (EMPTY)

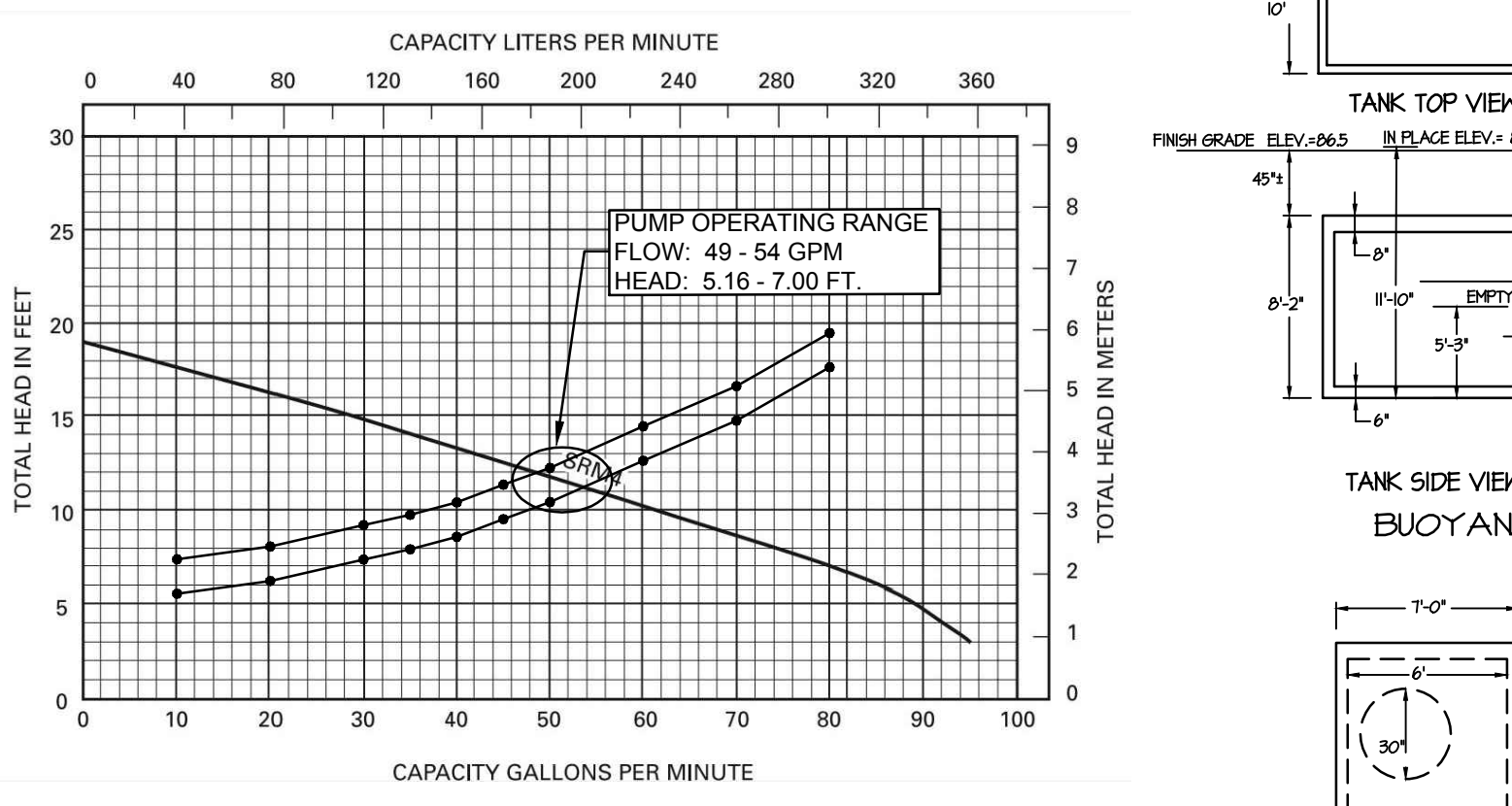
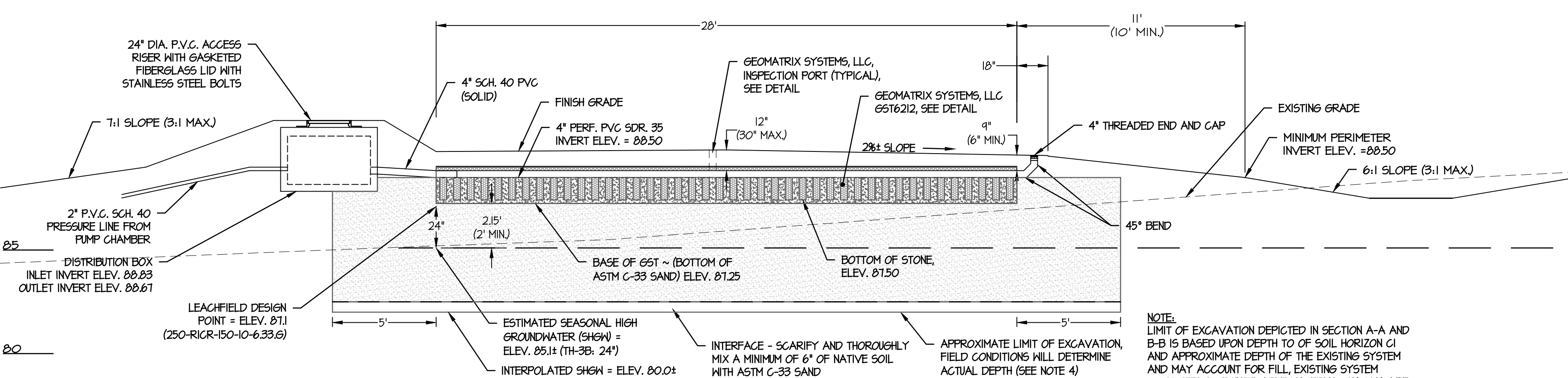
DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL

BOTTOM SLAB AREA: 10.00' WIDE X 17.00' LONG = 170.00 S.F. (SQUARE FEET)
 TANK: 170.00 S.F. X 62.4 POUNDS/S.F. = 10608 POUNDS (EMPTY TANK)
 BP = 60950 POUNDS + 62.4 POUNDS/S.F. X 170.00 S.F.
 BP = 5.75' - 5'-4" (ELEV. 80.40 - EMPTY TANK IS BUOYANT)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE

BP = 102624 POUNDS + 62.4 POUNDS/S.F. X 170.00 S.F.
 BP = 10.45' - 10'-1" (ELEV. 80.25)

BUOYANCY CALCULATIONS FOR 7500 ANOXIC TANK
 MUST SET IN DRY CONDITIONS



VOLUMES

TOP SLAB: 10.00' WIDE X 17.00' LONG X 0.67' THICK = 113.33 C.F. (CUBIC FOOT)
 SIDES: 2 SIDES X 4.00' LONG X 1.00' HIGH X 0.50' WIDE = 6.00 C.F.
 BOTTOM: 10.00' WIDE X 17.00' LONG X 0.50' THICK = 85.00 C.F.
 TOTAL VOLUME OF CONCRETE FOR TANK = 380.33 C.F.
 EARTH: 10.00' WIDE X 17.00' LONG X 3.75' THICK = 691.50 C.F.

CONSTANTS (HEIGHTS)

CONCRETE: 150 POUNDS/C.F.
 EARTH: 100 POUNDS/C.F.
 WATER: 62.4 POUNDS/C.F.
 CONCRETE HEIGHT: 57075 POUNDS (TYPE 1 - SEE SCHEDULE SHEET C-3J)

HEIGHT OF TANK AND EARTH COVER

CONCRETE: 380.33 C.F. X 150 POUNDS/C.F. = 57050 POUNDS (EMPTY TANK)
 CONCRETE HEIGHT: 69150 C.F. X 100 POUNDS/C.F. = 69150 POUNDS (EARTH COVER)
 TOTAL HEIGHT OF TANK SET IN PLACE = 127170 POUNDS (EMPTY)

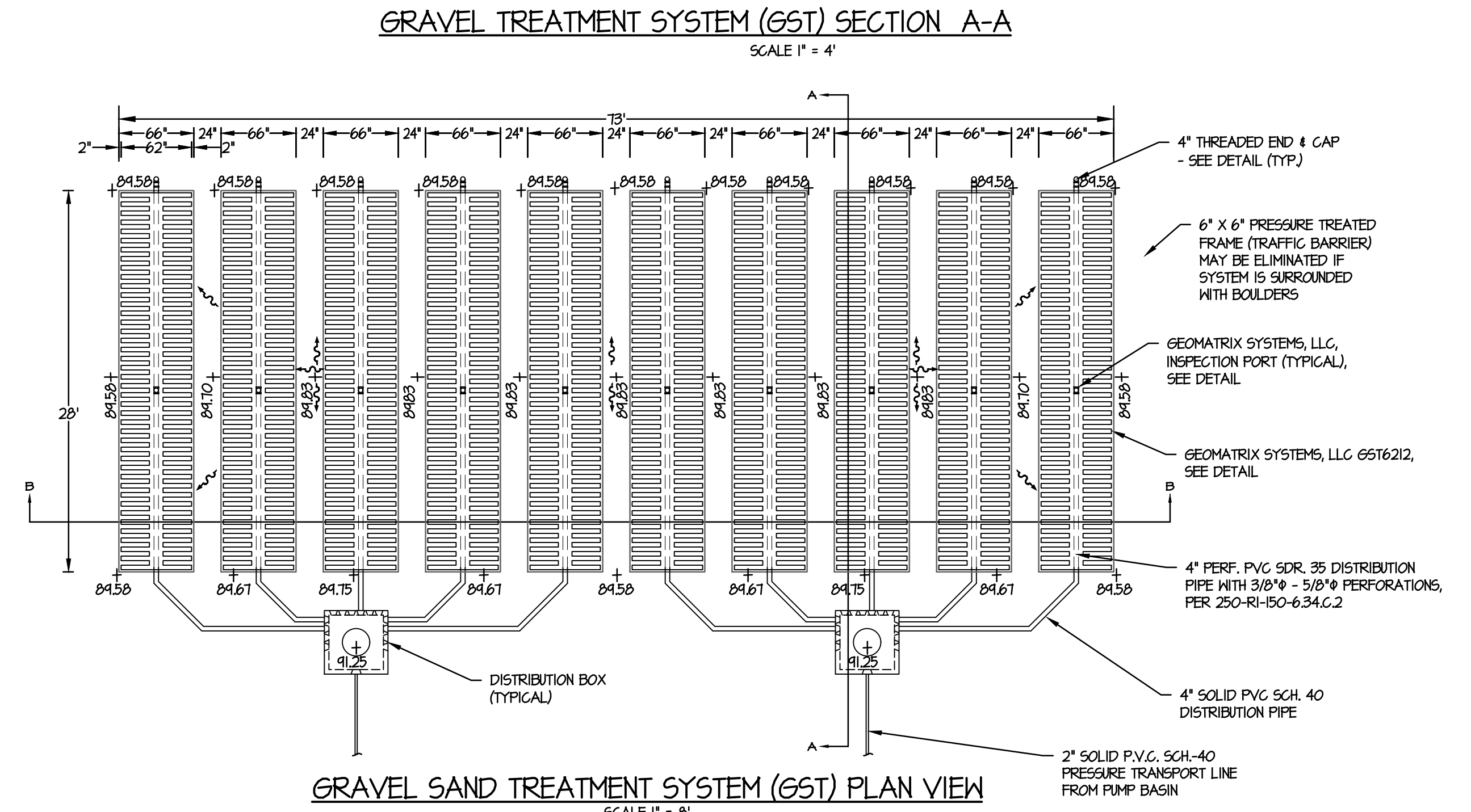
DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL

BOTTOM SLAB AREA: 10.00' WIDE X 17.00' LONG = 170.00 S.F. (SQUARE FEET)
 TANK: 170.00 S.F. X 62.4 POUNDS/S.F. = 10608 POUNDS (EMPTY TANK)
 BP = 57050 POUNDS + 62.4 POUNDS/S.F. X 170.00 S.F.
 BP = 5.37' - 5'-3" (ELEV. 79.85 - EMPTY TANK IS BUOYANT)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE

BP = 127170 POUNDS + 62.4 POUNDS/S.F. X 170.00 S.F.
 BP = 11.89' - 11'-9" (ELEV. 80.50)

BUOYANCY CALCULATIONS FOR 6000 RECIRCULATION TANK
 MUST SET IN DRY CONDITIONS



ELEVATION SCHEDULE

DESCRIPTION	ELEVATION
INVERT AT FOUNDATION - TO SEPTIC TANK	84.00
INVERT IN - SEPTIC TANK	83.25
LIQUID LEVEL IN SEPTIC TANK	83.00
INVERT IN - ANOXIC TANK	82.90
INVERT OUT - ANOXIC TANK	82.65
INVERT IN RECIRC. TANK	81.33
BOTTOM OF RECIRCULATION TANK	14.50
TOP OF ADVANTEX AX-100	81.25
INVERT OUT - RECIRCULATION TANK TO PUMP BASIN	83.25
INV. IN PUMP BASIN	83.00
TOP OF PUMP BASIN RIM	86.25
ELEVATION HIGH LEVEL ALARM/ALT. PUMP	81.23
ELEVATION PUMP ON	81.61
ELEVATION PUMP OFF	14.23
ELEVATION LOW LEVEL ALARM	14.61
INV. 2" OUT PUMP BASIN	83.25
BOTTOM OF PUMP BASIN	16.50
INVERT INTO DISTRIBUTION BOX	80.83
INVERT OUT OF DISTRIBUTION BOX	80.61
ELEV. TOP OF COVER STONE ABOVE DISTRIBUTION PIPE	84.00
INV. 4" PERF. DISTRIBUTION PIPE GST	80.50
BOTTOM OF GST STONE	81.50
BASE OF GST SAND	81.25
EST. SEASONAL HIGH GW (4" - HIGHEST ELEV. = 81.1)	80.10 (TH-3B)
MAX FINISHED GRADE AT GST	81.33
MIN FINISHED GRADE AT GST	84.33

PUMPING AND SYSTEM SPECIFICATIONS/DATA:

PUMP CHAMBER PUMP MODEL:
 MYERS SRM4 SUBMERSIBLE SEWAGE PUMP
 HORSEPOWER - 0.4; SINGLE PHASE
 2" INCH DISCHARGE; 230 VOLTS; 60 HZ 6 AMPS
 LIFT OUT (2)
 MYERS SRA 200 WITH STAINLESS STEEL BRACKETS
 CONTROL PANEL MODEL
 MYERS CE-210W ALTERNATING
 ENCLOSURE - NEMA 1 (NEMA 4X IF EXPOSED TO WEATHER)
 VOLTAGE - 230
 HIGH LEVEL ALARM - VISUAL AND AUDIO
 FLOATS MODEL
 MYERS MODEL 20VM S/E OR EQUAL

PUMP CHAMBER DISCHARGE VOLUME PER CYCLE:
 6" X 6" INTERIOR @ 1' - 10" = 66 CUBIC FEET X 4.8 GALLONS/CYCLE = 494 GAL./CYCLE
 2" PIPE DRAIN BACK: APPROXIMATELY 8 GAL.
 494 GALLONS/CYCLE - 8 GALLONS = 486 GAL./CYCLE
 7500 GPD/2 GST SYSTEMS = 3750 GPD/486 GAL./CYCLE = 7.7 - 8 CYCLES/DAY/GST

FLOATS - ON, OFF, HIGH AND LOW WATER:
 HIGH WATER - ELEVATION 81.63
 PUMP ON - ELEVATION 81.67
 PUMP OFF - ELEVATION 79.83
 LOW WATER - ELEVATION 79.67

ORENCO AX-100 TREATMENT SYSTEM DATA REVIEWED AND PROVIDED BY ATLANTIC SOLUTIONS (CONTROL PANEL - TIME DOSED)

GRAVEL SAND TREATMENT (GST) SYSTEM DATA REVIEWED BY GEOMATRIX SYSTEMS LLC.

AREAS

TOP: 17.0' X 17.0' = 44.1 S.F. (17' X 12.5' = 41.9 S.F.) = 44.04 S.F. (SQUARE FEET)

VOLUMES

TOP SLAB: 44.04 S.F. X 0.50' THICK = 22.02 C.F. (CUBIC FOOT)
 SIDES: 2 SIDES X 1.00' LONG X 1.00' HIGH X 0.50' THICK = 44.00 C.F.
 BOTTOM: 44.04 S.F. X 1.20' HIGH X 0.39' WIDE = 42.20 C.F.
 TOTAL VOLUME OF CONCRETE FOR TANK = 245.00 C.F.
 EARTH: 44.04 S.F. X 3.50' THICK = 154.14 C.F.

CONSTANTS (HEIGHTS)

CONCRETE: 150 POUNDS/C.F.
 EARTH: 100 POUNDS/C.F.
 WATER: 62.4 POUNDS/C.F.
 CONCRETE HEIGHT: 36750 POUNDS (TYPE 1 - SEE SCHEDULE SHEET C-3J)

HEIGHT OF TANK AND EARTH COVER

CONCRETE: 157.35 C.F. X 150 POUNDS/C.F. = 23603 POUNDS (EMPTY TANK)
 CONCRETE HEIGHT: 15414 C.F. X 100 POUNDS/C.F. = 15414 POUNDS (EARTH COVER)
 TOTAL HEIGHT OF TANK SET IN PLACE = 39017 POUNDS (EMPTY)

DETERMINE BUOYANCY POINT FOR EMPTY TANK PRIOR TO BACKFILL

BOTTOM SLAB AREA: 44.04 S.F. X 62.4 POUNDS/S.F. = 2748 S.F.
 CHAMBER: 44.04 S.F. X 62.4 POUNDS/S.F. = 2748 POUNDS (EMPTY TANK)
 BP = 23603 POUNDS + 62.4 POUNDS/S.F. X 44.04 S.F.
 BP = 6.75' - 6'-4" (ELEV. 83.25 - EMPTY CHAMBER IS BUOYANT)

DETERMINE BUOYANCY POINT FOR EMPTY TANK IN PLACE

BP = 39017 POUNDS + 62.4 POUNDS/S.F. X 44.04 S.F.
 BP = 12.12' - 12'-1" (ELEV. 84.20)

BUOYANCY CALCULATIONS FOR PUMP CHAMBER
 MUST SET IN DRY CONDITIONS

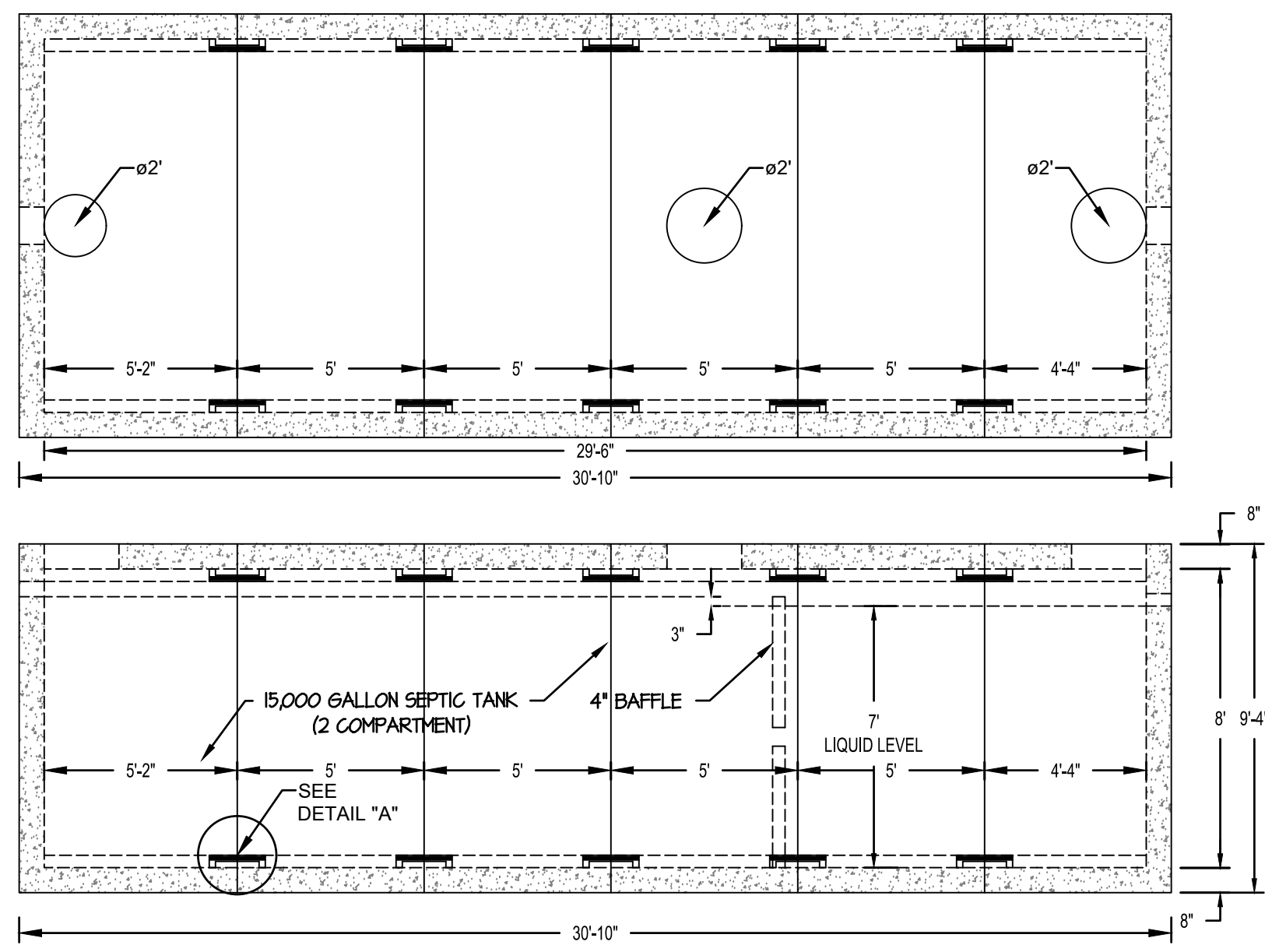
STATE OF RHODE ISLAND
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
 DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
 BURLINGAME STATE PARK AND CAMPGROUND
 CHARLESTOWN, RHODE ISLAND

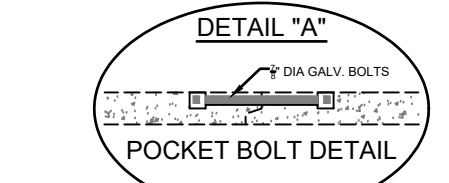
BATHHOUSE "A" - OWTS DETAILS

Dwg: _____ Scale: 1" = 20'
 Contract No. x _____ Date: MARCH, 2023

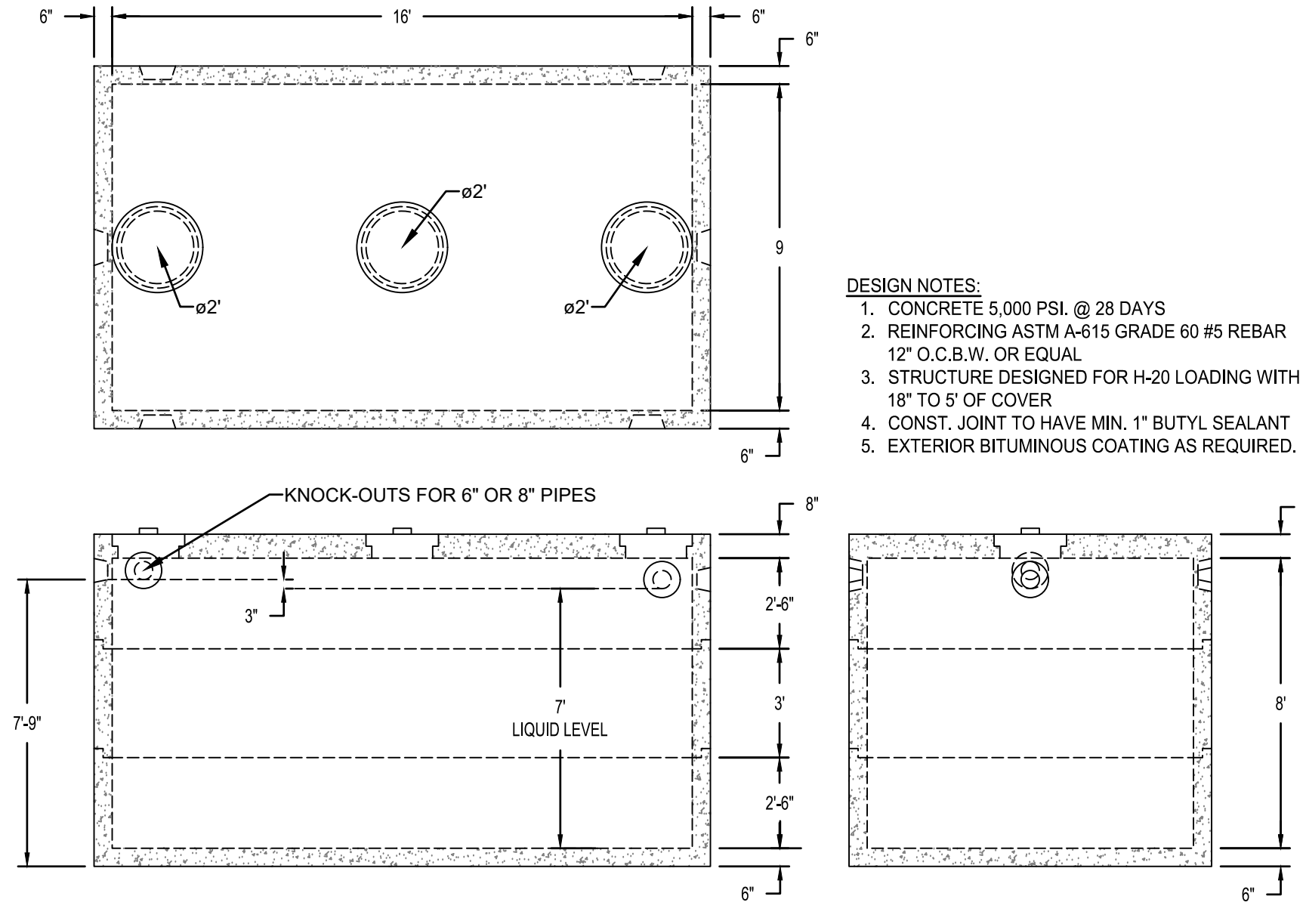
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15,000 GALLON TWO COMPARTMENT SEPTIC TANK
SCALE 1" = 4"

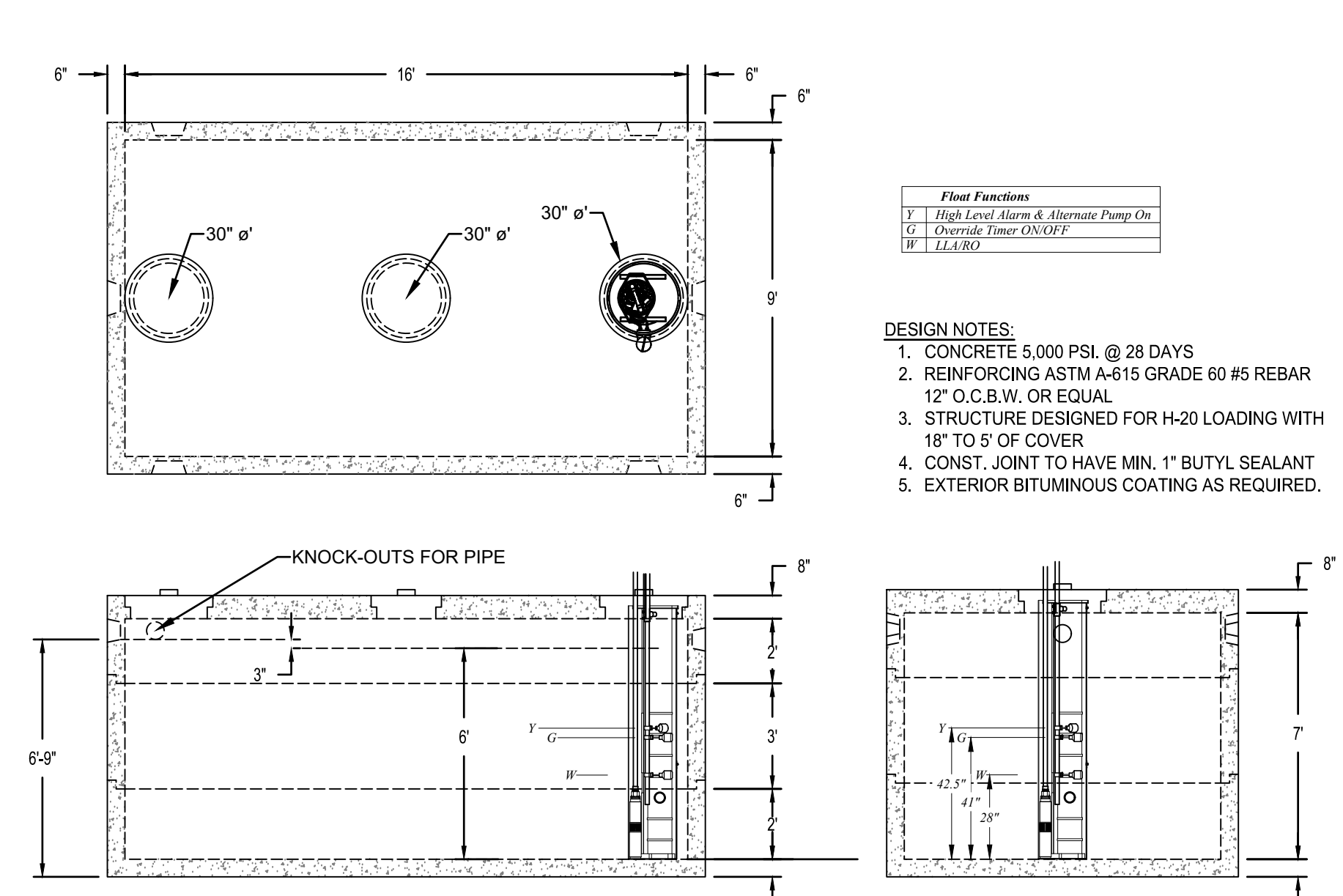


- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.



7,500 GALLON ANOXIC TANK
SCALE 1" = 4"

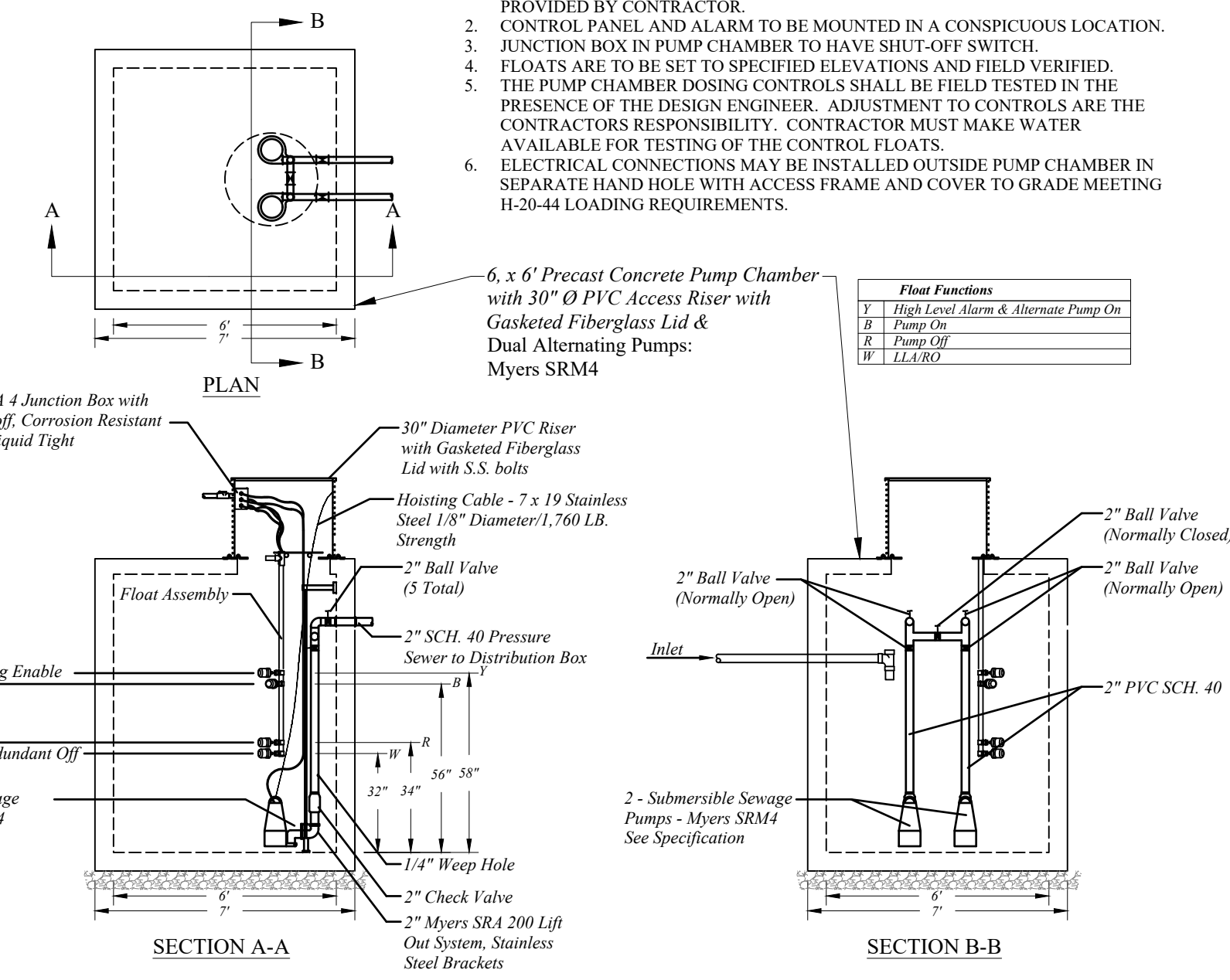
- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.



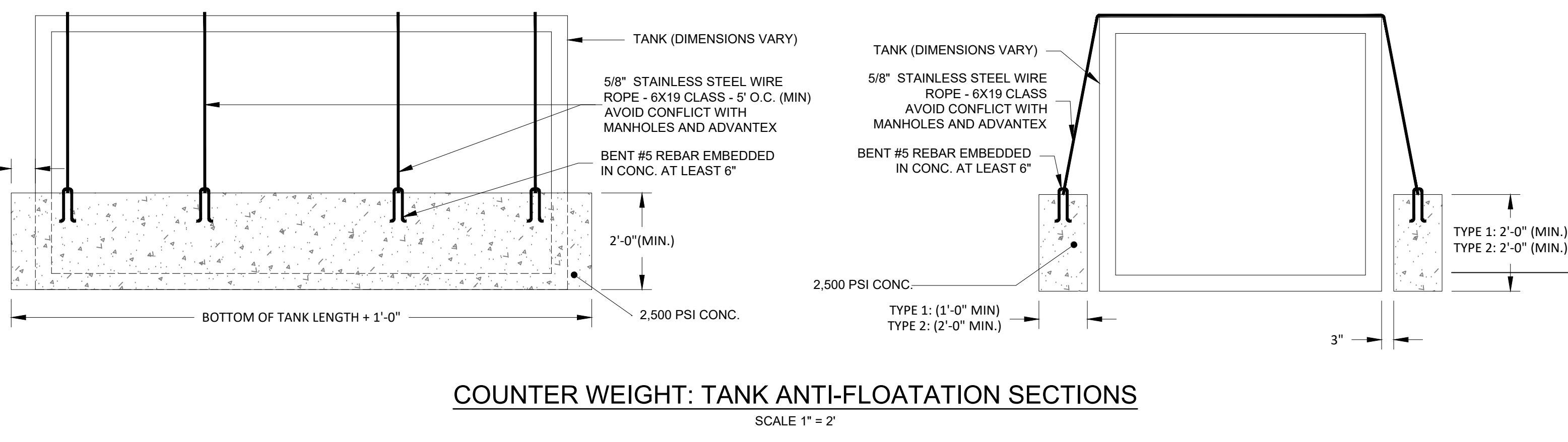
6,000 GALLON RECIRCULATION TANK
SCALE 1" = 4"

- Float Functions**
- | | |
|---|--------------------------------------|
| Y | High Level Alarm & Alternate Pump On |
| G | Overload Timer ON/OFF |
| W | LL/RR |
- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

- PUMPING NOTES:**
1. EQUIPMENT FROM OTHER MANUFACTURERS MAY BE USED IF EQUAL APPROVAL FOR ALTERNATE EQUIPMENT REQUIRED FROM ENGINEER PRIOR TO CONSTRUCTION. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY CONTRACTOR.
 2. CONTROL PANEL AND ALARM TO BE MOUNTED IN A CONSPICUOUS LOCATION.
 3. JUNCTION BOX IN PUMP CHAMBER TO HAVE SHUT-OFF SWITCH.
 4. FLOATS ARE TO BE SET TO SPECIFIED ELEVATIONS AND FIELD VERIFIED.
 5. THE PUMP CHAMBER DOSING CONTROLS SHALL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
 6. ELECTRICAL CONNECTIONS MAY BE INSTALLED OUTSIDE PUMP CHAMBER IN SEPARATE HAND HOLE WITH ACCESS FRAME AND COVER TO GRADE MEETING H-20-44 LOADING REQUIREMENTS.



PUMP CHAMBER DETAIL
SCALE 1" = 4"



COUNTER WEIGHT: TANK ANTI-FLOATATION SECTIONS
SCALE 1" = 2"

ANTI-FLOATATION AREA

16,000 GALLON TANK (TYPE 1) - 2 SIDES x 32.88' LONG x 1.00' WIDE	= 66.66 S.F.
15,000 GALLON TANK (TYPE 1) - 2 SIDES x 31.88' LONG x 1.00' WIDE	= 63.66 S.F.
15,000 GALLON TANK (TYPE 2) - 2 SIDES x 31.88' LONG x 2.00' WIDE	= 127.32 S.F.
8,000 GALLON TANK (TYPE 1) - 2 SIDES x 19.00' LONG x 1.00' WIDE	= 38 S.F.
8,000 GALLON TANK (TYPE 2) - 2 SIDES x 19.00' LONG x 2.00' WIDE	= 76 S.F.
7,500 GALLON TANK (TYPE 1) - 2 SIDES x 18.00' LONG x 1.00' WIDE	= 36 S.F.
7,500 GALLON TANK (TYPE 2) - 2 SIDES x 18.00' LONG x 2.00' WIDE	= 72 S.F.
6,000 GALLON TANK (TYPE 1) - 2 SIDES x 18.00' LONG x 1.00' WIDE	= 36 S.F.
6,000 GALLON TANK (TYPE 2) - 2 SIDES x 18.00' LONG x 2.00' WIDE	= 72 S.F.
PUMP CHAMBER (TYPE 1) - 2 SIDES x 8.00' LONG x 1.00' WIDE	= 16 S.F.
PUMP CHAMBER (TYPE 2) - 2 SIDES x 8.00' LONG x 2.00' WIDE	= 32 S.F.

ANTI-FLOATATION VOLUMES

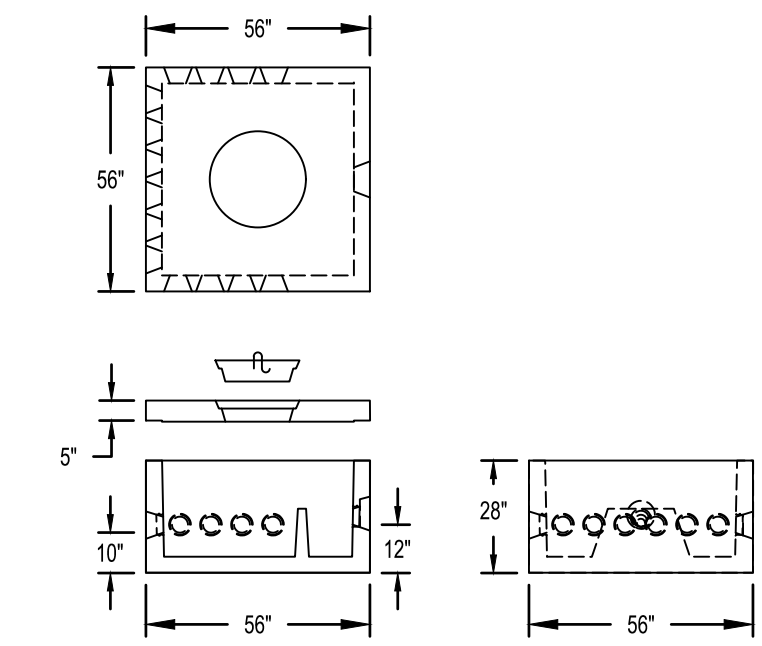
16,000 GALLON TANK (TYPE 1) - 66.66 S.F. x 2.00' HIGH	= 133.32 C.F.
16,000 GALLON TANK (TYPE 1) - 63.66 S.F. x 2.00' HIGH	= 127.32 C.F.
15,000 GALLON TANK (TYPE 2) - 127.32 S.F. x 2.00' HIGH	= 254.64 C.F.
8,000 GALLON TANK (TYPE 1) - 38 S.F. x 2.00' HIGH	= 76 C.F.
8,000 GALLON TANK (TYPE 2) - 76 S.F. x 2.00' HIGH	= 152 C.F.
7,500 GALLON TANK (TYPE 1) - 36 S.F. x 2.00' HIGH	= 72 C.F.
7,500 GALLON TANK (TYPE 2) - 72 S.F. x 2.00' HIGH	= 144 C.F.
6,000 GALLON TANK (TYPE 1) - 36 S.F. x 2.00' HIGH	= 72 C.F.
6,000 GALLON TANK (TYPE 2) - 72 S.F. x 2.00' HIGH	= 144 C.F.
PUMP CHAMBER (TYPE 1) - 16 S.F. x 2.00' HIGH	= 32 C.F.
PUMP CHAMBER (TYPE 2) - 32 S.F. x 2.00' HIGH	= 64 C.F.

CONSTANTS (WEIGHTS)

CONCRETE	150 POUNDS/C.F.
WATER	62.4 POUNDS/C.F.
SUBMERGED CONCRETE	87.6 POUNDS/C.F.

WEIGHT OF ANTI-FLOATATION IN PLACE

16,000 GALLON TANK (TYPE 1) - 133.32 C.F. x 87.6 POUNDS/C.F.	= 11,680 POUNDS
16,000 GALLON TANK (TYPE 1) - 127.32 C.F. x 87.6 POUNDS/C.F.	= 11,133 POUNDS
15,000 GALLON TANK (TYPE 2) - 254.64 C.F. x 87.6 POUNDS/C.F.	= 22,306 POUNDS
8,000 GALLON TANK (TYPE 1) - 76 C.F. x 87.6 POUNDS/C.F.	= 6,658 POUNDS
8,000 GALLON TANK (TYPE 2) - 152 C.F. x 87.6 POUNDS/C.F.	= 13,315 POUNDS
7,500 GALLON TANK (TYPE 1) - 72 C.F. x 87.6 POUNDS/C.F.	= 6,307 POUNDS
7,500 GALLON TANK (TYPE 2) - 144 C.F. x 87.6 POUNDS/C.F.	= 12,614 POUNDS
6,000 GALLON TANK (TYPE 1) - 72 C.F. x 87.6 POUNDS/C.F.	= 6,307 POUNDS
6,000 GALLON TANK (TYPE 2) - 144 C.F. x 87.6 POUNDS/C.F.	= 12,614 POUNDS
PUMP CHAMBER (TYPE 1) - 32 C.F. x 87.6 POUNDS/C.F.	= 2,803 POUNDS
PUMP CHAMBER (TYPE 2) - 64 C.F. x 87.6 POUNDS/C.F.	= 5,606 POUNDS



DISTRIBUTION BOX WITH 14 OUTLETS
SCALE 1" = 4"

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS PRECAST STRUCTURES DETAILS

Dwg: _____ Scale: 1" = 20'
Contract No. x _____ Date: FEBRUARY, 2023

C-3.1
21

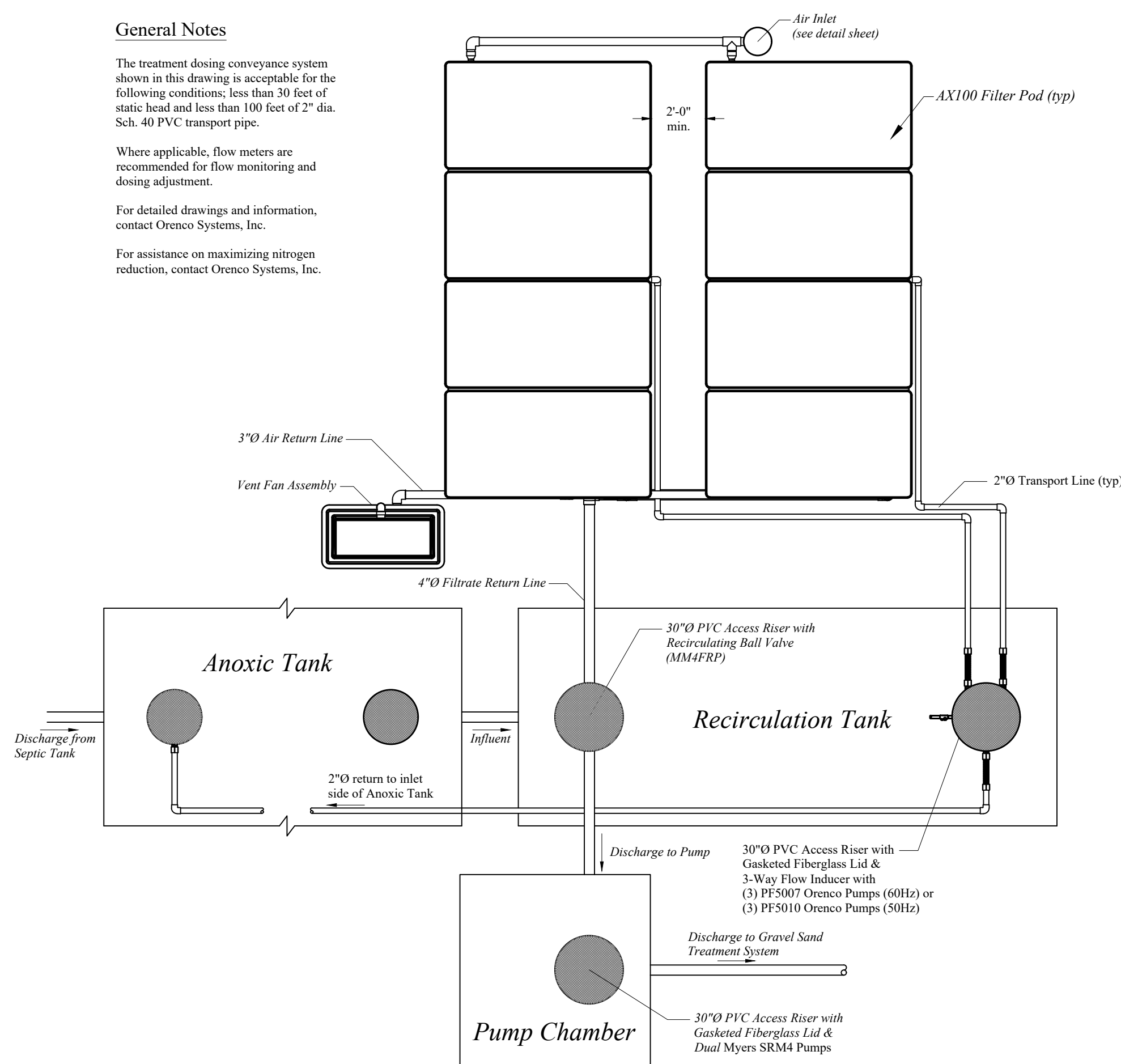
General Notes

The treatment dosing conveyance system shown in this drawing is acceptable for the following conditions: less than 30 feet of static head and less than 100 feet of 2" dia. Sch. 40 PVC transport pipe.

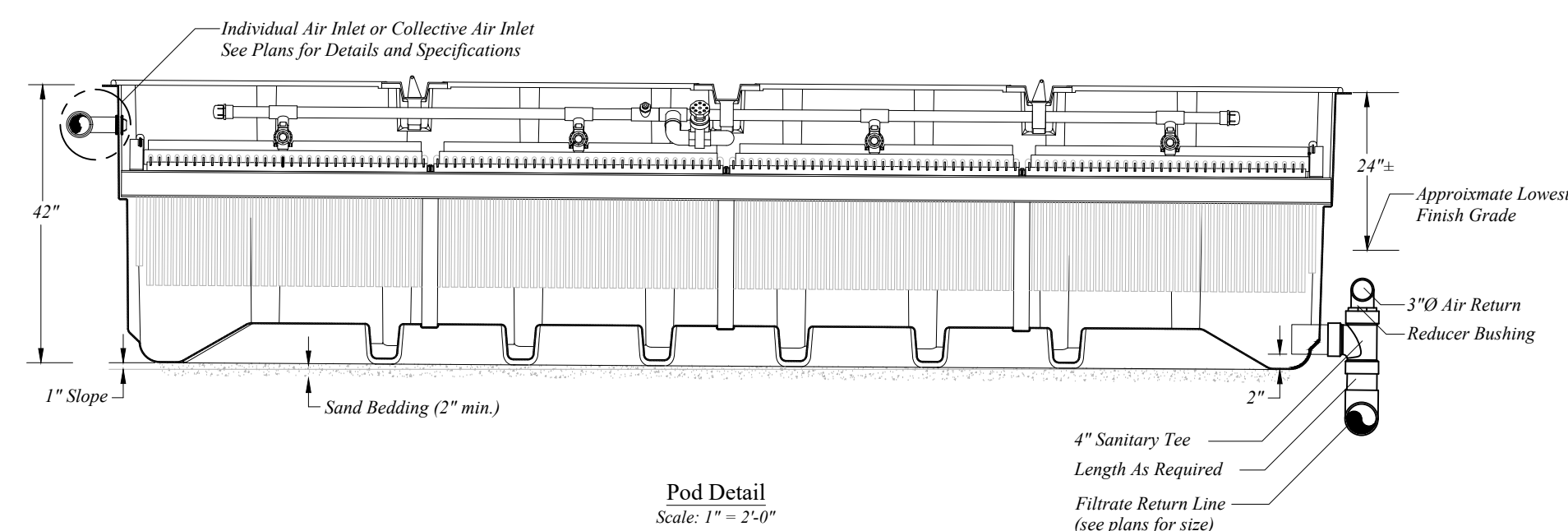
Where applicable, flow meters are recommended for flow monitoring and dosing adjustment.

For detailed drawings and information, contact Oresco Systems, Inc.

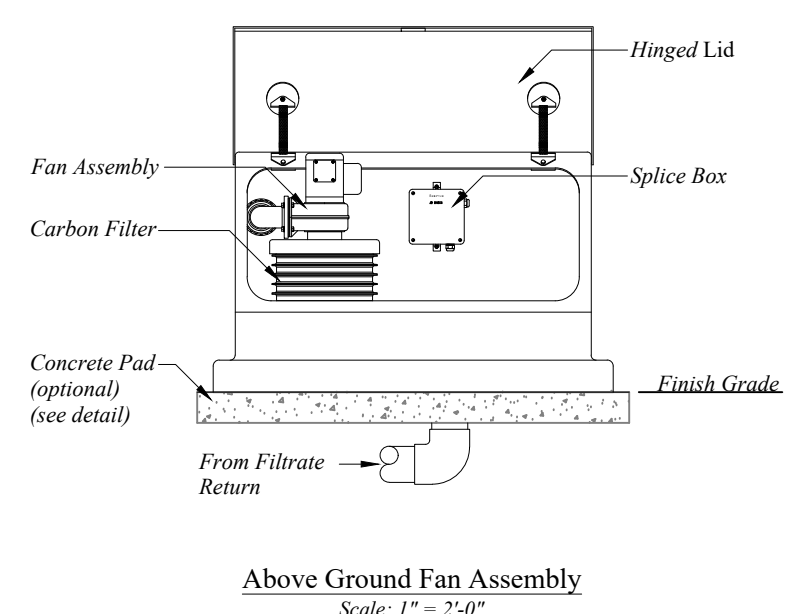
For assistance on maximizing nitrogen reduction, contact Oresco Systems, Inc.



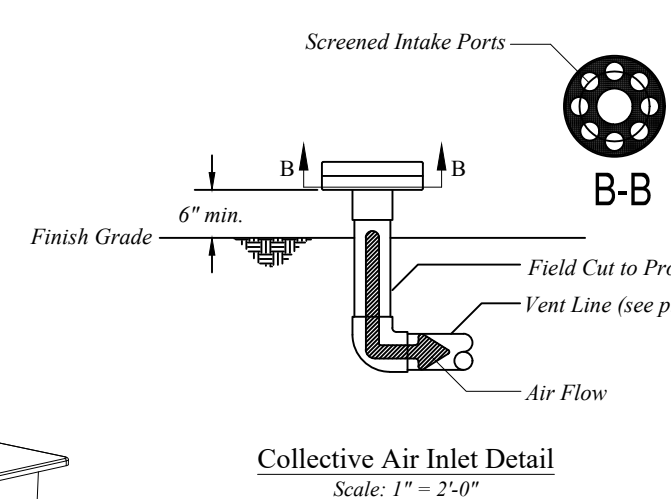
**AdvanTex AX100 SYSTEM - MANIFOLDED VENT INLET
2 POD CONFIGURATION**
SCALE 1" = 4'



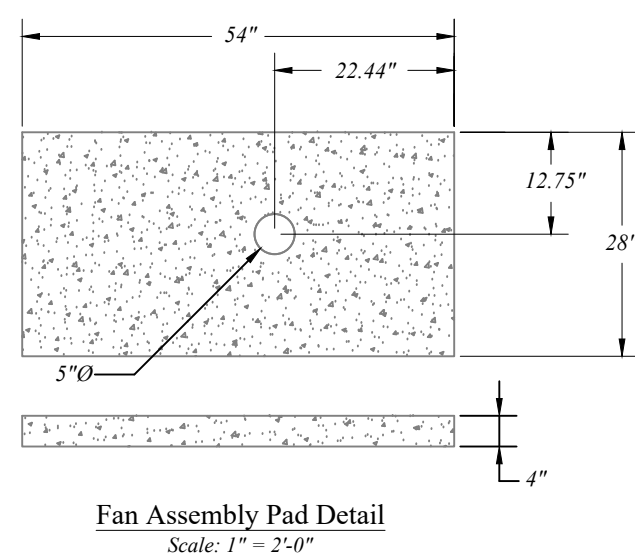
Pod Detail
Scale: 1" = 2'-0"



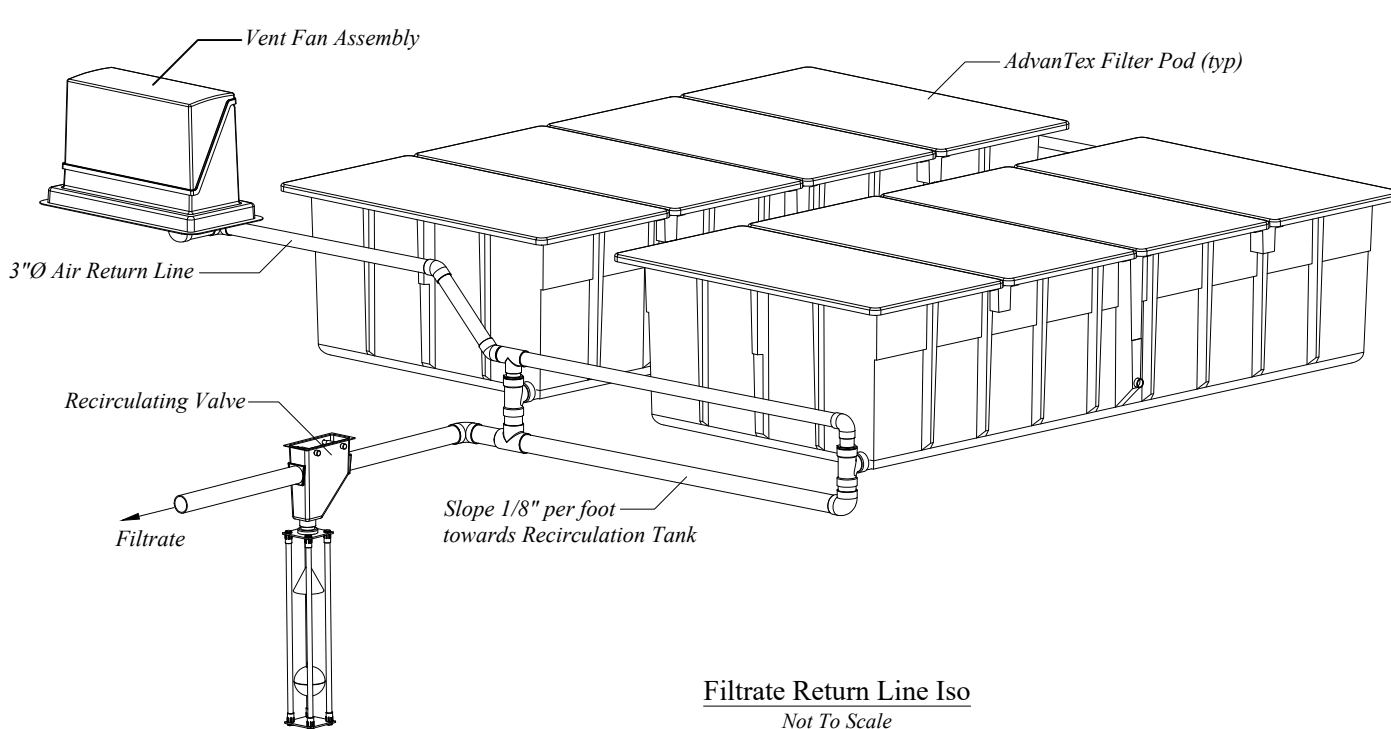
Above Ground Fan Assembly
Scale: 1" = 2'-0"



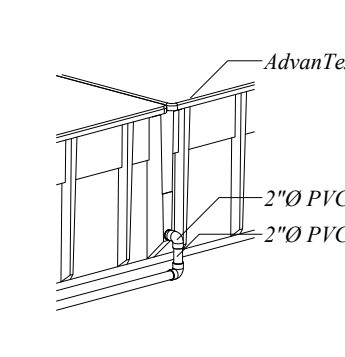
Collective Air Inlet Detail
Scale: 1" = 2'-0"



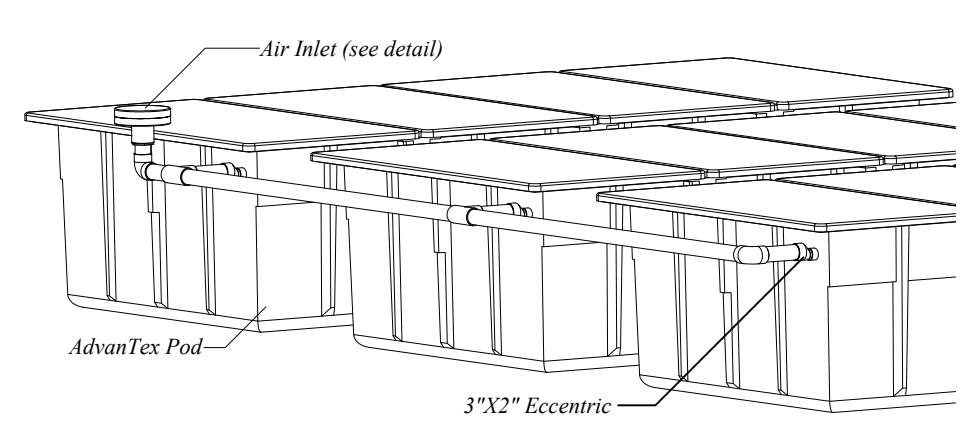
Fan Assembly Pad Detail
Scale: 1" = 2'-0"



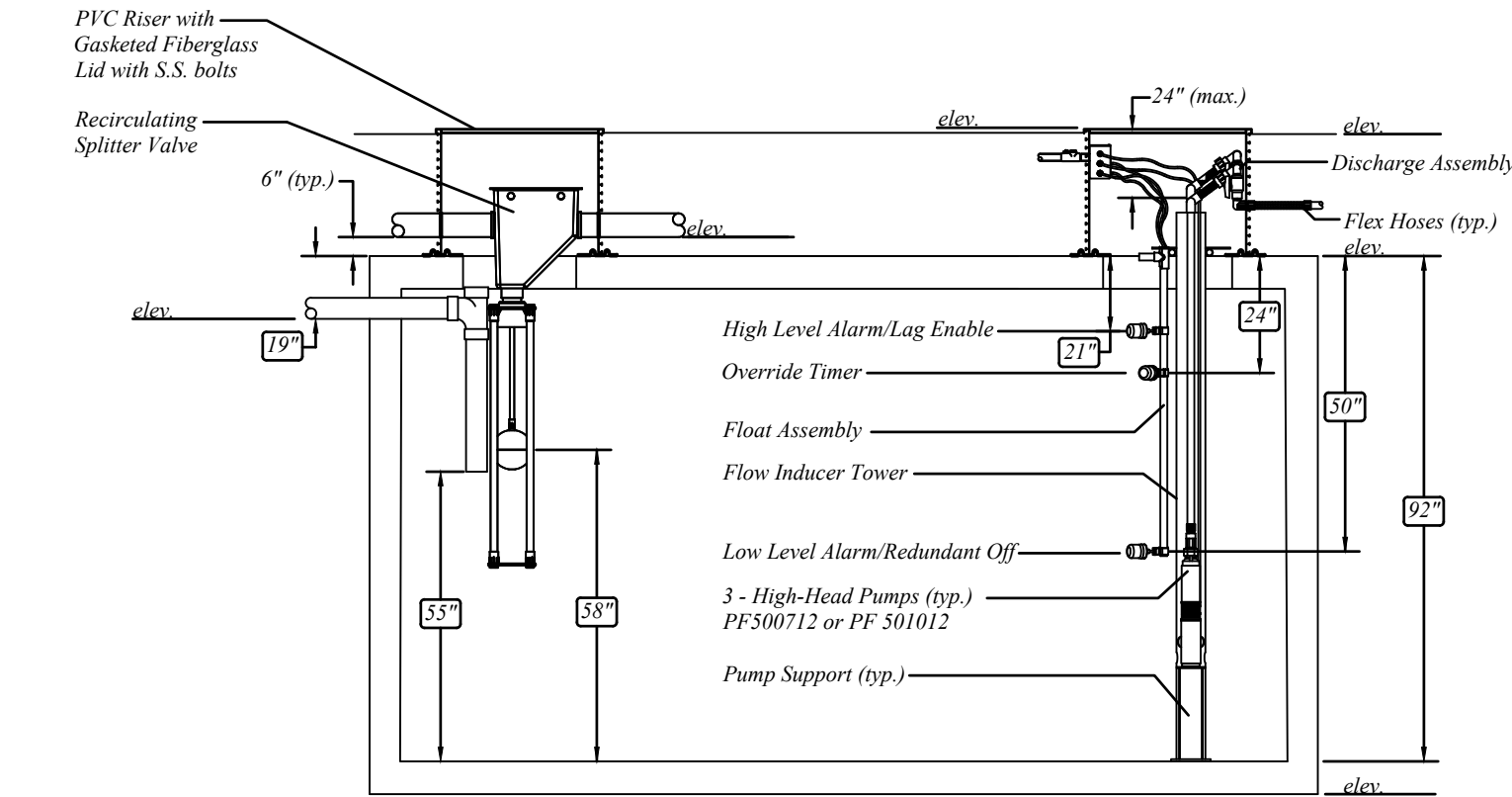
Filtrate Return Line Iso
Not To Scale



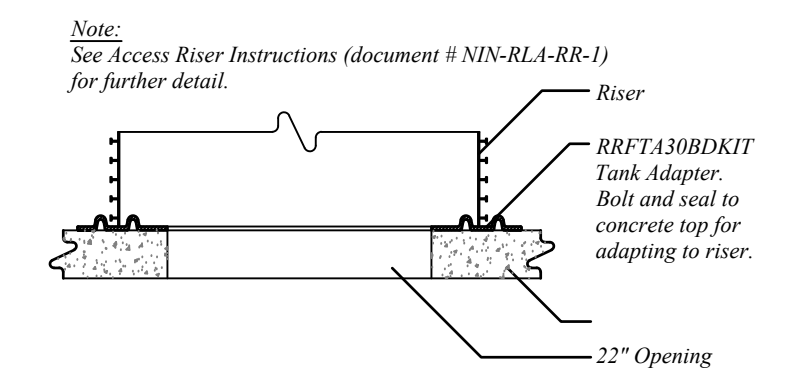
Typical Pod Inlet Connection
Not To Scale



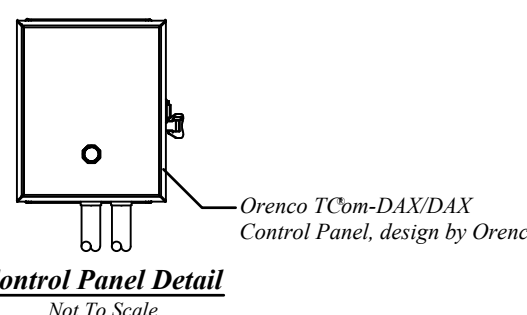
Collective Air Inlet Option
Not To Scale



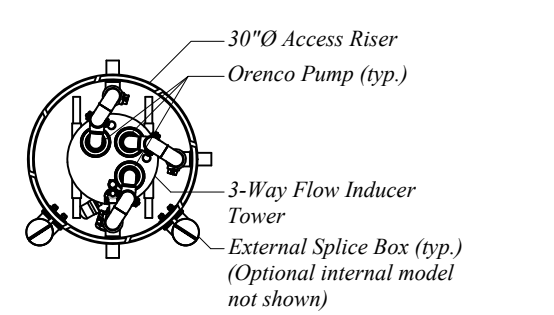
RECIRCULATION TANK FLOAT AND RSV SETTINGS
NOT TO SCALE



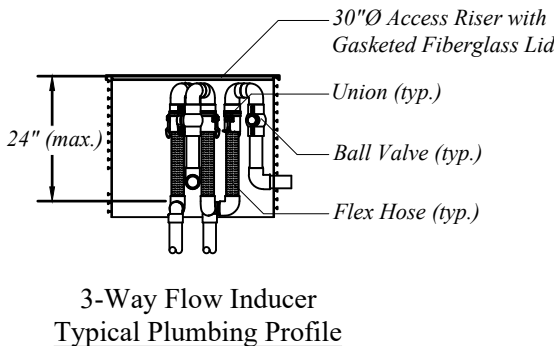
30" Riser Attachment Detail for Concrete Tank
Scale: NTS



Control Panel Detail
Not To Scale

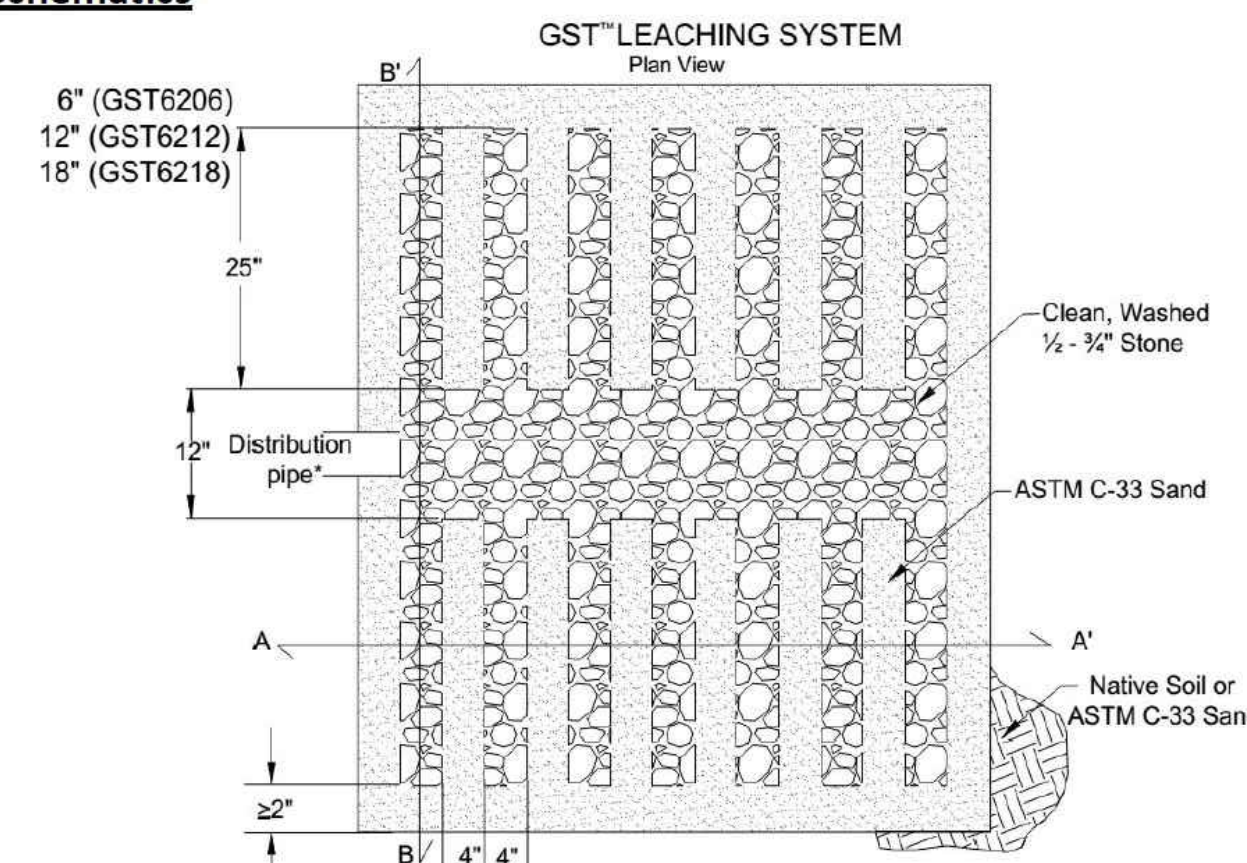


3-Way Flow Inducer Typical Plumbing Example
Scale: 1" = 3'-0"



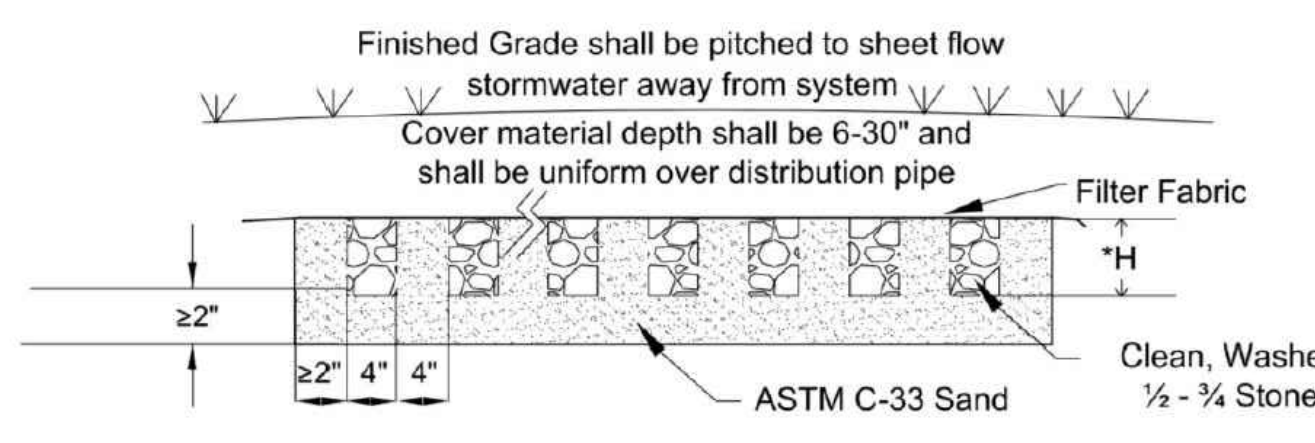
3-Way Flow Inducer Typical Plumbing Profile
Scale: 1" = 3'-0"

GST Schematics

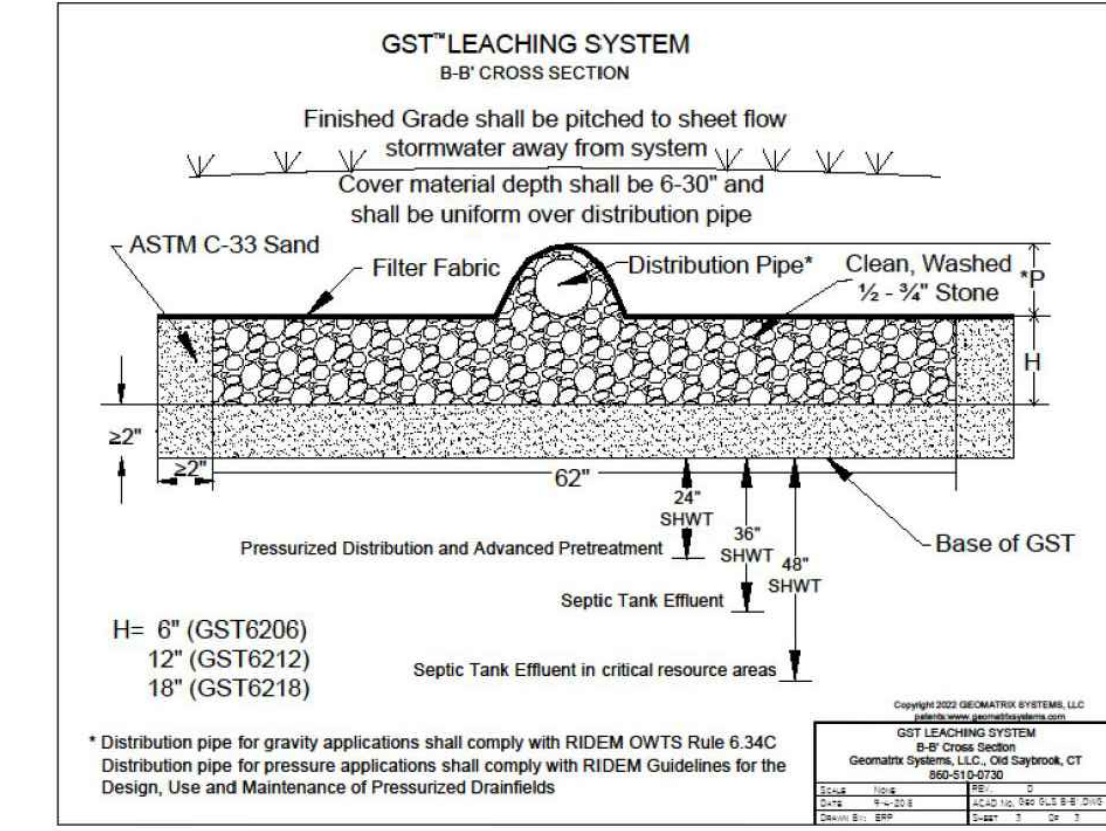


* Distribution pipe for gravity systems shall comply with RIDEM DWTS Rule 6.34C. Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

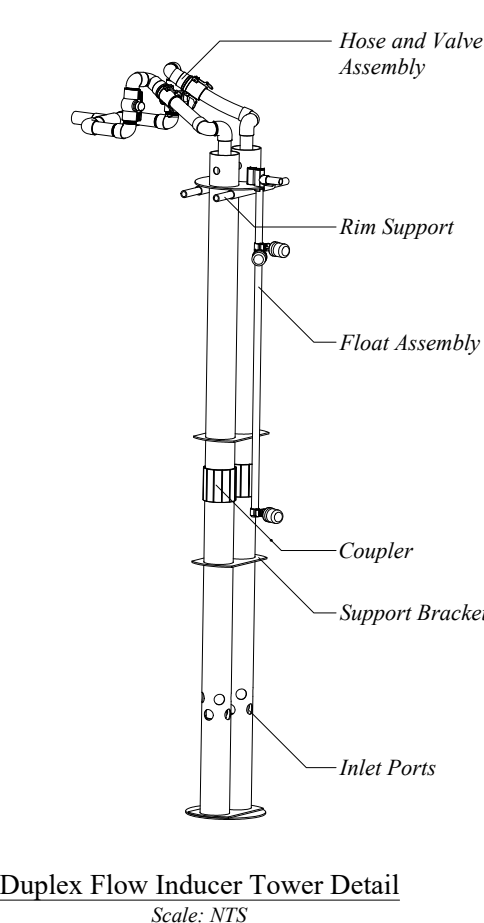
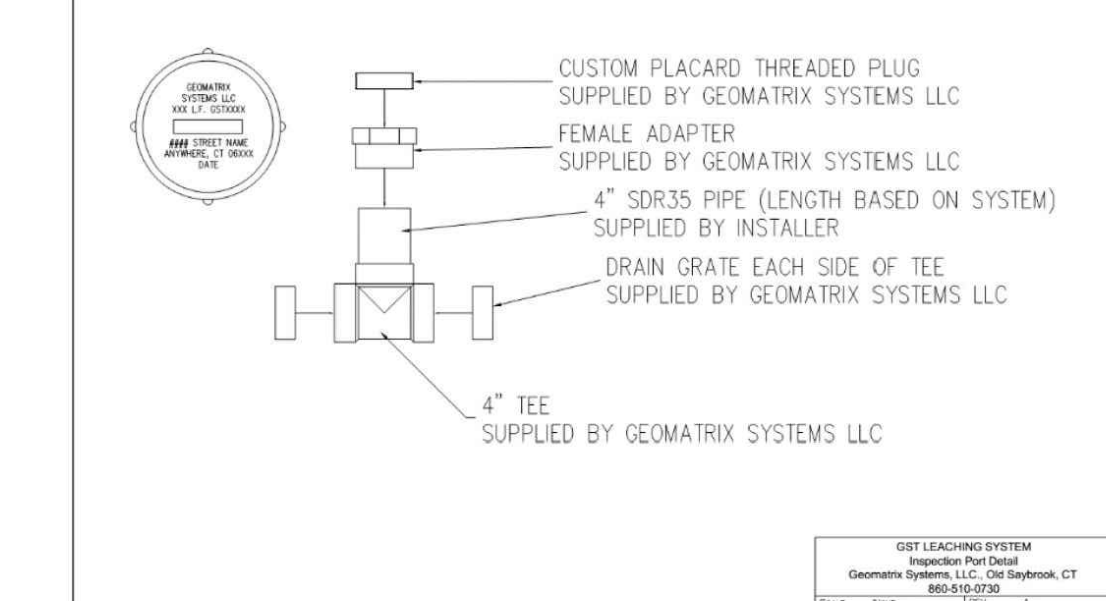
GEOMATRIX GST LEACHING SYSTEM A-A' CROSS SECTION



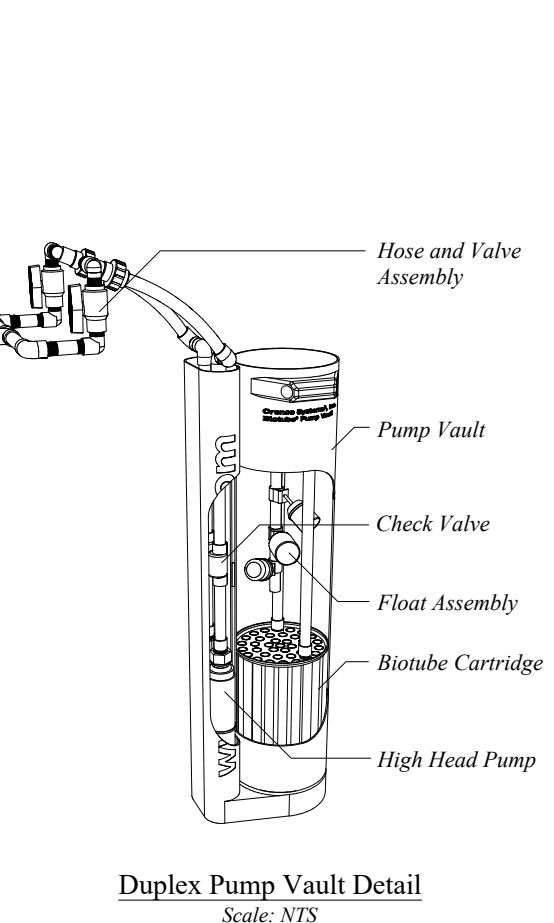
*H= 6" (GST6206)
12" (GST6212)
18" (GST6218)



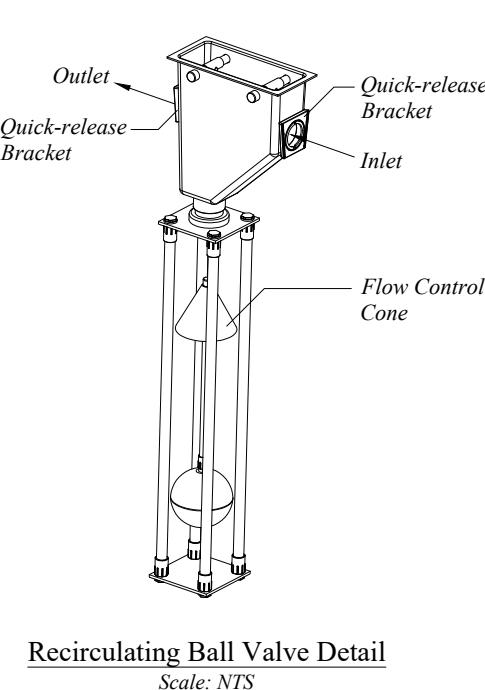
GEOMATRIX GST LEACHING SYSTEM INSPECTION PORT DETAIL



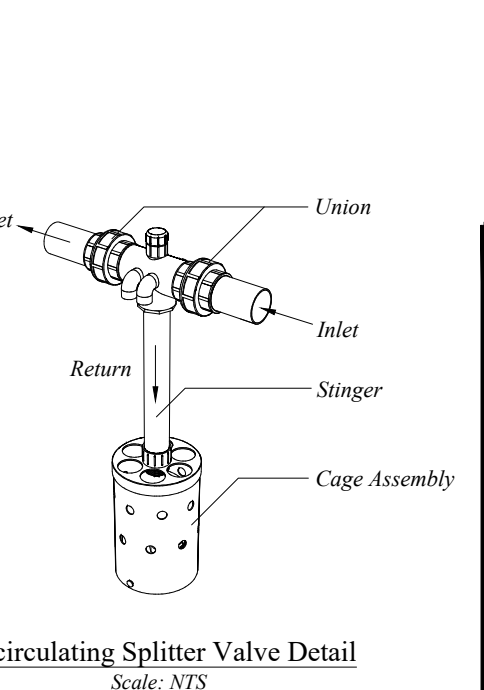
Duplex Flow Inducer Tower Detail
Scale: NTS



Duplex Pump Vault Detail
Scale: NTS



Recirculating Ball Valve Detail
Scale: NTS



Recirculating Splitter Valve Detail
Scale: NTS

COLLECTIVE AIR INLET DETAIL

SCALE: VARIES

AdvanTex AX100 SYSTEM - MISCELLANEOUS DETAILS

SCALE: VARIES

OWTS DETAILS



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

20.0179 3A, 3B
SHEET 1-2



Site Evaluation Form
Part A - Soil Profile Description

Application Number

Property Owner: RHODE ISLAND STATE OF (DEM) DIVISION OF PARKS

Property Location: 1-100 BURLINGAME PARK RD, CHARLESTOWN, RI PLAT 15 LOT 10

Date of Test Hole: 8/17/21

Soil Evaluator: KAMAL HINGORANY License Number: D4005

Weather: CLOUDY Shaded: Yes No Time: 9:30 AM

Table with 11 columns: TH Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Contains data for horizons 3A and 3B.

TH 3A Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 120" (og)

TH 3B Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 24" (og)

Comments:

Part B

Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer





20.0179 3A, 3B
SHEET 2-2

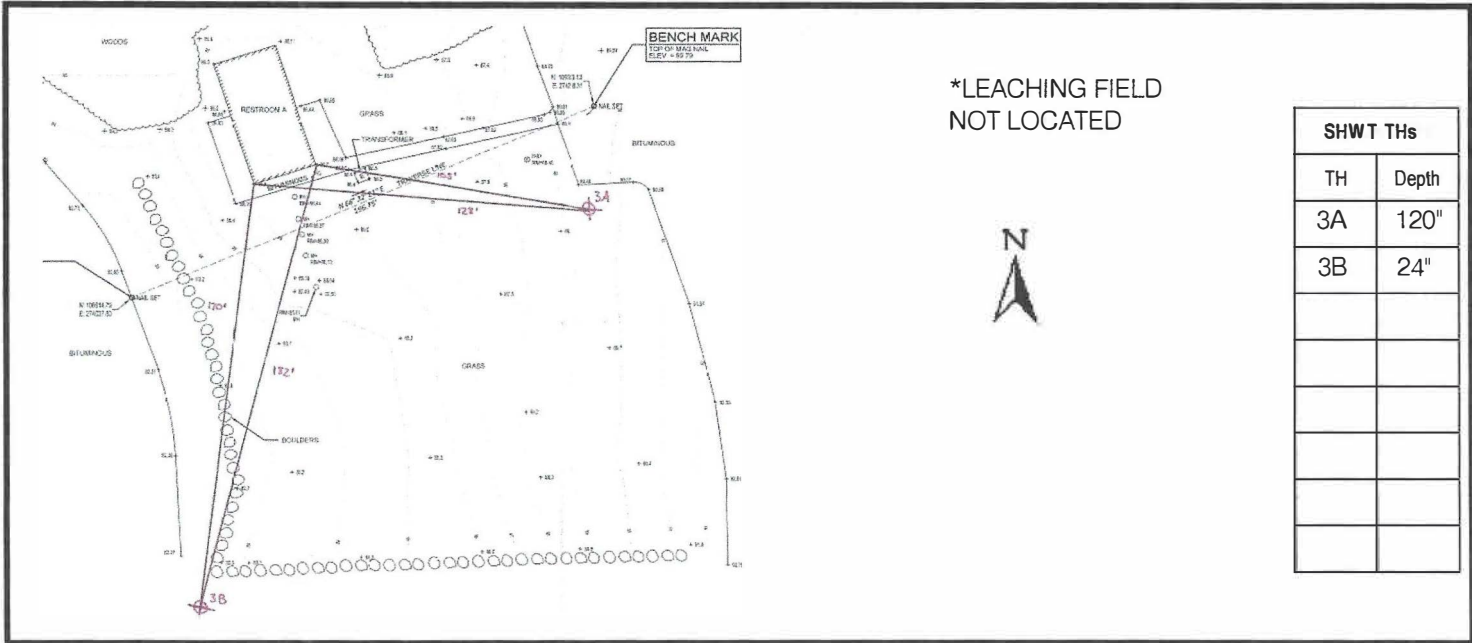
Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*

***OFFSETS MUST BE SHOWN**

Key:

-  Approximate location of test holes
-  Approximate location of bedrock test holes
-  Estimated gradient and direction of slope
-  Approximate direction of due north



SHWT THs	
TH	Depth
3A	120"
3B	24"

1. Relief and Slope: _____
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO YES
8. Site's potential for flooding or ponding: NONE SLIGHT MODERATE SEVERE
9. Landscape position: SHOULDER
10. Vegetation: GRASS
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site: _____

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: [Signature] D4005 License # _____ Part B prepared by: [Signature] D4005 License # _____

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur Inconclusive Disclaim

Unwitnessed Soil Evaluations Decision: Accept Inconclusive Disclaim

Wet Season Determination required Additional Field Review Required

Explanation: _____

Signature Authorized Agent

Date



Bathroom "A" and System Replacement Project
Burlingame State Park and Campground
Charlestown, Rhode Island

DESIGN NARRATIVE

RIDEM is in the process of replacing the Bathroom and Onsite Wastewater System (OWTS) at this location. Soil logs can be found on Sheet C-1.3 together with the proposed site layout and System Design Data and Notes. Details for the system are on Sheets C-2.3, C-3.1 and C-3.2.

Soil evaluations for this OWTS location were conducted on August 17, 2021, soils are Category 3 and the Estimated Seasonal High Water Table depth at the OWTS is 24" or at elevation 80.7±.

In total the six bathrooms for the overall campground accommodate approximately 720 campsites. Utilizing the RIDEM wastewater design flow for a campground with washroom and toilets of 50 gallons per day we determine a daily flow for the entire campground to be approximately 36,000 gallons per day (GPD). The average daily flow per acre of the campground is (36,000 GPD / 847 Acres) 42.5 GPD/Acre. The average daily flow for each bathroom is approximately 6,000 GPD. In calculating an estimated daily flow for the Bathroom "A" OWTS we took a conservative approach utilizing 150 campsites at 50 GPD/campsite to determine a design flow for the Bathroom "A" to be 7,500 GPD which is greater than the 6,000 GPD average. Please see the attached campsite map which depicts the campsites (as highlighted) chosen to be included within the 150 sites utilized for sizing the OWTS. Please note that sites throughout the campground overlap to agree with the conservative estimate. The system as sized is oversized and is considered a large system. The system is used on a seasonal basis between the months of April and October.

The OWTS will utilize Two (2) Orenco AdvanTEX AX100 Pods for advanced treatment. This system is a Category 1 advanced treatment technology. The system will treat the wastewater and reduce the biochemical oxygen demand (BOD) and comply with the latest Orenco system design criteria and thus the RIDEM OWTS criteria. See attached Final Design Review Letter from Orenco.

The systems drainfield is designed as a Geomatrix Gravel Sand Treatment (GST) System. The Loading Rate for Category 1 Technology for the GST is 3.5 GPD/square feet (SF). The minimum size drainfield is 7,500 GPD/3.5 GPD/SF which equals 2,143 SF. We propose to use the GST 6212 and the minimum size drainfield requirement for this application is 123 lineal feet (LF). We propose to use the 280 lineal feet (LF) of GST 6212 which provides 17.5 S.F. per LF, which equals 4,900 SF. and is greater than 2,143 SF (minimum size). The GST system has been divided into two equal drainfields and the GST are spaced 7'6" on center. The two drainfields consist of 5 rows each 28 feet long and 62" wide with a stone depth of 12" below the 4" perforated distribution pipe. See pump selection and system specifications on Sheet C-2.3 for additional information. Please see the attached review letter from Geomatrix.

WATCHAUG POND



FISH CAMP AREA
150

400 AREA

MAIN CAMP AREA
146

A 150

B 150

LEGIONTOWN
CAMP AREA
156

500 AREA

MILLS CAMP AREA
150

- CHECK STATION
- PERMITS
- COMFORT STATION

TO WESTERLY TO WAKEFIELD & PROVIDENCE



DEVELOPED BY:
 PARE CORPORATION
 1000 W. KENNEDY - MANASSAS
 8 BRADSTON VALLEY PLACE
 LEXINGTON, MASSACHUSETTS
 01846-1100

BURLINGAME STATE PARK
 RHODE ISLAND DEPT. OF
 ENVIRONMENTAL MANAGEMENT



LEGEND

- A TENTS ONLY
- B SMALL TRAILERS
- C LARGE TRAILERS AND MOTORHOMES
- M MOTORHOMES
- P PORTAJONS
- ⊙ WATER
- ▨ RESTROOMS WITH SHOWERS
- ★ DUMPING STATIONS
- ▢ CABIN
- D DUMPSTERS

01/19/2023

Kevin Harrop
Caputo & Wick
1150 Pawtucket Ave
Rumford, RI 02916

Subject: Final Design Review of Burlingame Park/Bathhouse A

Kevin,

Orenco Systems, Inc. (“Orenco”) has received the Plans with all required fields completed (attached to this letter), a copy of the plan set showing the designed site layout and configuration plans, and other documents that comprise the Final Design for the Burlingame Park project. Orenco staff reviews the Final Design of all wastewater collection and treatment systems for commercial applications to ensure that the design is compliant with the most current version of the system’s applicable design criteria published by Orenco for the specified parameters provided by the system’s designer in the Plans. The findings and conclusions of my review of this Final Design are as follows:

Design Basis

The system has been designed for a Type 2, Park application. Influent flow and constituent concentrations and effluent constituent concentration requirements have been provided by the system’s designer on the attached Plans and were used in my review of the Final Design.

The influent flow on the Plans were not extrapolated from the metered flows from the subject site, but in our experience, they are consistent with influent flows from other, similar Type 2, Park systems that Orenco has previously observed. As such, I have no reason to doubt the accuracy of the designer’s findings and assumptions as to the influent flow, and find that it was reasonable for the designer to use them as the design basis for the system.

System Design

The proposed Final Design of the system consists of a park. Influent will enter a 15,000 gallon Primary Tank, which will then flow into a 7,500 gallon Pre-Anoxic Tank. From here, flow will gravity discharge into a 6,000 gallon Recirculation Tank. The recirc-filtrate blend in this tank will pump into (2) AX100 pods and the filtrate will enter a splitter valve in the front of the Recirculation Tank where it will either be recirculated again or siphon to a drain field.

Design Criteria

The applicable design criteria for this system, which I used to conduct the review of its Final Design, is revision 8.0 of document NDA-ATX-1, titled *Orenco[®] AdvanTex[®] Design Criteria, Commercial Treatment Systems*, which was published by Orenco in October, 2020. A copy of the design criteria can be downloaded from Orenco’s online document library at www.orenco.com/corporate/doclibrary.cfm.

Findings

The findings of my review as to whether the Final Design complies with Orenco’s design criteria for treating wastewater to the effluent constituent concentration requirements provided in the Plans are as follows:

Primary Treatment

The Final Design specifies the use of 1 - 15,000 U.S. Gallon Primary concrete and 1 - 7,500 U.S. Gallon Primary concrete tanks in series for primary treatment. Using the flow data specified on the Plans the hydraulic retention times for grease capture and primary treatment calculate as follows:

Primary Tank(s) Hydraulic Retention Time (HRT)¹				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Effective Combined Primary Tankage (gpd)	Avg HRT (days)	Max Day HRT (days)
3,500	7,500	22,500	6.4	3.0

¹ Design Max Day Flow is the maximum daily flow a facility is expected to receive no more than one day within any week’s time.

The Primary Tank Sizing Recommendations states that the recommended primary tankage for a Park treatment system should be sized to at a minimum of 3 days of hydraulic retention time at the Design Max Day Flow. Therefore, the configuration and specifications of the primary treatment tanks in the Final Design satisfy Orenco’s recommendation for primary tankage for this Park application. This pre-anoxic tank should be sized equal to one day at maximum day design flow and is considered part of the overall primary tank volume.

Recirculation Tank — Standard Stage

The Final Design further specifies the use of 1 - 6,000 U.S. Gallon concrete tank for recirculation and blending of the AdvanTex-treated effluent with primary tank effluent. Using the flow data specified on the Plans the tank is sized to be equal to 80% of the Maximum Day Design Flow. The recirculation tank for the standard stage should be sized at a minimum of 75% of the Maximum Day Design Flow. Therefore, the specification of the recirculation-blend tank in the Final Design satisfies Orenco’s design criteria.

Hydraulic Load — Standard Stage

The Final Design specifies the use of 2 - AX100 pods, which contain a nominal surface area of 200 square feet of treatment media. Using the flow data specified on the Plans the hydraulic loading rate for the system calculates as follows:

Hydraulic Loading Rate (HLR) — Standard Stage				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Nominal Textile Area (sq. ft.)	Average HLR (gal. per day/sq. ft.)	Peak HLR (gal. per day/sq. ft.)
3,500	7,500	200	17.5	37.5

According to the AdvanTex System Loading Chart in the applicable design criteria, the standard AdvanTex treatment system (Stage 1) should not be hydraulically loaded more than 25 gpd/square foot at Design Average Flow or 50 gpd/square foot at Design Max Day Flow. Therefore, the specified type and number of AdvanTex pods in the Final Design satisfy Orenco’s design criteria to achieve the effluent quality listed in the design criteria at a 95% confidence level for this Type 2, Park application.

Organic Load — Standard Stage

The following influent characteristics provided on the Plans were estimated and not derived from direct sampling. Even though the influent characteristics were not derived from direct sampling, the values provided are consistent with values we have seen in other, similar Type 2, Park applications.

Influent (Primary Tank Effluent) Characteristics — Loading to Textile	
Average BOD ₅ (mg/L)	Average TSS (mg/L)
250	200

Based on the average influent biochemical oxygen demand (BOD₅) concentration and flow data specified on the Plans, the system will receive approximately 7.3 pounds of BOD₅ per day at Design Average Flow, and 15.6 pounds of BOD₅ per day at Maximum Day Design Flow. Using this information, the organic loading rate of the system calculates as:

Organic Loading Rate (OLR) — Standard Stage				
Average Organic Load (lbs/day)	Maximum Organic Load (lbs/day)	Nominal Treatment Area (sq. ft.)	Average OLR (lbs BOD/sq. ft./day)	Maximum OLR (lbs BOD/sq. ft./day)
7.3	15.6	200	0.04	0.08

Conclusions

I have reviewed the Final Design of the Burlingame Park wastewater treatment system, and have found that the design is compliant with the most current version of the system’s applicable design criteria published by Orenco for the specified parameters provided by the system’s designer in the Plans. In addition, I noted no anomalies in the site layout or configuration of the system during my review.

Compliance Table — Meets Minimum Design Standards	
	Standard Stage
Recirc Tank Size	Yes
Hydraulic Load	Yes
Organic Load	Yes

As such, the system as designed satisfactorily complies with Orenco’s design criteria to meet the following effluent limits specified in the Plans at a 95% confidence level, provided that all influent flows and constituent concentrations specified in the Plans are not exceeded:

Expected Effluent Quality	
Constituent	Average (mg/L)
BOD ₅	20
TSS	20

It is important to note that even though the AdvanTex Treatment System has the capability to meet or exceed the required treatment parameters, there is no way that Orenco can guarantee that a particular system will be operated or maintained in a manner consistent with the Final Design reviewed. Once the facility is placed into operation, the influent flows and constituent concentrations to the facility should be monitored, and if flow or any of the influent constituent concentrations exceed those listed in the Plans, measures should be taken to reduce the flow or constituent concentration to those listed. However, if additional treatment capacity becomes necessary, the system is designed to have the capability to expand to account for the new flow or constituent concentration.

Proper air ventilation is a critical feature of all commercial AdvanTex Treatment Systems, and as such, adequate active ventilation is required for all systems. In addition, please note that disposing of toxics or chemicals into the system is strictly prohibited. Examples of toxics include restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo, waste products, or any other toxins. Furthermore, water softener brine discharge is prohibited from being discharged into the AdvanTex Treatment System. Failure to adhere to these policies will void Orenco's limited product warranties.

If you have any questions about my review process, findings, or conclusions, please feel free to call or e-mail me.

Sincerely,



Caleb Castleman
Systems Engineering
Orenco Systems Inc.
(800) 348-9843 ext. 548
ccastleman@orencocom

Project: Burlingame State Park and Camp Ground
 Location: Bathhouse "A"

Description	Input values	Units
Finish Grade	86.25	Elevation
Water Table Elevation	80.70	Elevation
Bottom of Tank Elevation	75.33	Elevation
Lowest Pipe Invert	83.00	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	19.00	Inches
Length of Tank	30.83	Feet
Width of Tank	11.33	Feet
Depth of Tank	9.33	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	8.00	Inches
Sides Concrete Thickness	8.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	4.00	Inches
Compartment Wall Height	87.00	Inches
Computed Value		
Submerged Depth	5.37	Feet
Top/Bottom Surface Area of Tank	349.43	SF
Displaced Volume	1,876.46	CF
Volume of Tank Top	232.96	CF
Volume of Tank Sides	435.53	CF
Volume of Tank Bottom	232.96	CF
Volume of Baffle	24.17	CF
Weight of Tank Top	34,943.38	lbs
Weight of Tank Sides	65,330.02	lbs
Weight of Tank Bottom	34,943.38	lbs
Weight of Baffle	3,624.88	lbs
Total Weight of Tank	138,841.66	lbs
Volume of Soil	553.27	CF
Weight of Soil Above Tank	55,327.02	lbs
Uplift Created by Submerged Tank	117,091.07	lbs
Total Weight of Tank, Counter Weight and Soil	194,168.68	lbs
Exceeds Displaced Volume by	77,077.61	lbs
Buoyance Point for Empty Tank	6.37	Feet (above bottom)
Buoyance Point for Empty Tank	81.70	Elev
Buoyance Point for Tank in Place	8.90	Feet (above bottom)
Buoyance Point for Tank in Place	84.23	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Bathhouse "A"

Description	Input values	Units
Finish Grade	86.50	Elevation
Water Table Elevation	80.70	Elevation
Bottom of Tank Elevation	75.15	Elevation
Lowest Pipe Invert	82.65	Elevation
Counter Weight	12,614.40	lbs
Soil Above Tank	26.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	9.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
Computed Value		
Submerged Depth	5.55	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	943.50	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	208.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	31,199.74	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	60,949.74	lbs
Volume of Soil	368.33	CF
Weight of Soil Above Tank	36,833.33	lbs
Uplift Created by Submerged Tank	58,874.40	lbs
Total Weight of Tank, Counter Weight and Soil	110,397.47	lbs
Exceeds Displaced Volume by	51,523.07	lbs
Buoyance Point for Empty Tank	5.75	Feet (above bottom)
Buoyance Point for Empty Tank	80.90	Elev
Buoyance Point for Tank in Place	10.41	Feet (above bottom)
Buoyance Point for Tank in Place	85.56	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
Location: Bathhouse "A"

Description	Input values	Units
Finish Grade	86.50	Elevation
Water Table Elevation	80.70	Elevation
Bottom of Tank Elevation	74.58	Elevation
Lowest Pipe Invert	81.33	Elevation
Counter Weight	6,307.20	lbs
Soil Above Tank	45.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	8.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches

Two Compartment Tank

Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches

Computed Value

Submerged Depth	6.12	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	1,040.40	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	182.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	27,300.13	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	57,050.13	lbs
Volume of Soil	637.50	CF
Weight of Soil Above Tank	63,750.00	lbs
Uplift Created by Submerged Tank	64,920.96	lbs
Total Weight of Tank, Counter Weight and Soil	127,107.33	lbs
Exceeds Displaced Volume by	62,186.37	lbs
Buoyance Point for Empty Tank	5.38	Feet (above bottom)
Buoyance Point for Empty Tank	79.96	Elev
Buoyance Point for Tank in Place	11.98	Feet (above bottom)
Buoyance Point for Tank in Place	86.56	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Building "A"

Description	Input values	Units
Finish Grade	88.00	Elevation
Water Table Elevation	80.70	Elevation
Bottom of Chamber Elevation	76.50	Elevation
Lowest Pipe Invert	83.00	Elevation
Counter Weight	2,803.20	lbs
Soil Above Chamber	42.00	Inches
Chamber Length	7.00	Feet
Chamber Width	7.00	Feet
Diameter of Opening	2.50	Feet
Chamber Interior Height	7.00	Feet
Top of Concrete Thickness	6.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Concrete Wall Thickness	6.00	Inches
	Computed Value	
Submerged Depth	4.20	Feet
Top Surface Area of Chamber	44.09	SF
Surface Area of Chamber Sides	182.00	SF
Bottom Surface Area of Chamber	49.00	SF
Displaced Volume	205.80	CF
Volume of Chamber Top	22.05	CF
Volume of Chamber Sides	91.00	CF
Volume of Chamber Bottom	24.50	CF
Weight of Chamber Top	3,306.84	lbs
Weight of Tank Side	13,650.00	lbs
Weight of Chamber Bottom	3,675.00	lbs
Total Weight of Chamber	20,631.84	lbs
Volume of Soil	154.32	CF
Weight of Soil Above Chamber	15,431.94	lbs
Uplift Created by Submerged Chamber	12,841.92	lbs
Total: Chamber, Counter Weight and Soil	38,866.99	lbs
Exceeds Displaced Volume by	26,025.07	lbs
Buoyance Point for Empty Chamber	6.75	Feet (above bottom)
Buoyance Point for Empty Chamber	83.25	Elev
Buoyance Point for Chamber in Place	12.71	Feet (above bottom)
Buoyance Point for Chamber in Place	89.21	Elev

(Soil friction has not been taken into account)

Duplex Control Panels

Applications

Orenco Duplex Control Panels are used to control dual pumps, alarms, and other equipment as specified in pressure sewers and onsite septic systems.



Orenco® DAX2 Control Panel



General

Orenco Duplex Control Panels are specifically engineered for pressure sewer (STEP) systems and onsite septic treatment systems that require the use of two alternating pumps. Standard features include circuit breakers, an automatic/manual/off motor control toggle for each pump, an audio/visual high level alarm, an alarm reset, and a duplex alternator. Other standard features and options are listed on page 2. Orenco panels are designed for use with mechanical and/or mercury float switches. Listed per UL 508 in the US and Canada.

Standard Models

DAX1, DAX2

Product Code Diagram



Standard options (list in order):
 PT = programmable timer
 RO = redundant off relay
 CS = current sensor
 ETM = elapsed time meter
 CT = event counter
 HT = heater
 SA = surge arrester
 PRL = pump run light
 PL = power light

Intrinsically safe relays:
 Blank = standard, no IR relays
 IR = intrinsically safe relays

Pump voltage:
 1 = 120 VAC
 2 = 120 VAC or 240 VAC

DAX series duplex control panel

Materials of Construction

Enclosure	UV-resistant fiberglass, UL Type 4X
Hinges	Stainless steel

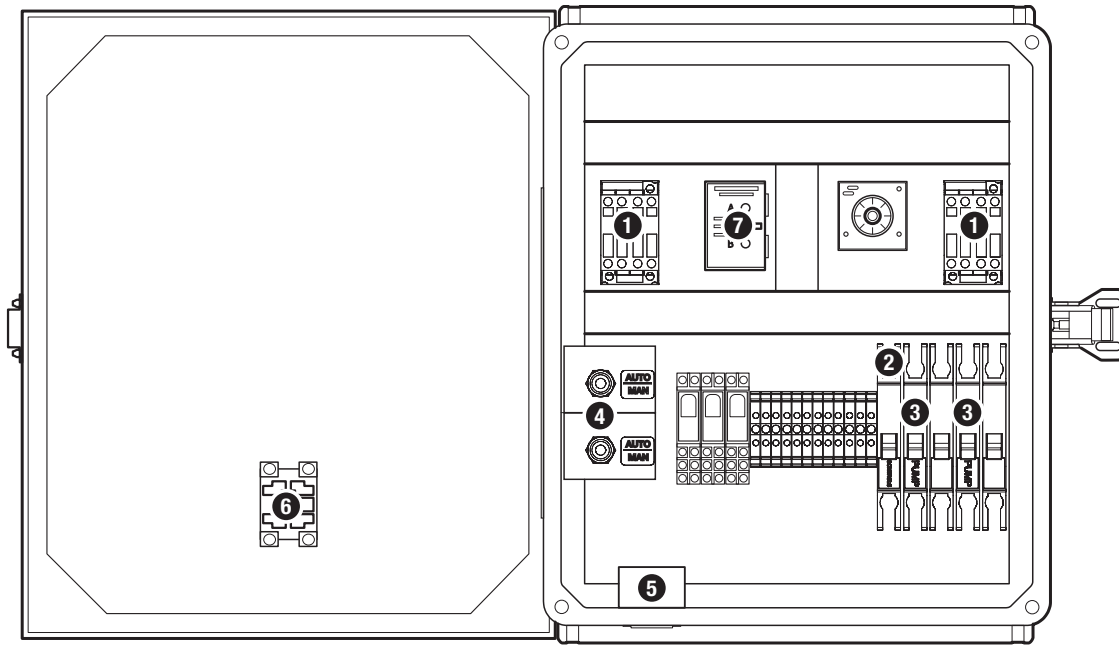
Specifications

Panel Ratings

DAX1:	120 V, 1 hp, 16 amps, single phase, 60 Hz.
DAX2:	240 V, 3 hp, 16 amps, single phase, 60 Hz.

Dimensions

Height, in. (mm)	15.5 (394)
Width, in. (mm)	13.5 (343)
Depth, in. (mm)	6.7 (170)



Orenco® DAX2PTR0 240 V panel

Standard Components

Feature	Specification(s)
1. Motor-Start Contactor	120 V, 16 FLA, 1 hp (0.75 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA). 240 V, 16 FLA, 3 hp (2.24 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).
2. Controls Circuit Breaker	10 A, OFF/ON switch. Single-pole 120 V. DIN rail mounting with thermal magnetic tripping characteristics.
3. Pump Circuit Breakers	20 A, OFF/ON switch. Single-pole 120 V or double-pole 240 V. DIN rail mounting with thermal magnetic tripping characteristics.
4. Toggle Switches	20 A, 1hp (0.75 kW). Single-pole, double-throw HOA switch,
5. Audible Alarm	95 dB at 24 in. (610 mm), warble-tone sound.
6. Visual Alarm	7/8-in. (22-mm) diameter red lens, "Push-to-silence." UL Type 4X rated, 1 W LED light, 120 V.
7. Duplex Alternator	120 V. Cross-wired style for independent lag pump function. Selector switch for locking one pump into lead position.
Audible Alarm Silence Relay (Not shown)	120 V. Automatic reset. DIN rail mount.

Optional Features

Feature	Specification(s)	Code Adder
Intrinsically Safe Control Relays	Listed per UL 698A, for Class 1 Div. 1, groups A, B, C, D hazardous locations (requires larger enclosure).	IR
Programmable Timer	120 V. Repeat cycle from 0.05 seconds to 30 hours. Separate variable controls for OFF & ON time periods.	PT
Redundant Off Relay	120 V. Provides a secondary off. Sounds alarm on low level condition. DIN rail mount.	RO
Elapsed Time Meter	120 V, 7-digit, non-resettable. Limit of 99,999 hours; accurate to 0.01 hours.	ETM
Event Counter	120 V, 6-digit, non-resettable.	CT
Heater	Anti-condensation heater. Self-adjusting: radiates additional wattage as temperature drops.	HT
Surge Arrestor	Status light on unit; protects incoming power supply from electrical surges.	SA
Pump Run Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PRL
Power Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PL

PF-Series Submersible Effluent Pumps: 1-Phase, 60-Hz, 4-inch (100-mm)

Applications

Our PF-Series 4-inch (100-mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or dosing tanks. These pumps are constructed of light-weight, corrosion-resistant stainless steel and engineered plastics, and are field-serviceable and repairable with common tools. They're also CSA- and UL-certified to U.S. and Canadian safety standards for effluent pumps.

PF-Series pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.



Features/Specifications

To specify this pump for your installation, require the following:

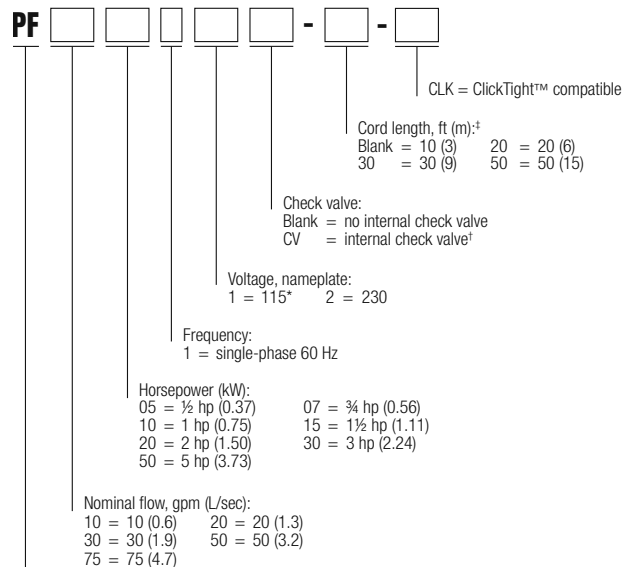
- Minimum 24-hour run-dry capability (liquid end) with no deterioration in pump life or performance*
- 1/8-inch (3-mm) bypass orifice to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid-end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10, 20, and 30 gpm (0.6, 1.3, and 1.9 L/sec) models; floating stack design on 50 and 75 gpm (3.2 and 4.7 L/sec) models
- Franklin Electric Super Stainless motor, rated for continuous use and frequent cycling
- Type SOOW 600-V motor cable (model PF751512 uses 14 AWG, SJ00W, 300-V cord)

* Not applicable for 5-hp (3.73 kW) models

Standard Models

See specifications chart on page 2 for a list of standard pumps. For a complete list of available pumps, call Orenco.

Product Code Diagram



Pump, PF Series

* ½-hp (0.37 kW) only

[†] Available for 10 gpm (0.6 L/sec), 1/2 hp (0.37 kW)

[‡] Note: 20-ft cords are available only for pumps through 1½ hp



C US
LR80980
LR2053896



Powered by
Franklin Electric

Specifications

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Discharge size and material ¹	Length in. (mm)	Min. liquid level in. (mm)	Weight lb (kg)	Rated cycles per day
PF100511 ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100511CV ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512 ⁹	10 (0.6)	0.50 (0.37)	1	230	240	6.3	6.3	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712 ^{4,5,9}	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	1 ¼ in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF101012 ^{5,6,9}	10 (0.6)	1.00 (0.75)	1	230	240	9.6	9.6	1 ¼ in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF200511 ⁹	20 (1.3)	0.50 (0.37)	1	115	120	12.3	12.5	1 ¼ in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512 ⁹	20 (1.3)	0.50 (0.37)	1	230	240	6.4	6.5	1 ¼ in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF201012 ^{4,5,9}	20 (1.3)	1.00 (0.75)	1	230	240	10.5	10.5	1 ¼ in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF201512 ^{4,5}	20 (1.3)	1.50 (1.11)	1	230	240	12.4	12.6	1 ¼ in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF300511 ⁹	30 (1.9)	0.50 (0.37)	1	115	120	11.8	11.8	1 ¼ in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512 ⁹	30 (1.9)	0.50 (0.37)	1	230	240	6.2	6.2	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712 ⁹	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	1 ¼ in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF301012 ^{4,9}	30 (1.9)	1.00 (0.75)	1	230	240	10.4	10.4	1 ¼ in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF301512 ^{4,5}	30 (1.9)	1.50 (1.11)	1	230	240	12.6	12.6	1 ¼ in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF302012 ^{5,6,7}	30 (1.9)	2.00 (1.49)	1	230	240	11.0	11.0	1 ¼ in. SS	35.5 (902)	26 (660)	44 (20)	100
PF303012 ^{5,6,7,8}	30 (1.9)	3.00 (2.23)	1	230	240	16.8	16.8	1 ¼ in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF305012 ^{5,6,7,8}	30 (1.9)	5.00 (3.73)	1	230	240	25.6	25.8	1 ¼ in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF500511 ⁹	50 (3.2)	0.50 (0.37)	1	115	120	12.1	12.1	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512 ⁹	50 (3.2)	0.50 (0.37)	1	230	240	6.2	6.2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500712 ⁹	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501012 ⁹	50 (3.2)	1.00 (0.75)	1	230	240	10.1	10.1	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF501512 ⁴	50 (3.2)	1.50 (1.11)	1	230	240	12.5	12.6	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF503012 ^{4,5,7,8}	50 (3.2)	3.00 (2.23)	1	230	240	17.7	17.7	2 in. SS	43.0 (1092)	37 (940)	55 (25)	100
PF505012 ^{5,6,7,8}	50 (3.2)	5.00 (3.73)	1	230	240	26.2	26.4	2 in. SS	65.4 (1661)	55 (1397)	64 (29)	100
PF751012 ⁹	75 (4.7)	1.00 (0.75)	1	230	240	9.9	10.0	2 in. SS	27.0 (686)	27 (686)	34 (15)	100
PF751512	75 (4.7)	1.50 (1.11)	1	230	240	12.1	12.3	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

1 GFP = glass-filled polypropylene; SS = stainless steel. The 1 ¼-in. NPT GFP discharge is 2 7/8 in. octagonal across flats; the 1 ¼-in. NPT SS discharge is 2 1/8 in. octagonal across flats; and the 2-in. NPT SS discharge is 2 7/8 in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

2 Minimum liquid level is for single pumps when installed in an Orenco Biotube® Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

3 Weight includes carton and 10-ft (3-m) cord.

4 High-pressure discharge assembly required.

5 Do not use cam-lock option (Q) on discharge assembly.

6 Custom discharge assembly required for these pumps. Contact Orenco.

7 Capacitor pack (sold separately or installed in a custom control panel) required for this pump. Contact Orenco.

8 Torque locks are available for all pumps and are supplied with 3-hp and 5-hp pumps.

9 ClickTight™ compatible.

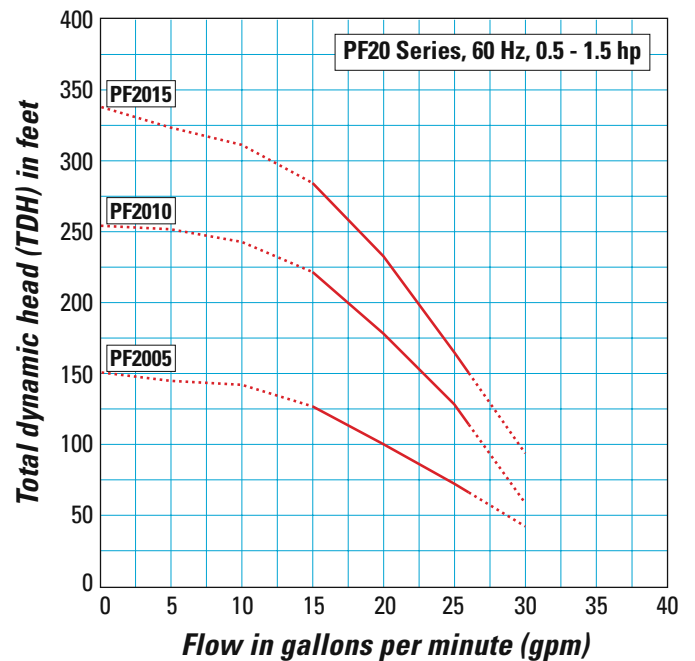
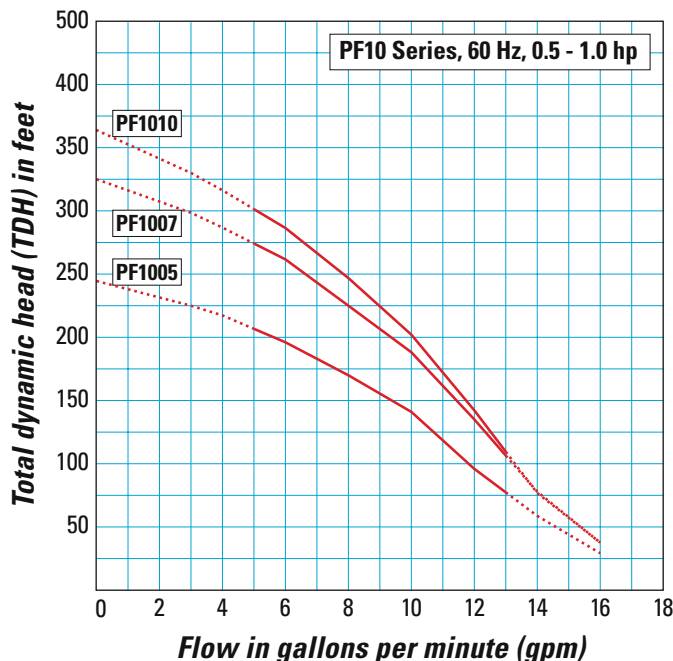
Materials of Construction

Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (Noryl GFN3)
Impellers	Celcon® acetal copolymer on 10-, 20-, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	7/16-in. hexagonal stainless steel, 300 series
Coupling	Sintered stainless steel, 300 series
Shell	Stainless steel, 300 series
Motor	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing ensures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Single-phase motors are equipped with surge arrestors for added security. Single-phase motors through 1.5 hp (1.11 kW) have built-in thermal over-load protection, which trips at 203-221° F (95-105° C).

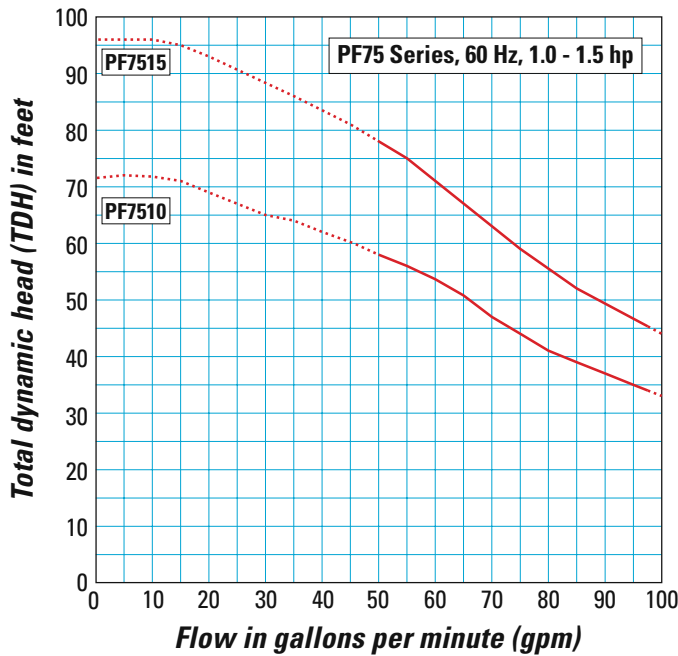
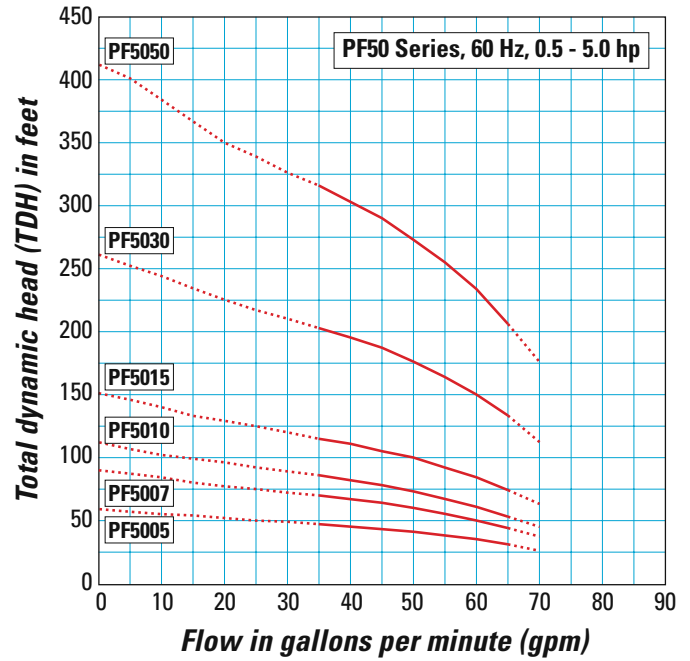
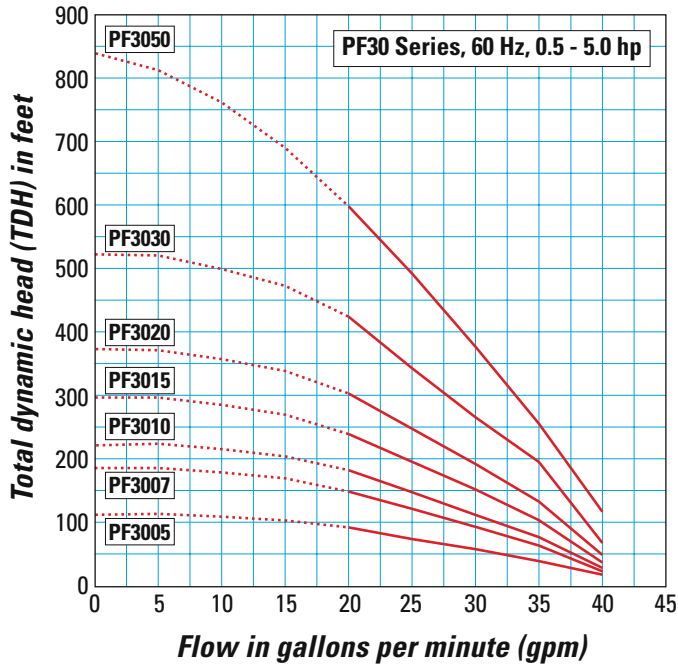
Using a Pump Curve

A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow and pressure (total dynamic head or “TDH”), providing a graphical representation of a pump’s optimal performance range. Pumps perform best at their nominal flow rate. These graphs show optimal pump operation ranges with a solid line and show flow rates outside of these ranges with a dashed line. For the most accurate pump specification, use Orenco’s PumpSelect™ software.

Pump Curves



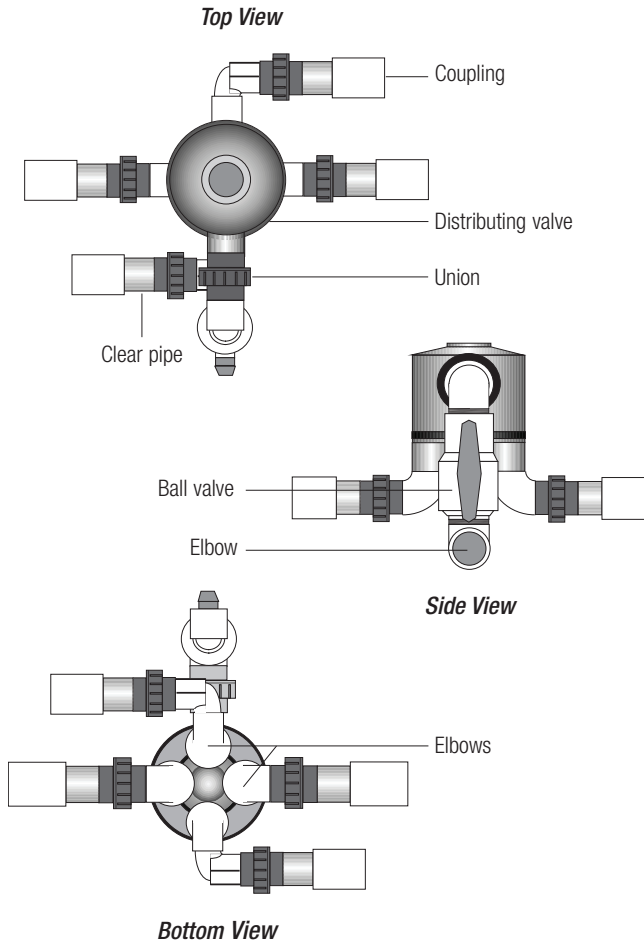
Pump Curves, cont.



Distributing Valves

Applications

Automatic Distributing Valve Assemblies are used to pressurize multiple zone distribution systems including textile filters, sand filters and drainfields.



General

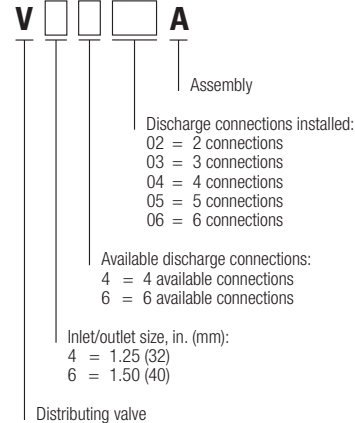
Orenco's Automatic Distributing Valve Assemblies are mechanically operated and sequentially redirect the pump's flow to multiple zones or cells in a distribution field. Valve actuation is accomplished by a combination of pressure and flow. They allow the use of smaller horsepower pumps on large sand filters and drainfields. For example, a large community drainfield requiring 300 gpm (18.90L/sec) can use a six-line valve assembly to reduce the pump flow rate requirement to only 50 gpm (3.14L/sec).

Orenco only warrants Automatic Distributing Valves when used in conjunction with High-Head Effluent Pumps with Biotube[®] pump vaults to provide pressure and flow requirements, and to prevent debris from fouling valve operation. An inlet ball valve, a section of clear pipe, and a union for each outlet are provided for a complete assembly that is easy to maintain and monitor. Ideal valve location is at the high point in the system. Refer to Automatic Distributing Valve Assemblies (NTP-VA-1) for more information.

Standard Models

V4402A, V4403A, V4404A, V4605A, V4606A, V6402A, V6403A, V6404A, V6605A, V6606A.

Product Code Diagram



Materials of Construction

All Fittings	Sch. 40 PVC per ASTM specification
Unions	Sch. 80 PVC per ASTM specification
Ball Valve	Sch. 40 PVC per ASTM specification
Clear Pipe	Sch. 40 PVC per ASTM specification

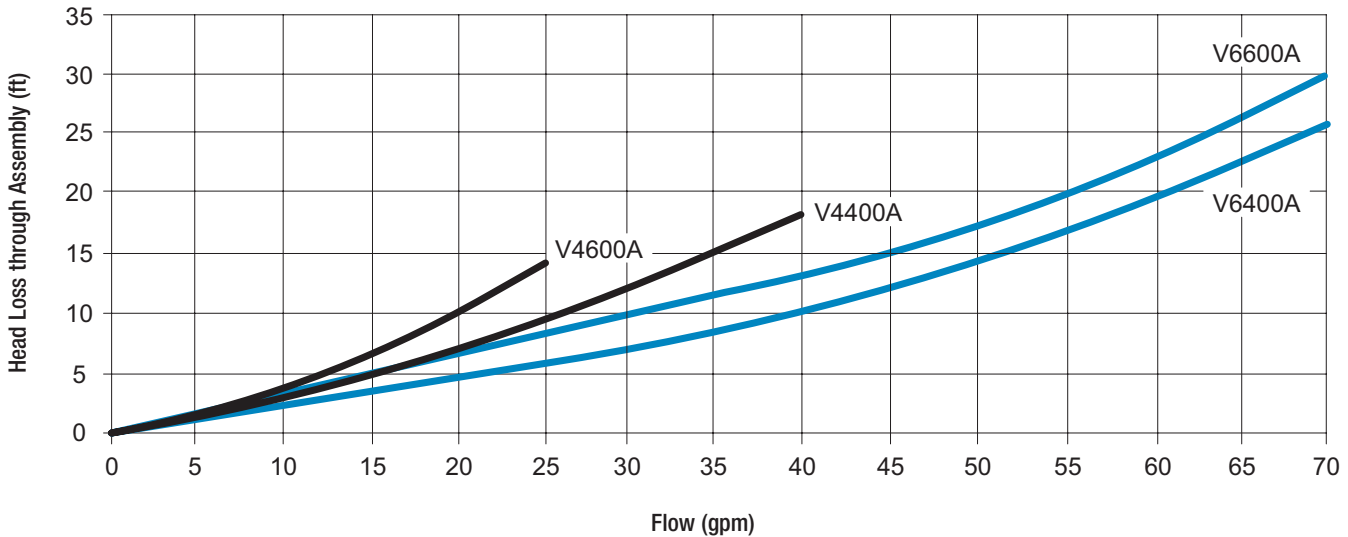
Specifications

Model	Inlet Size, in. (mm)	Outlets Size, in. (mm)	Flow Range, gpm (L/sec)	Max Head, ft (m)	Min. Enclosure*
V4402A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4403A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4404A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4605A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V4606A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V6402A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6403A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6404A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6605A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6606A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418

* When using an enclosed basin, choose the next larger-sized diameter.

Table 1. Automatic Distributing Valve Assembly Headloss Equations

Model Series	Equation	Operating Range, gpm (L/sec)
V4400A	$H_L = 0.085 \times Q^{1.45}$	10 - 40 (0.63 – 2.52)
V4600A	$H_L = 0.085 \times Q^{1.58}$	10 - 25 (0.63 – 1.57)
V6400A	$H_L = 0.0045 \times Q^2 + 3.5 \times (1 - e^{-0.06Q})$	15 - 70 (0.95 – 4.42)
V6600A	$H_L = 0.0049 \times Q^2 + 5.5 \times (1 - e^{-0.1Q})$	15 - 70 (0.95 – 4.42)



AdvanTex® AX100 Textile Filter

Applications

Orenco's AdvanTex® AX100 Treatment System is an innovative technology for onsite treatment of domestic-strength wastewater. The heart of the system is the AdvanTex Filter, a sturdy, watertight fiberglass basin filled with an engineered textile material. This lightweight, highly absorbent textile material treats a tremendous amount of wastewater in a small space. AX100 Treatment Systems are ideal for:

- New construction
- System upgrades and repairs
- Small sites
- Poor soils
- Pretreatment
- Nitrogen reduction
- Price-sensitive markets

For sizing, see AdvanTex® Design Criteria (NDA-ATX-COMM-1-PKG).



The heart of the AdvanTex® AX100 Treatment System is this sturdy, watertight fiberglass basin filled with an engineered textile material.

Features/Specifications

To specify this product, require the following:

- Wastewater treatment to better than secondary treatment standards
- Consistent treatment, even during peak flows
- Timer operation for flow monitoring, flow modulation, and surge control
- Fixed-film, engineered textile media, operated in an unsaturated condition
- Consistent media quality
- Low energy consumption
- Low maintenance requirements
- Complete pre-manufactured package, ready to install
- Watertight construction, corrosion-proof materials, and components
- Foam-core lid provides insulation value of R-6 (RSI-1.1)
- Quiet operation

Standard Model

AX100

Specifications**

Length, in. (mm)	191 (4851)
Width, in. (mm)	94 (2388)
Height, in. (mm)	42 (1067)
Area (footprint), ft ² (m ²)	128 (11.9)
Dry Weight, lb (kg)	1616 (733)

* Covered by U.S. patent numbers 6,540,920; 6,372,137; 5,531,894; 5,480,561; 5,360,556

** Nominal values provided. See AdvanTex® Treatment System drawings for exact dimensions.

AdvanTex[®] Vent Fan Assembly

Applications

Oreco's AdvanTex[®] Vent Fan Assembly consists of a water-proof fiberglass enclosure with equipment for venting onsite wastewater treatment systems. One enclosure can hold a vent fan with carbon filter and an optional heater.

The vent fan is used in commercial-sized AdvanTex Treatment Systems to gently pull air through the textile media, ensuring that adequate oxygen is available for biological treatment. The carbon filter scrubs the air that the system exhausts. An optional heater can be added where climate requires heating of the air that enters the AdvanTex textile filter pods.



Standard Models

AXVFACF — AX above ground Vent Fan Assembly with LMF-3 Fan

AXVFACF-HT — AX above ground Vent Fan Assembly with LMF-3 Fan and HT10 Heater

Enclosure

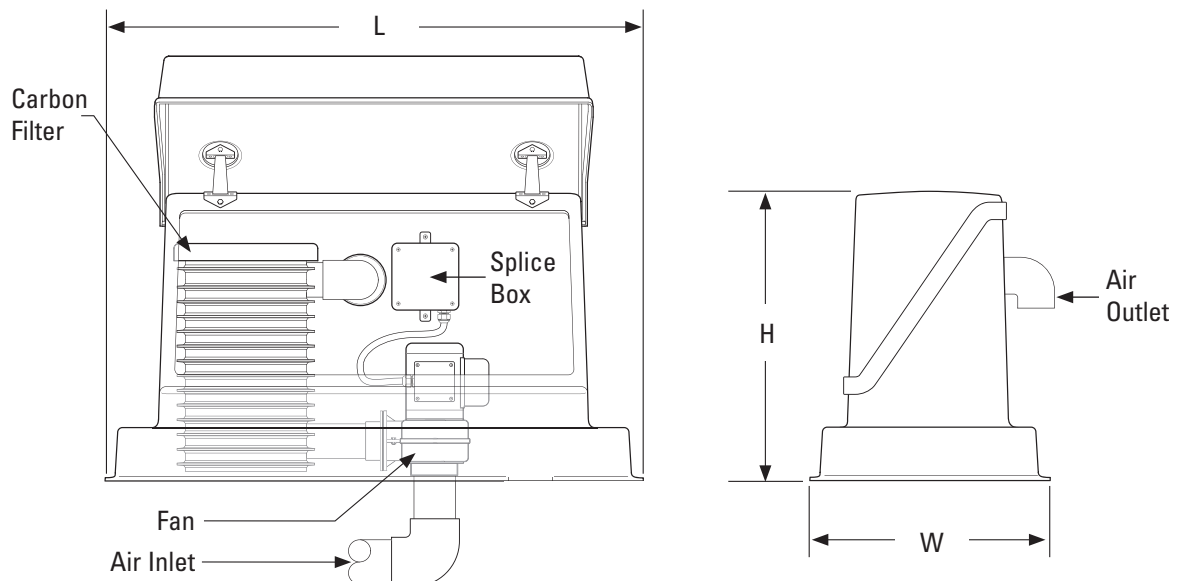
Physical Specifications

Materials of Construction

Shell	Fiberglass-reinforced polyester (FRP)
Hardware	Stainless steel
Exterior finish	Green, textured, UV resistant
Straps	Nylon

Dimensions

Length (L)	50 in. (1270 mm)
Width (W)	24 in. (610 mm)
Height (H)	30 in. (762 mm)
Volume	15.1 ft ³ (0.43 m ³)
Area (footprint)	8.3 ft ² (0.77 m ²)



AdvanTex® Vent Fan Assembly (continued)

Fan

Physical Specifications

Dimensions

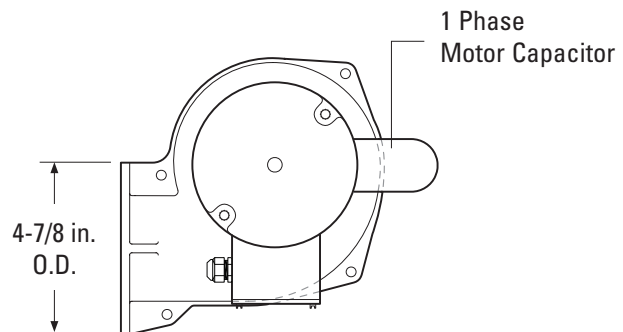
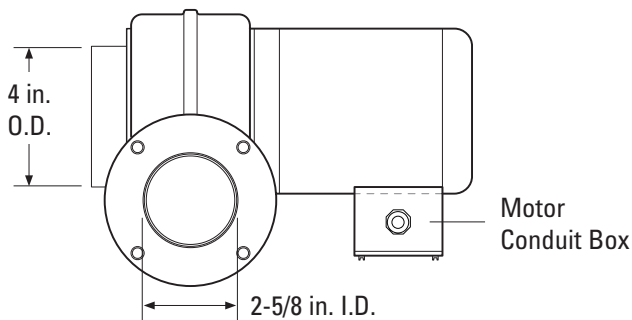
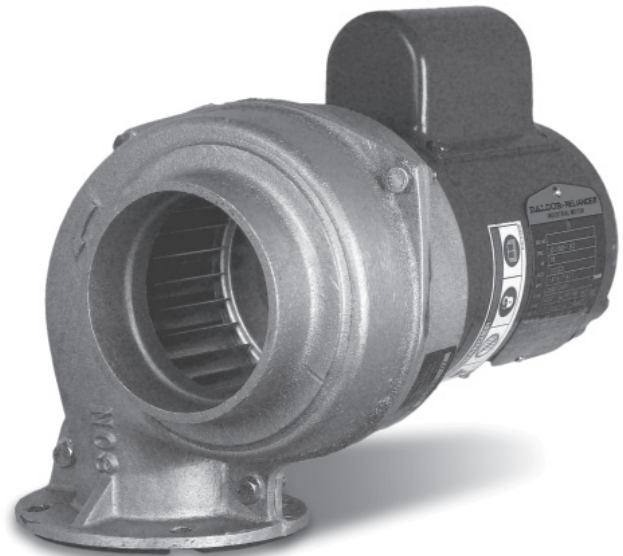
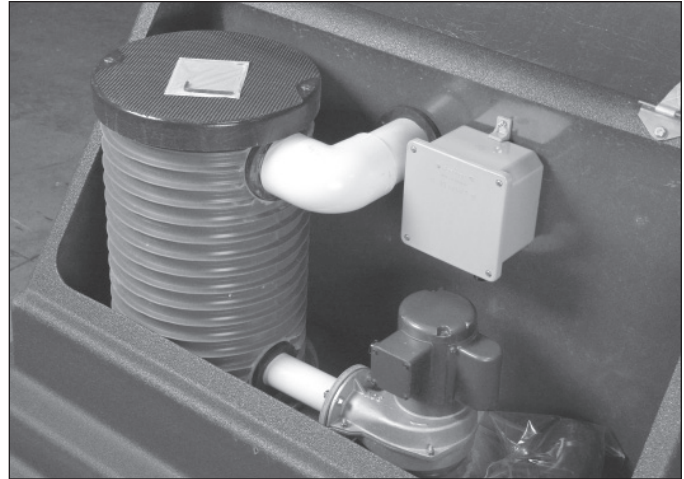
Inlet O.D.	4 in. (100 mm)
Inlet nominal pipe size	4 in. (100 mm)
Outlet I.D.	2-5/8 in. (67 mm)
Outlet Flange O.D.	4-7/8 in. (124 mm)

Materials of Construction

Housing	Aluminum
Wheel	Steel

Performance Data

	60 Hz	50 Hz
Horsepower (kW)	0.08 (0.06 kW)	0.08 (0.06 kW)
Phase	1 phase	1 phase
Volts	115/230	110/220
Amperage	1.4 A/0.7 A	1.8 A/0.9 A
RPM	3400	2900
CFM at 0" H ₂ O static pressure	245	205
CFM at 0.4" H ₂ O static pressure	220	170
CFM at 0.8" H ₂ O static pressure	190	130
CFM at 1.5" H ₂ O static pressure	120	N/A



AdvanTex® Vent Fan Assembly (continued)

Carbon Filter Basin

Physical Specifications

Dimensions

Outlet diameter	Accepts nominal 3-in. PVC pipe
Inlet diameter	Accepts nominal 2-in. PVC pipe
Height	21.5 in. (546 mm)
Diameter	12 in. (305 mm)

Materials of Construction

Housing	PVC
Bottom	Fiberglass-reinforced polyester (FRP)
Interior supports	Polypropylene grid and polyethylene screen
Support rings	PVC
Lid	Fiberglass
Fill material	Activated carbon



Heater (Optional)

Physical Specifications

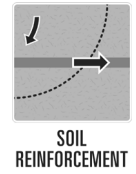
Dimensions

Outlet diameter	Fits nominal 3-in. Class 125 PVC pipe
Length (inlet to outlet)	11.75 in. (297 mm)
Width	11.25 in. (286 mm)
Depth	8.25 in. (210 mm)

Performance Data

Watts	1000
Volts	120
Amps	8.3





Miragrid® 22XT

Miragrid® 22XT geogrid is composed of high molecular weight, high tenacity polyester multifilament yarns woven in tension and finished with a PVC coating. Miragrid® 22XT geogrid is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Miragrid 22XT geogrid is used as soil reinforcement in MSE structures such as segmental retaining walls, precast modular block walls, wire faced walls, geosynthetic wrapped faced walls and steepened slopes. Miragrid 22XT is also used in MSE stabilized platforms for voids bridging, embankments on soft soils, landfill veneer stability, reducing differential settlement and for foundation seismic stability.

TenCate Geosynthetics Americas is accredited by Geosynthetic Accreditation Institute – Laboratory Accreditation Program ([GAI-LAP](#)).

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE
			MD
Tensile Strength @ Ultimate	ASTM D6637 (Method B)	lbs/ft (kN/m)	20559 (300.0)
Tensile Strength @ 5% strain	ASTM D6637 (Method B)	lbs/ft (kN/m)	6700 (97.8)
Mass/Unit Area ¹	(ASTM D5261)	oz/yd ² (g/m ²)	28.2 (956)
			MINIMUM ROLL VALUE
Creep Rupture Strength ²	ASTM D5262/D6992	lbs/ft (kN/m)	14277 (208.3)
Long Term Design Strength ³		lbs/ft (kN/m)	12361 (180.4)
PHYSICAL PROPERTIES		UNIT	ROLL CHARACTERISTIC
Roll Dimensions ⁴ (width x length)		ft (m)	12 x 200 (3.6 x 61)
Roll Area		yd ² (m ²)	267 (220)
Estimated Roll Weight		lbs (kg)	470 (213)
Label Roll Color			WHITE

¹ Typical Value

² 75-year design life based on NTPEP Report [REGEO-2016-01-069](#).

³ Long Term Design Strength for sand, silt, clay. $RF_{CR} = 1.44$; $RF_{ID} = 1.05$; $RF_D = 1.1$ (Installation damage reduction factor for other soils available upon request).

⁴ Special order roll lengths are available upon request

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FGS000105
ETQR19



MYERS[®]
MODEL SRM4
4/10 HORSEPOWER
RESIDENTIAL SEWAGE PUMP



MYERS® MODEL SRM4 Residential Sewage Pump

The Right Choice

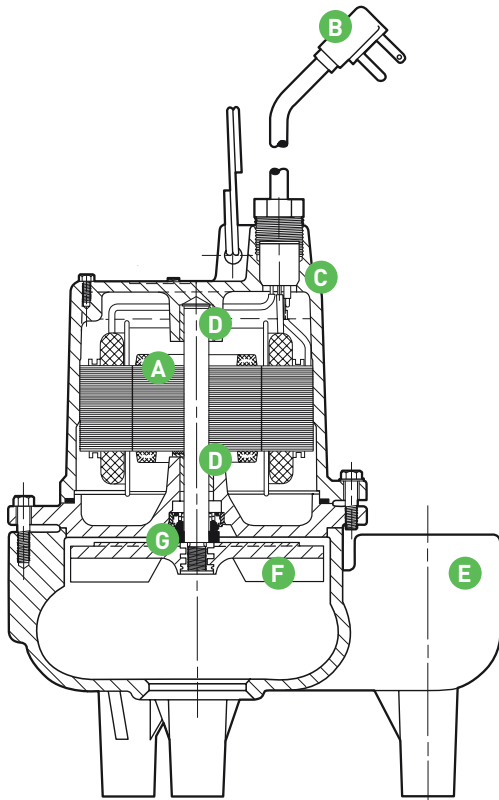
The SRM4 solids handling pump is the most reliable 4/10 horsepower residential sewage pump available today. The SRM4 is a plumbers/contractors dream! Its recessed impeller design allows 2" solids to pass freely through the volute without the chance of jamming the impeller. The SRM4 series pump has a national field-proven record of reliability. Look to your Myers distributor for the answer to your residential sewage handling needs ... and across the counter will be the Myers mini solids handling, the SRM4. It works for you! For more information, call your Myers distributor today, or the Myers Ohio sales office at 419-289-6898.



Product Capabilities		
Capacities To	95 gpm	360 lpm
Heads To	18 ft. 19 ft. shutoff	5.5 m 5.8 m
Pump Down Range Float Switch	7 to 14 in.	178 to 356 mm
Solids Handling Capacity	2 in.	50.8 mm
Liquids Handling	raw sewage, effluent, drain water	
Intermittent Liquid Temp.	up to 140°F	up to 60°C
Motor Electrical Data	4/10 HP shaded pole 1650 RPM	
Electrical	115V, 12A or 230V, 6A, 1Ø, 60 Hz.	
Acceptable pH Range	6 - 9	
Discharge, NPT	2 in.	50.8 mm
Min. Sump Diameter		
Simplex	18 in.	457 mm
Duplex	30 in.	762 mm

Note: Consult factory for applications outside these recommendations.

Pump Features and Applications



A. 4/10 HP Motor

Pressed in place and oil-filled for best alignment and heat transfer. Built-in overload protection.

B. Power Cord

Quick-disconnect watertight fitting.

C. Motor Housing

Heavy cast iron for efficient heat transfer.

D. Dual Thrust Washers, Sleeve Bearings

Oil lubricated, enhance smooth operation and extend pump life..

E. Cast Iron Volute

Passes 2" diameter solids.

F. Recessed Impeller

Operates out of volute passage, allowing maximum flow of liquids and solids.

G. Mechanical Shaft Seal

Carbon and ceramic faces, body is stationary, prevents string or trash from winding on seal..

Mechanical Float Switch

Mercury-free, 90° angle operation. (Piggyback models only).

Durable Motor Will Deliver Many Years Of Reliable Service.

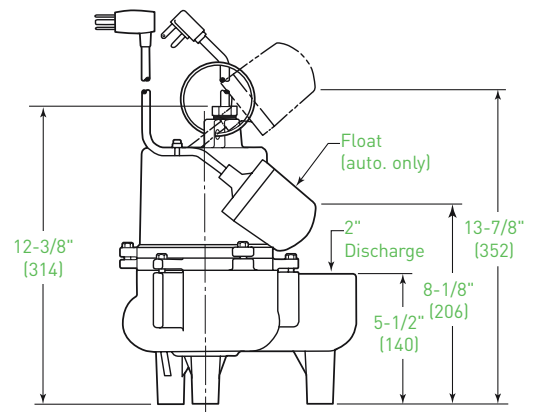
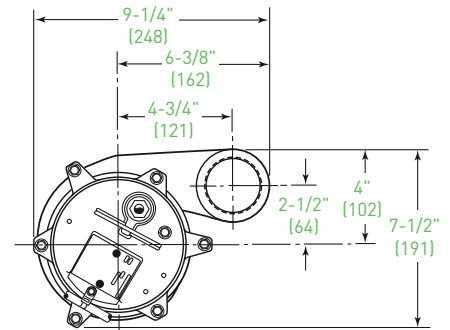
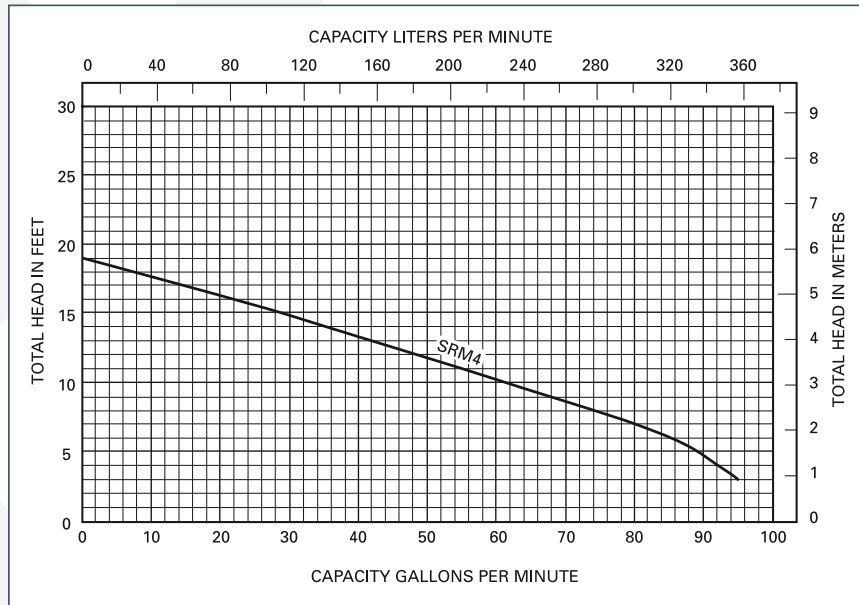
- Oil-filled motor for maximum heat dissipation and continuous bearing lubrication.
- Overload protected shaded pole motor eliminates starting switches.
- Recessed vortex impeller provides minimal radial loading for long bearing life.

The SRM4P Is Engineered For Many Years Of Maintenance-Free Operation.

- Wide-angle piggy-back float switch for maximum draw down. (Automatic models.)
- Pump can be operated manually by unplugging piggy-back switch and plugging pump directly into outlet (Automatic models).
- Recessed vortex impeller operates completely out of volute and provides free flow through passage for solids and liquids.

Performance Data and Dimensions [Dimensions in mm]

1650 RPM



740 EAST 9TH STREET,
ASHLAND, OHIO 44805
WWW.FEMYERS.COM

269 TRILLIUM DRIVE, KITCHENER,
ONTARIO, CANADA N2G 4W5
WWW.FEMYERS.COM

Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.
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January 13, 2023

David T. Bray, PLS
President
Caputo & Wick LTD
1150 Pawtucket Ave.
Rumford, RI 02916-1897
Phone: (401) 434-8880

RE: Burlingame State Park and Camp Ground, Charlestown, RI

Dear Mr. Bray:

This letter will confirm that you have been trained and certified to design GST™ Leaching Systems by Geomatrix Systems, LLC ("Geomatrix") in the State of Rhode Island.

This letter also confirms that Geomatrix has reviewed the design of the GST Leaching System proposed for installation at Burlingame State Park and Camp Ground, Charlestown, RI and found the site and design to be suitable and in compliance with the approved design manuals for the aforementioned product.

If you have any questions, please contact me.

Sincerely,
GEOMATRIX SYSTEMS, LLC

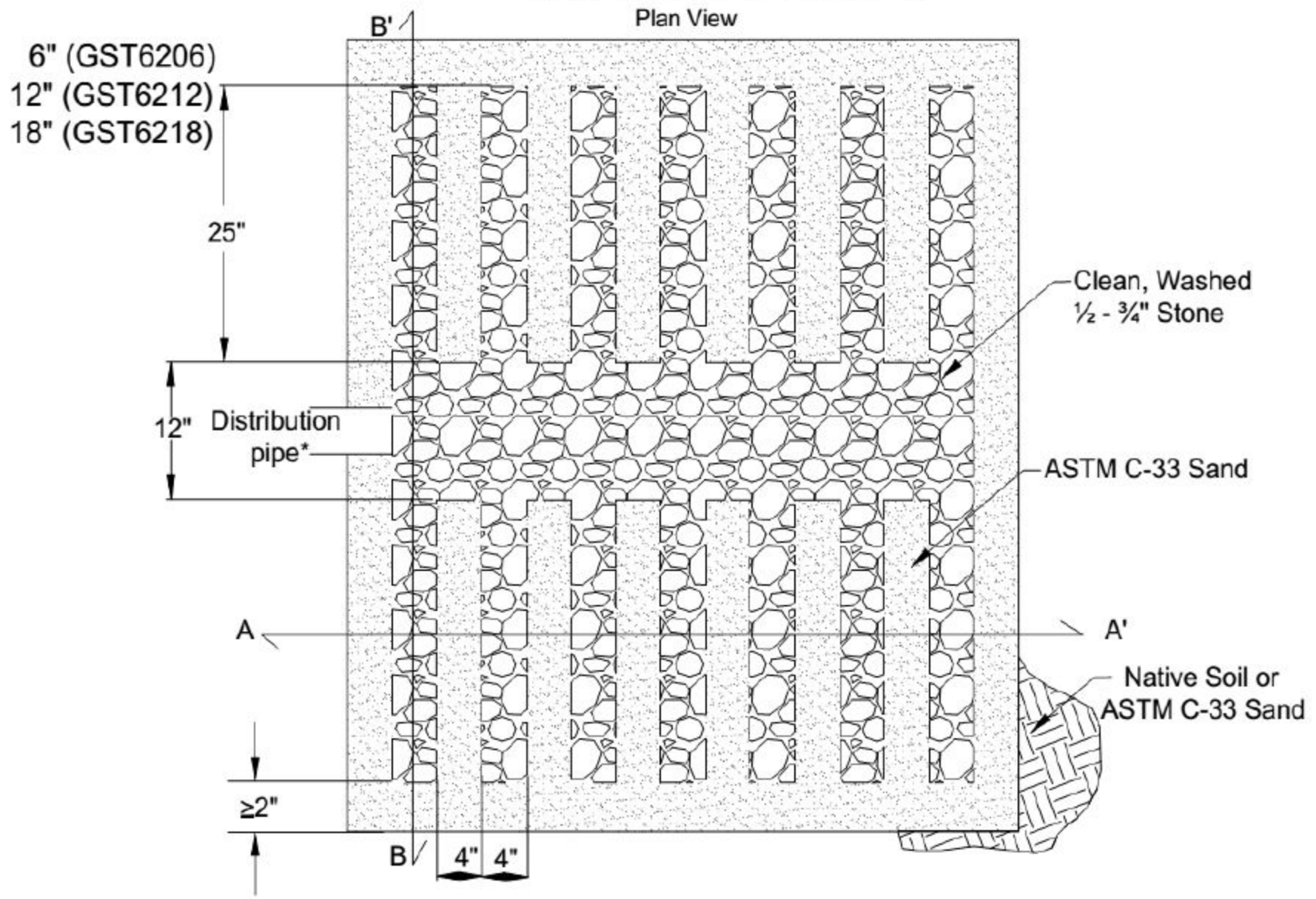
A handwritten signature in black ink that reads "David Jewett". The signature is written in a cursive, flowing style.

David Jewett

Geomatrix Systems, LLC
114 Mill Rock Road East - Old Saybrook, CT 06475
Phone: 860-510-0730 – Fax: 860-510-0735

GST Schematics

GST™ LEACHING SYSTEM



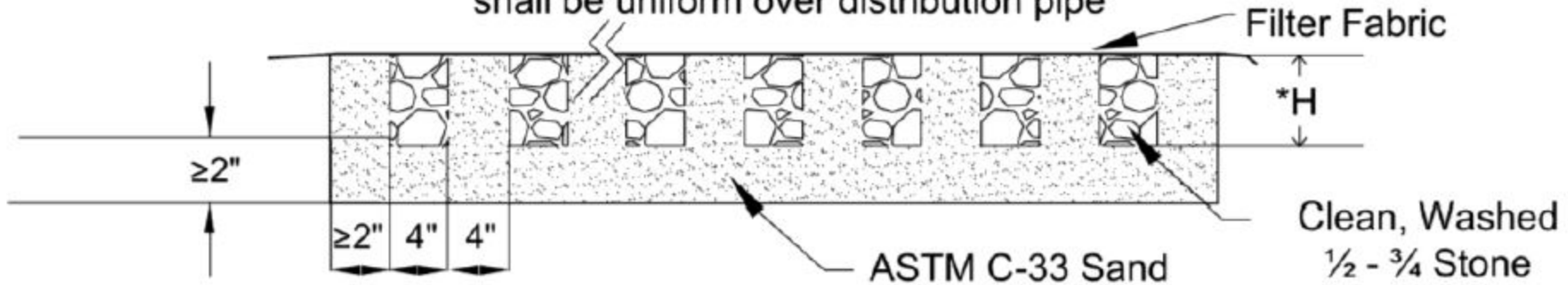
* Distribution pipe for gravity systems shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

GEOMATRIX GST™ LEACHING SYSTEM

A-A' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



*H= 6" (GST6206)

12" (GST6212)

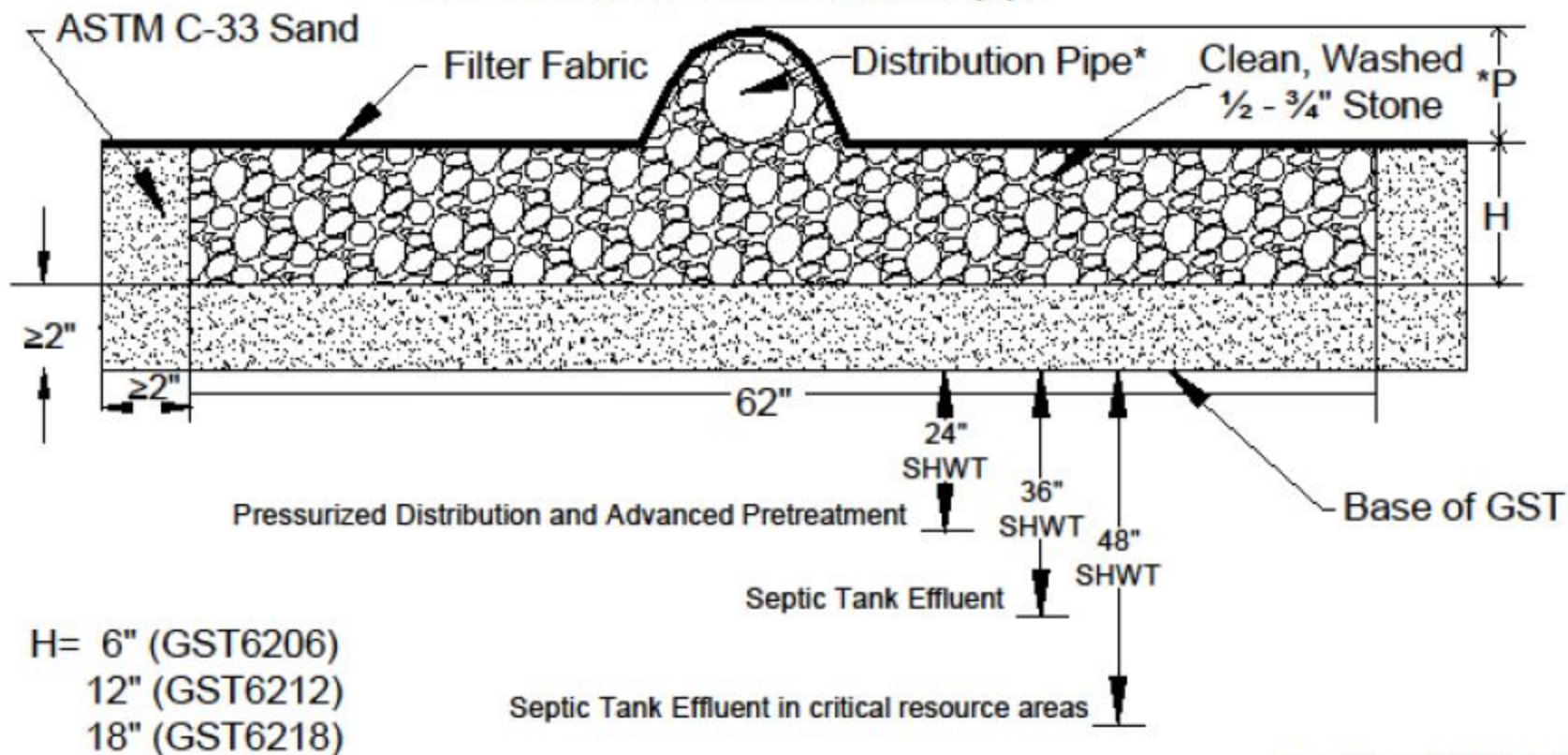
18" (GST6218)

GST™ LEACHING SYSTEM

B-B' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



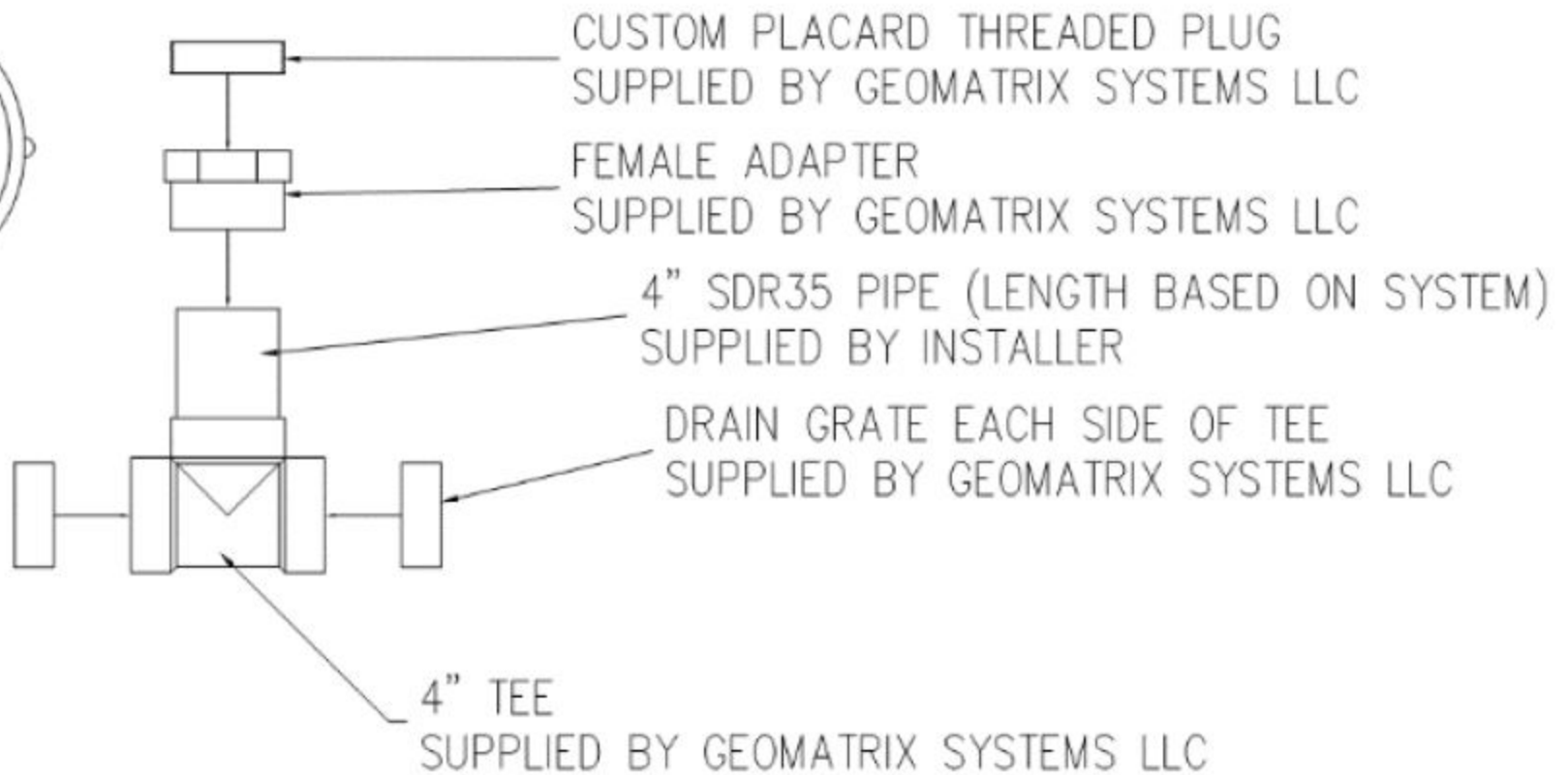
* Distribution pipe for gravity applications shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the
Design, Use and Maintenance of Pressurized Drainfields

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patents: www.geomatrixsystems.com

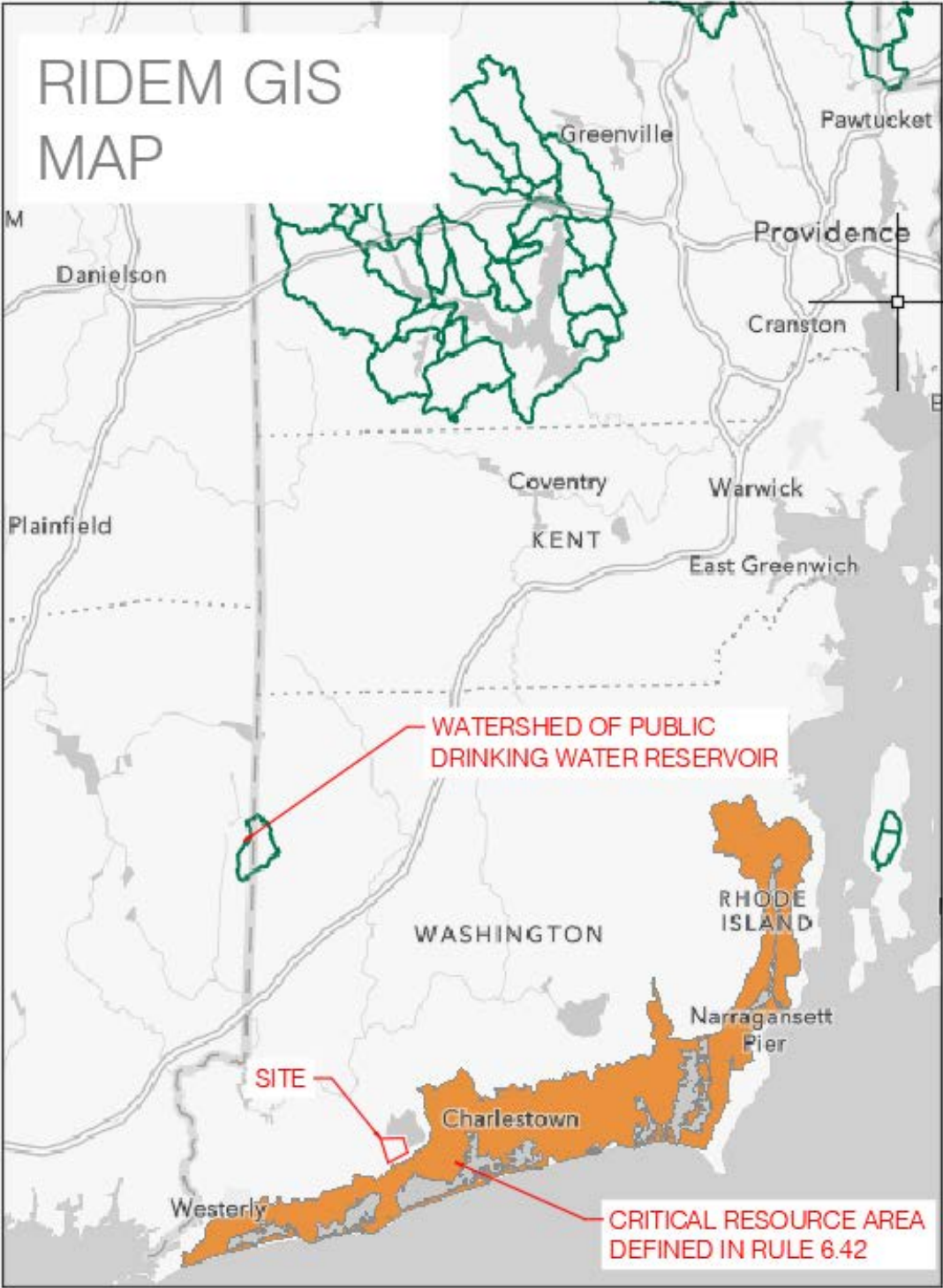
GST LEACHING SYSTEM
B-B' Cross Section
Geomatrix Systems, LLC., Old Saybrook, CT
860-510-0730

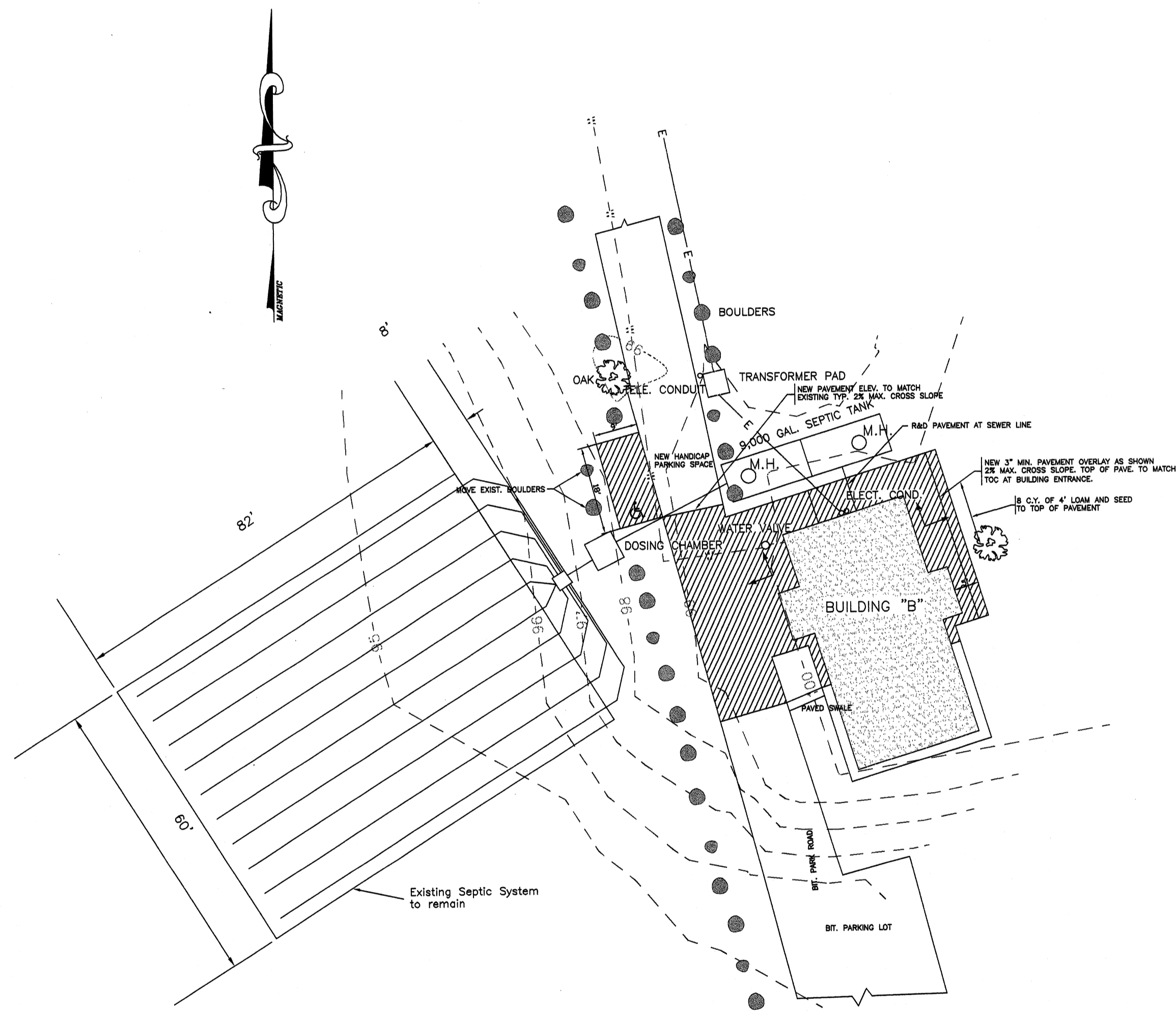
SCALE	None	REV.	0
DATE	9-4-2018	ACAD No.	040 GLS B-B'.DWG
DRAWN BY:	ERP	SHEET	3 Of 3

GEOMATRIX GST™ LEACHING SYSTEM INSPECTION PORT DETAIL



GST LEACHING SYSTEM			
Inspection Port Detail			
Geomatrix Systems, LLC., Old Saybrook, CT			
860-510-0730			
SCALE	None	REV.	A
DATE	6/2/2015	ACAD No.	GSTIP.DWG
DRAWN BY:	ERP	SHEET	1 OF 1

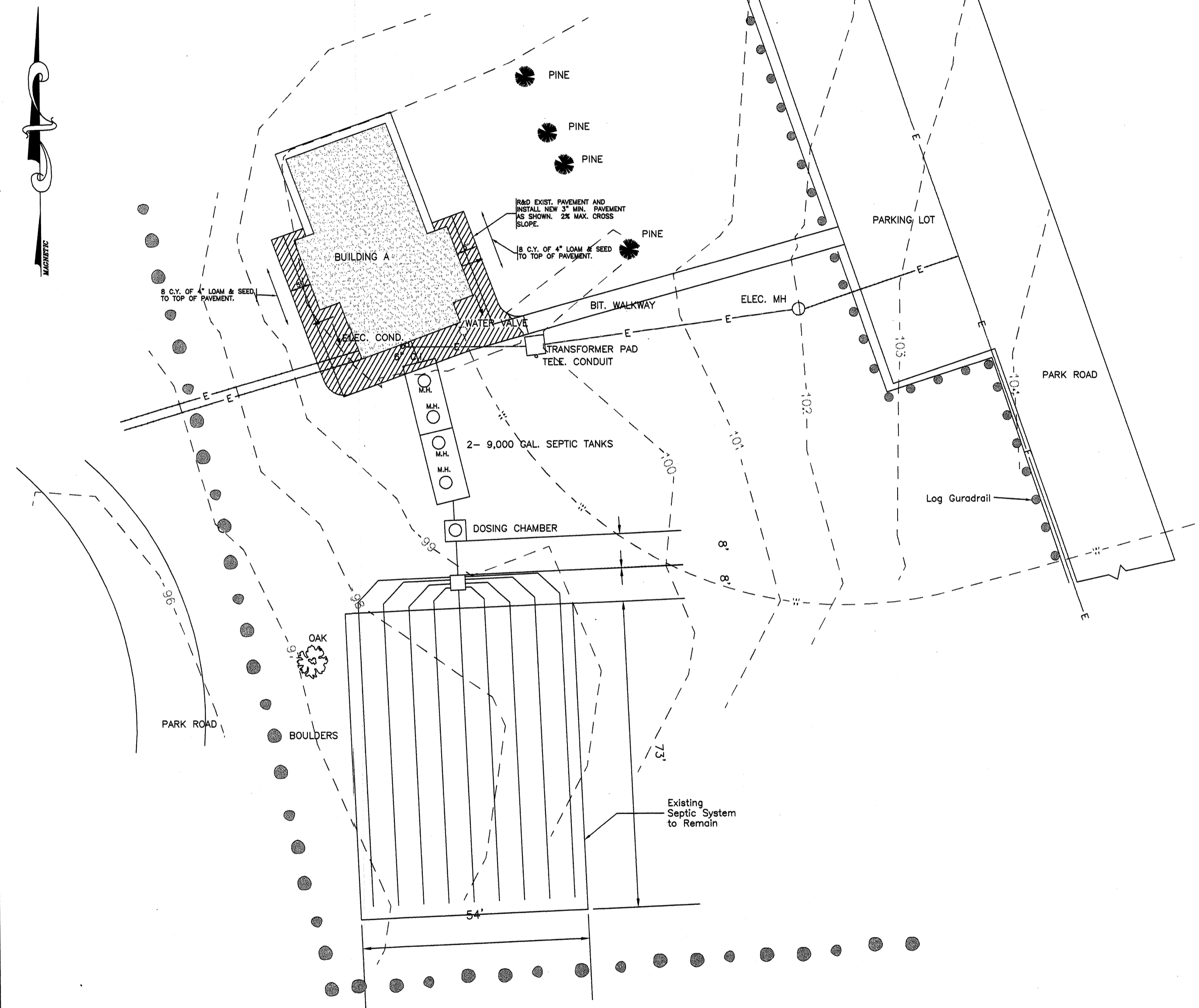




Site Plan Building "B"
Scale: 1" = 20'

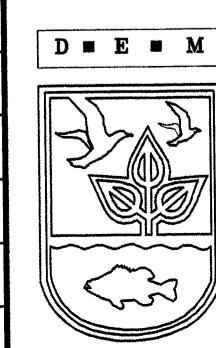
Notes:

1. All features shown are existing unless noted otherwise.
2. Locations of all utilities shown are approximate, Contractor to verify exact locations of all utilities in the field, both overhead and underground, with DIGSAFE. Any damage to utilities shall be the Contractor's responsibility.
3. Construction work area is 20' outside of building, walkway to parking area, and parking area.
4. Contractor must restore the site to it's original condition at the completion of all work. Any grassed areas to be loamed and seeded with 4" min. loam. Any pavement areas to be repaved per the specifications.
5. Each utility company is to be notified at least 24 hrs. before any work impacting their utilities begins.
6. adjust valve covers and M.H. covers to new grade as required.



Site Plan Building "A"
Scale: 1" = 20'

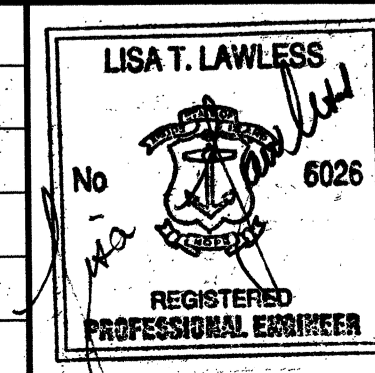
No.	Description	Date
REVISIONS:		



STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

RENOVATIONS TO A&B TOLIETS
BURLINGAME STATE PARK
CHARLESTOWN, RI

Design by: LL
Drawn by: CVP
Checked by: LL
Date: JUNE 2002
Scale: 1"=20'
Project No.:



SITE PLANS
BUILDINGS A & B

C2
SHEET OF



“Fish Camp Bathhouse and Onsite Wastewater Treatment System Replacement”

For

Rhode Island Department of Environmental Management
Burlingame State Park and Campground

Burlingame Park Road
Charlestown, Rhode Island

Assessors Map 15 – Lot 10
Area: 847 Acres±

July 2022
Rev.: March 2023

Prepared by

Caputo & Wick Ltd.
1150 Pawtucket Avenue
Rumford, Rhode Island 02916-1897
401-434-8880



RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ON-SITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT

www.dem.ri.gov/septic



MAR - 8 2023

FOR RIDEM USE ONLY

APPLICATION No. 2205-1141 DATE RECEIVED 08/29/22 AMOUNT RECEIVED \$ Waived CHECK # 02A NOTE 02A

Office of Water Resources

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- NEW BUILDING CONSTRUCTION
- ALTERATION
- REPAIR
- TRANSFER
- A/E TECHNOLOGY TYPE 2207-27
- VARIANCE
- REDESIGN
- JOINT OWTS / WETLANDS PD

CERTIFICATION

I, Kevin Hood (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

Designer's Signature Kevin Hood License # 22155

Designer's Email Kevin.Hood@dem.ri.gov Phone # 401-222-4700

Business/Company Name CONSTRUCTION WORK LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

SITE INFORMATION

BIRCHGAMME STATE PARK AND CAMP GROUND
1210 BIRCHGAMME PARK ROAD CHARGE TOWN
NO. STREET CITY/TOWN POLE #
PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.
LOT SIZE 847 SF/ACRES
SUBDIVISION NAME N.A.
SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

OWNER INFORMATION

STATE OF R.I. DEM
LAST NAME FIRST NAME M.I.
225 PROMENADE ST. PROVIDENCE 02109
NO. STREET CITY/TOWN ZIP CODE

Owner's Phone Number (401) 222-4700 ext. 2774307

Owner's Email MEGAN.DIPETE@DEM.RI.GOV

Owner(s) Signature M.Dipete

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other

Per attached testing reports

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1141
DEPTH TO APPROVED WATER TABLE 120" HOW DETERMINED SOIL EVALUATION
TEST HOLE # 26 DATE EXCAVATED 1/17/21 WETLANDS within 200' OF OWTS YES NO
WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE 1/1/22
LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial _____
 Other BATHHOUSE
WATER SUPPLY: public water public well private well
OF DESIGN UNITS 15
UNIT DESIGN FLOW 50 gallons per 1 (unit) TOTAL DAILY FLOW 7,500 gallons
TANK SIZE 15,000 gallons DESIGN LOADING RATE 3.5 gpd/sf
MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet
LEACHFIELD TYPE GRAVEL SAND TREATMENT (S.T.)
TOTAL AREA OF LEACHFIELD PROVIDED 5,040 square feet

Signature of RIDEM Official _____ Date of Approval 3/15/23 Date of Expiration 3/15/25

DESIGNER



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**



www.dem.ri.gov/septic

FOR RIDEM USE ONLY

APPLICATION No. _____ DATE RECEIVED ____/____/____ AMOUNT RECEIVED \$ _____ CHECK # _____ NOTE _____

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- NEW BUILDING CONSTRUCTION
- ALTERATION
- REPAIR
- TRANSFER

- A/E TECHNOLOGY TYPE ORENCO AX100/GST
- VARIANCE
- REDESIGN
- JOINT OWTS / WETLANDS PD

CERTIFICATION

I, KEVIN HARROP (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

Designer's Signature Kevin Harrop License # D 3155

Designer's Email kharpopa@cw1fd.net Phone # 401-434-8880

Business/Company Name CAPUTO and WICK LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

Owner's Phone Number (401) 222-4700 ext. 2774307

Owner's Email MEGAN.DIPRETE@DEM.RI.GOV

Owner(s) Signature _____

SITE INFORMATION

BURLINGAME STATE PARK AND CAMPGROUND (FISHCAM)
1-100 BURLINGAME PARK ROAD CHARLESTOWN

NO. STREET _____ CITY/TOWN _____ POLE # _____

PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.

LOT SIZE 847 SF/ACRES

SUBDIVISION NAME N.A.

SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

OWNER INFORMATION

STATE OF R.I. DEM
LAST NAME _____ FIRST NAME _____ M.I. _____
235 PROMENADE ST. PROVIDENCE 02908
NO. STREET _____ CITY/TOWN _____ ZIP CODE _____

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1141

DEPTH TO APPROVED WATER TABLE 120" HOW DETERMINED SOIL EVALUATION

TEST HOLE # 28 DATE EXCAVATED 8/17/21 WETLANDS within 200' OF OWTS YES NO

WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE ____/____/____

LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial _____
 Other BATHHOUSE

WATER SUPPLY: public water public well private well

OF DESIGN UNITS 150

UNIT DESIGN FLOW 50 gallons per-SITE (unit) TOTAL DAILY FLOW 7,500 gallons

TANK SIZE 15,000 gallons DESIGN LOADING RATE 3.5 gpd/sf

MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet

LEACHFIELD TYPE GRAVEL SAND TREATMENT (GST)

TOTAL AREA OF LEACHFIELD PROVIDED 5,040 square feet

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other _____

Signature of RIDEM Official _____ Date of Approval _____ Date of Expiration _____



RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

OFFICE OF WATER RESOURCES
235 Promenade Street, Providence, Rhode Island 02908

March 15, 2023

State of Rhode Island
Rhode Island Department of Environmental Management Division of Planning and Development
235 Promenade Street
Providence, RI 02908

RE: Fish Camp Bathhouse
Burlingame State Park and Campground
Charlestown, RI
OWTS Application No. 2205-1141

Dear Applicant:

Attached herewith are revised monitoring and reporting requirements applicable to the above listed permit. As you are aware the above listed Onsite Wastewater Treatment System (OWTS) permit is granted based on a maximum daily design flow of **7,500** gallons per day and includes 1 - 15,000 gallon septic tank, 1 - 7,500 gallon anoxic tank, 1 - 6,000 gallon recirculation tank, 2 - Advantex AX 100 filter pods followed by a 6 x 6 pump chamber to a Gravel Sand Treatment (GST) type of leaching system.

Advanced treatment systems are utilized to mitigate against possible adverse impacts of residual onsite wastewater pollutants on groundwater quality and surface water quality. Owners of advanced OWTSs with design flows $\geq 2,000$ gallons per day are subject to regular monitoring and reporting. The following stipulations now apply to your permit:

1. The following discharge limits as measured at the 6 x 6 pump chamber shall apply:

Orengo Systems, Inc. AdvanTex AX-100 – Mode 1
Biochemical Oxygen Demand (5 Day) ≤ 20 mg/L
Total Suspended Solids ≤ 20 mg/L
Oil & Grease ≤ 5 mg/L

2. Wastewater flow shall not exceed a maximum daily flow of **7,500** gallons per day. Wastewater flow shall be monitored and recorded to ensure compliance with this stipulation.
3. Sampling and testing shall be conducted quarterly at the compliance point specified in Item 1 above. Sampling and measurements shall be representative of the monitored activity. The Permittee shall sample and test the wastewater in each system as follows:

Dissolved Oxygen (mg/L) – *Field Test*
Effluent Temperature (°F) – *Field Test*
pH (s.u.) – *Field Test*
Biochemical Oxygen Demand (5-Day) (mg/L)
Total Suspended Solids (mg/L)
Oil and Grease (mg/L)
Alkalinity (mg/L)

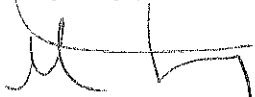
4. Corrective Action – Corrective action must be taken as soon as practicable following receipt of monitoring results which indicate that system modifications or maintenance is required. The system must be resampled no sooner than seven (7) days after any adjustment is made to the system and within thirty (30) days of the routine quarterly sample date. Samples must be analyzed for each of the parameters listed in Item 3 for any post corrective action sampling events.
5. Annual Report – All monitoring results including wastewater flow data shall be submitted to the DEM in the form of an annual report. The annual report is due **February 15th** of each year. The annual report must summarize all monitoring results and corrective actions implemented during the previous calendar year. A clear determination regarding the compliance status of the OWTS must be made as part of the annual report. The annual report must include a copy of the most recent Operation and Maintenance Contract as proof of compliance with this requirement.
6. The Permittee shall properly operate and maintain all facilities and equipment associated with the OWTS in accordance with the most recent operation and maintenance (O&M) plan. The O&M plan specifies procedures for operation, process control, record keeping, monitoring, weekly maintenance checks, other routine and periodic maintenance, safety and security. Also, the O&M plan includes a contingency plan to address emergency actions and procedures in the event of equipment failure and power loss.
7. Your permit approval is for the discharge of sanitary waste only. No toxic, hazardous or industrial processing waste may be discharged into the system.
8. All septage, sludges, screenings or other pollutants removed from the system shall be disposed in accordance with all applicable state and federal laws.
9. The permit may be automatically transferred by the Permittee to a new owner provided:
 - a. The current Permittee notifies the DEM by certified mail at least thirty (30) days in advance of the proposed transfer date;
 - b. The notice includes the name and address of the new Permittee and a written agreement between the existing and new Permittee containing a specific date for the transfer of permit responsibility, surety and liability between them and;
 - c. The DEM does not notify the existing Permittee and the proposed new Permittee of its intent to modify or reissue the permit.
10. The operator or person in responsible charge of the OWTS shall have at a minimum a Rhode Island Class 1 Wastewater Treatment Plant Operator Certification or an equivalent certification from another jurisdiction acceptable to the DEM. If the operator is not employed directly by the Permittee, a service agreement with the operator shall be entered into and continuously maintained, and a copy of the active service agreement shall be submitted to the DEM as part of the annual report.
11. The permit may be modified, suspended, or revoked for cause. The DEM reserves the right to revise the permit to ensure compliance with applicable state and federal regulations. Failure to comply with the conditions of this permit approval letter may result in an enforcement action.

12. The Permittee shall allow the DEM or their authorized representative to access the OWTS and work areas to inspect equipment, practices, records pertinent to this permit and stipulated compliance requirements, and to sample and monitor the wastewater for the purposes of determining compliance.
13. In the event of treatment interruption, bypass or sewage overflow, the Permittee shall notify the DEM verbally within twenty-four (24) hours. Such incident shall be reported in writing within five (5) days after it becomes known to the Permittee, the report shall include the date and time(s) of the incident, the duration of the incident, and actions taken to correct the problem and prevent a reoccurrence.
14. For purposes of notification, monitoring, compliance or inquiries pursuant to this permit, all correspondence, telephone calls and other contacts must reference the OWTS permit number and shall be directed to:

The Rhode Island Department of Environmental Management
Onsite Wastewater Treatment Systems Program
235 Promenade Street
Providence, RI 02908
Telephone: (401) 222-3961
www.dem.ri.gov/septic

Should you have any questions concerning these permit requirements, please contact Tom Angelone by email at tom.angelone@dem.ri.gov or by phone at 401-222-3961, extension 2777607.

Very truly yours,



Mohamed J. Freij, P.E., PLS
Supervising Sanitary Engineer

KF

Enclosure(s)

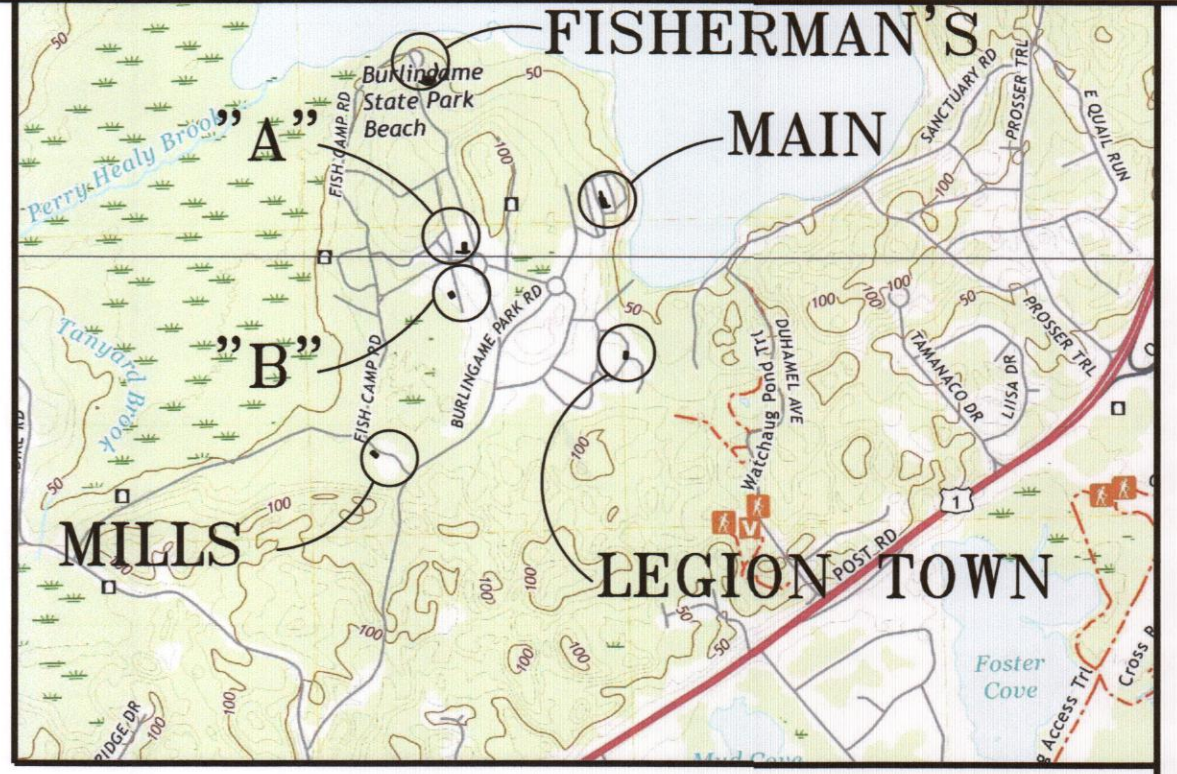
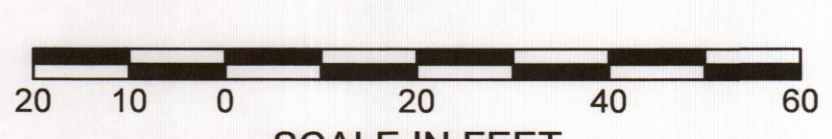
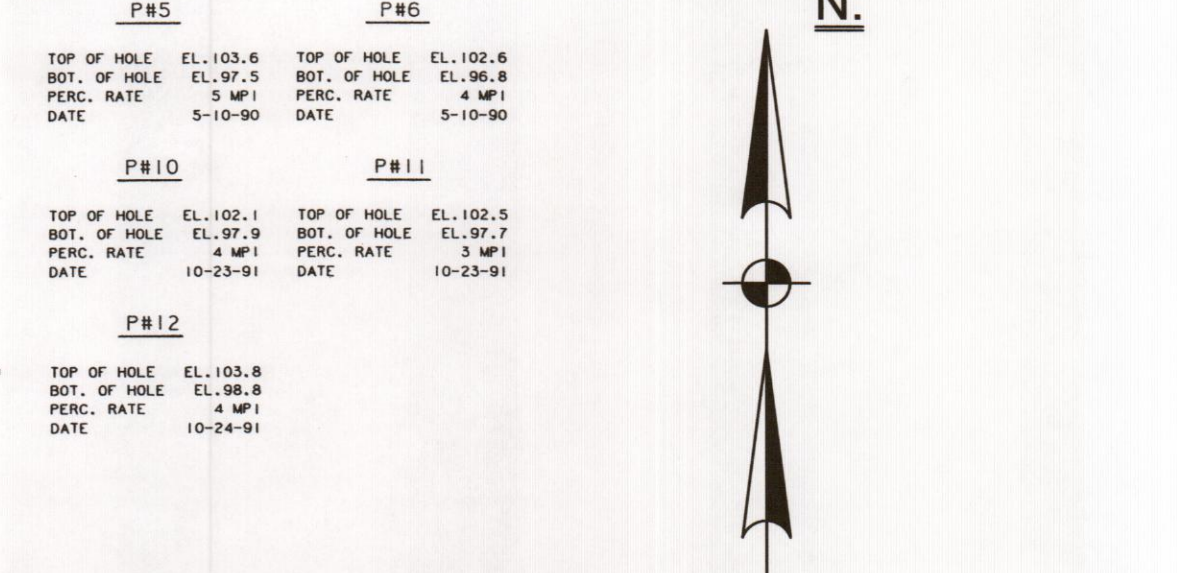
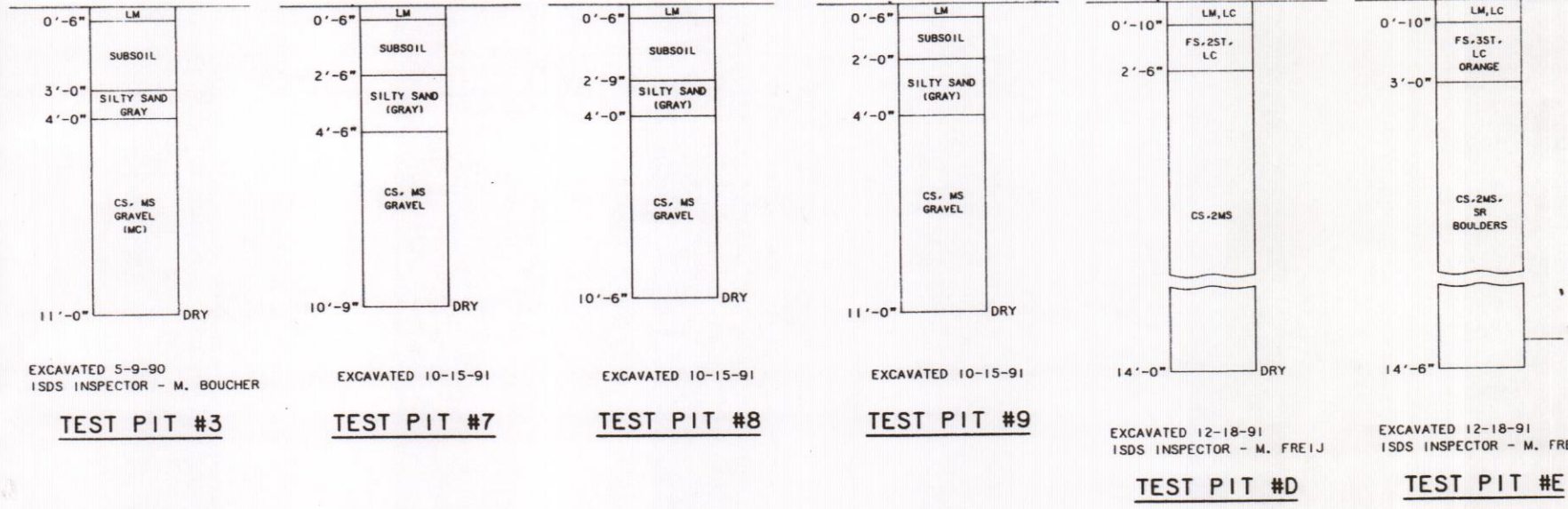
cc: Joseph L. Warner Jr., Charlestown Building Official

TH-2A - GROUND ELEV. 58.0 - AUGUST 17, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 5"	C	S	2.5YR 6/3			La	Zgld	Wf	3
Bw	5" - 29"	C	S	10YR 5/6			La	Zgld	Ff	3
C1	29" - 120"	C	S	2.5YR 7/3			La	Zgld	Ff	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV. 48.0) PERFORMED BY: KAMAL HINGORANT

TH-2B - GROUND ELEV. 62.0 - AUGUST 17, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 8"	C	S	2.5YR 6/3			La	Zgld	Wf	3
Bw	8" - 28"	C	S	10YR 5/6			La	Zgld	Ff	3
C1	28" - 120"	C	S	2.5YR 7/3			La	Zgld	Ff	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV. 52.0) PERFORMED BY: KAMAL HINGORANT



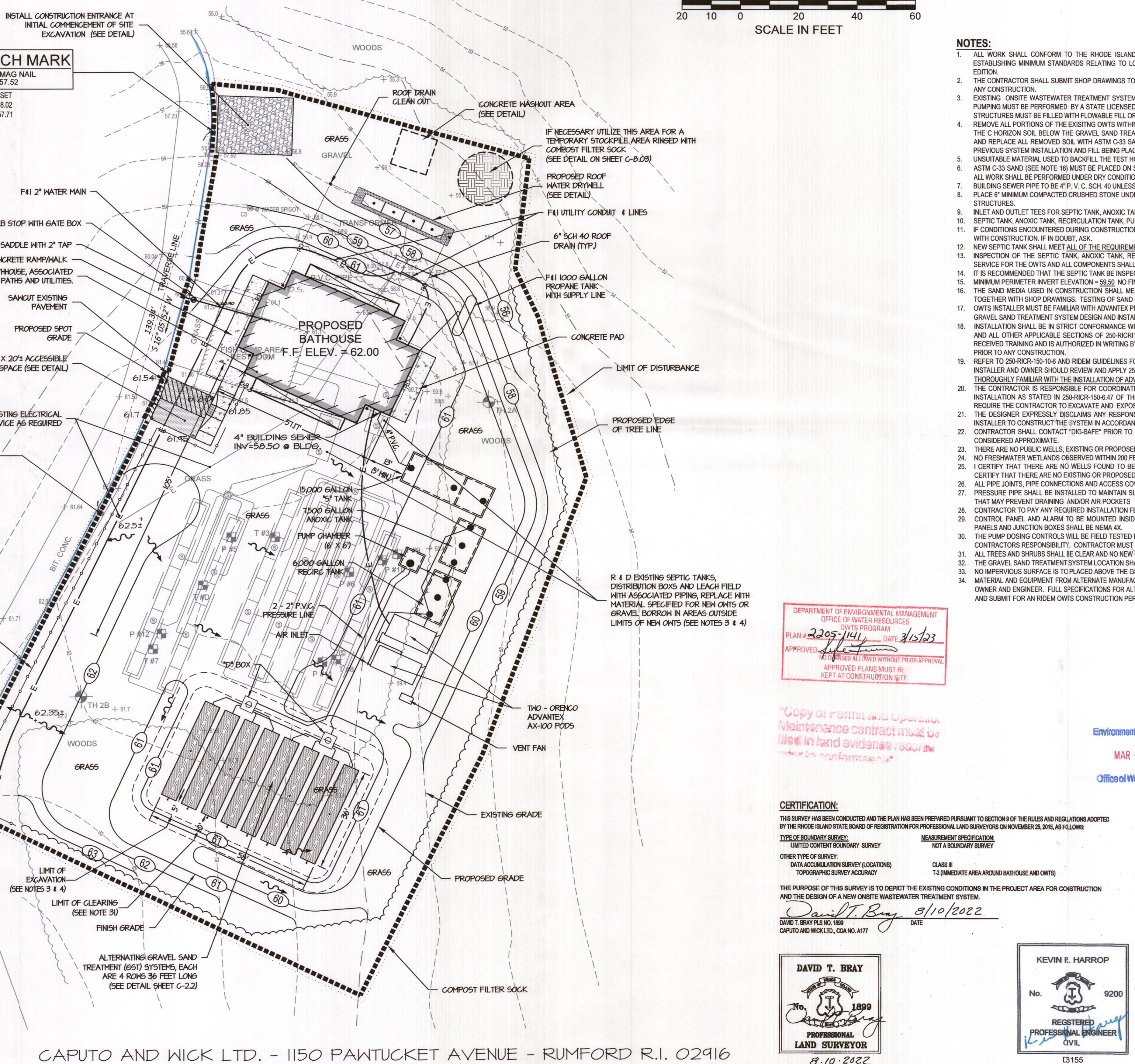
LOCUS MAP

BENCH MARK
TOP OF MAG NAIL
ELEV. = 57.52
MAG NAIL SET
N. 108458.02
E. 273757.71

BENCH MARK
TOP OF MAG NAIL
ELEV. = 62.06
MAG NAIL SET
N. 108324.15
E. 273719.07

LEGEND

100	EXISTING CONTOUR	+ 100.00	FINISHED SPOT GRADE
100	PROPOSED CONTOUR	+ 100.00	EXISTING SPOT GRADE
RI, STD.	RHODE ISLAND STANDARD		SPLIT RAIL FENCE
INV.	INVERT OF PIPE		DEEP OBSERVATION HOLE
P. V. C.	POLYVINYL CHLORIDE PIPE		OUT CROP OR SURFACE ROCK
S. D. R.	STANDARD DIMENSION RATIO		EXIST. UNDERGROUND ELECTRIC
CONC.	CONCRETE		EXIST. WATER
BIT.	BITUMINOUS		EXIST. UNDERGROUND TELEPHONE
TYP.	TYPICAL		FINISH GRADE SURFACE FLOW DIRECTION



- NOTES:**
- ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, OFFICE OF WATER RESOURCES "RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION AND MAINTENANCE OF ONSITE WASTEWATER TREATMENT SYSTEMS", LATEST EDITION.
 - THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL OF ALL PROPOSED CONSTRUCTION MATERIALS AND EQUIPMENT PRIOR TO ANY CONSTRUCTION.
 - EXISTING ONSITE WASTEWATER TREATMENT SYSTEM (OWTS) PRECAST STRUCTURES ARE TO BE PUMPED OUT, RINSED WITH CLEAN WATER AND PUMPED OUT AGAIN. PUMPING MUST BE PERFORMED BY A STATE LICENSED SEPTIC HAULER AND THE CONTENTS OF THE TANK DISPOSED OF PROPERLY. AFTER PUMPING, THE EXISTING OWTS STRUCTURES MUST BE FILLED WITH FLOWABLE FILL OR REMOVED AND REPLACED WITH GRAVEL BORROW AND 4" LOAM AND SEED.
 - REMOVE ALL PORTIONS OF THE EXISTING OWTS WITHIN 5' OF THE GRAVEL SAND TREATMENT SYSTEM; AND ALL FILL A HORIZON SOIL, B HORIZON SOIL AND SCARIFY 3" OF THE C HORIZON SOIL BELOW THE GRAVEL SAND TREATMENT SYSTEM AND THOROUGHLY MIX WITH ASTM C-33 SAND (SEE NOTE 16) TO INTERFACE THE FILL WITH THE SOIL, AND REPLACE ALL REMOVED SOIL WITH ASTM C-33 SAND. A AND B SOIL HORIZON LAYERS ARE TO BE REMOVED IN THIS APPLICATION DUE TO COMPACTION CAUSED BY PREVIOUS SYSTEM INSTALLATION AND FILL BEING PLACED ABOVE.
 - UNSATURABLE MATERIAL USED TO BACKFILL THE TEST HOLES SHALL BE REMOVED AND REPLACED WITH ASTM C-33 SAND (SEE NOTE 16).
 - ASTM C-33 SAND (SEE NOTE 16) MUST BE PLACED ON SCARIFIED, RELATIVELY DRY NATURAL SOIL. THE CONTRACTOR SHALL PROVIDE FOR DETERMINING AS REQUIRED AND ALL WORK SHALL BE PERFORMED UNDER DRY CONDITIONS.
 - BUILDING SEWER PIPE TO BE 4" P.V.C. SCH. 40 UNLESS OTHERWISE NOTED.
 - PLACE 6" MINIMUM COMPACTED CRUSHED STONE UNDER SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER, ADVANTEX TREATMENT TANKS AND SYSTEM STRUCTURES.
 - INLET AND OUTLET TEES FOR SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK AND PUMP CHAMBER ARE TO BE LOCATED DIRECTLY BELOW ACCESS COVERS.
 - SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
 - IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION. IF IN DOUBT, ASK.
 - NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6-27.
 - INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
 - IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
 - MINIMUM PERIMETER INVERT ELEVATION = 59.50. NO FINISHED GRADE BELOW 59.50 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM.
 - THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL DELIVERED TO THE SITE IS REQUIRED.
 - OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEX PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEX INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL, AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
 - INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEX INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR150-6. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEM LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE VENDORS TO INSTALL THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
 - REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY AN INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEX TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
 - THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-4-47 OF THE "REGULATIONS". FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE SYSTEM COMPONENTS FOR OBSERVATION.
 - THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
 - CONTRACTOR SHALL CONTACT "DIG-SAFE" PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
 - THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
 - NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
 - I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
 - ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS DEVICES ARE TO BE WATER TIGHT.
 - PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR POCKETS.
 - CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
 - CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION, EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
 - THE PUMP DOSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTORS RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
 - ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
 - THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STAKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
 - NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
 - MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR THE OWTS OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.

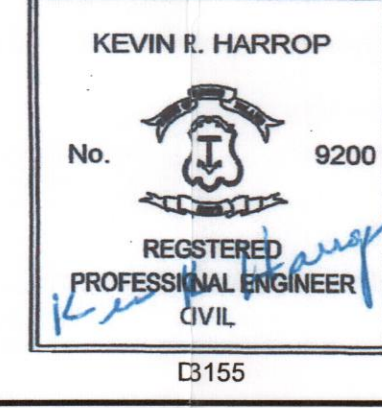
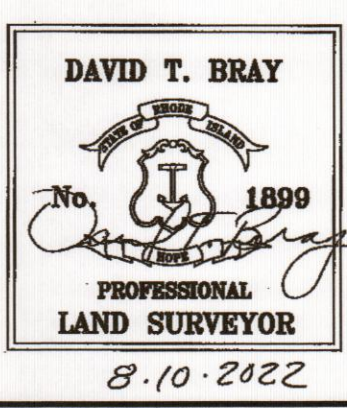
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
OWTS PROGRAM
PLAN # 2205-1141 DATE 3/15/23
APPROVED: [Signature] [Signature]
APPROVED PLANS MUST BE KEPT AT CONSTRUCTION SITE

Copy of permit and Operation Maintenance contract must be filed in hand evidence room at the construction site.

DESIGN DATA

DAILY SEWAGE FLOW:
50 GPD/CAMP SITE x 150 CAMP SITES = 7500 GALLONS PER DAY (G.P.D.)
GROUND WATER TABLE: 120"
DEPTH TO IMPERVIOUS: NOT ENCOUNTERED
SOIL CLASS: B, SOIL CATEGORY: 3, LOADING RATE: 0.70 GALS./S.F./DAY
SEPTIC TANK REQUIREMENTS VOLUME = 2 X 7,500 G.P.D. = 15,000 GALLONS
LEACHING AREA REQUIREMENTS:
GRAVEL SAND TREATMENT (GST) SYSTEM WITH CATEGORY 1 TREATMENT (ORENCO ADVANTEX TREATMENT AX100)
ASSIGNED EFFLUENT LOADING RATE = 3.5 GPD PER S.F.
SQUARE FOOTAGE OF GST REQUIRED = 7500 GPD / 3.5 GPD PER S.F. = 2,143 S.F.
LENGTH OF GST 6212 REQUIRED = 2,143 S.F. / 17.5 S.F./L.F. = 123 L.F.
LENGTH OF GST 6212 SPECIFIED: 288 L.F.
TOTAL GST SYSTEM CAPACITY = 288 L.F. X 17.5 S.F./L.F. X 3.5 G.P.D./S.F. = 17,640 GPD
17,640 GPD > 7,500 GPD - CAPACITY = 235% OF ANTICIPATED DESIGN FLOW

CERTIFICATION:
THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 9 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2016, AS FOLLOWS:
TYPE OF BOUNDARY SURVEY: LIMITED CONTENT BOUNDARY SURVEY
MEASUREMENT SPECIFICATION: NOT A BOUNDARY SURVEY
OTHER TYPE OF SURVEY: DATA ACQUISITION SURVEY (LOCATIONS)
CLASS II
T-2 (IMMEDIATE AREA AROUND BATHHOUSE AND OWTS)
TOPOGRAPHIC SURVEY ACCURACY
THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ONSITE WASTEWATER TREATMENT SYSTEM.
[Signature] 3/10/2023
DATE



STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

FISH CAMP BATHHOUSE - SITE PLAN

Dwg: Contract No. x Scale: 1" = 20' Date: MARCH, 2023

C-1.4 12

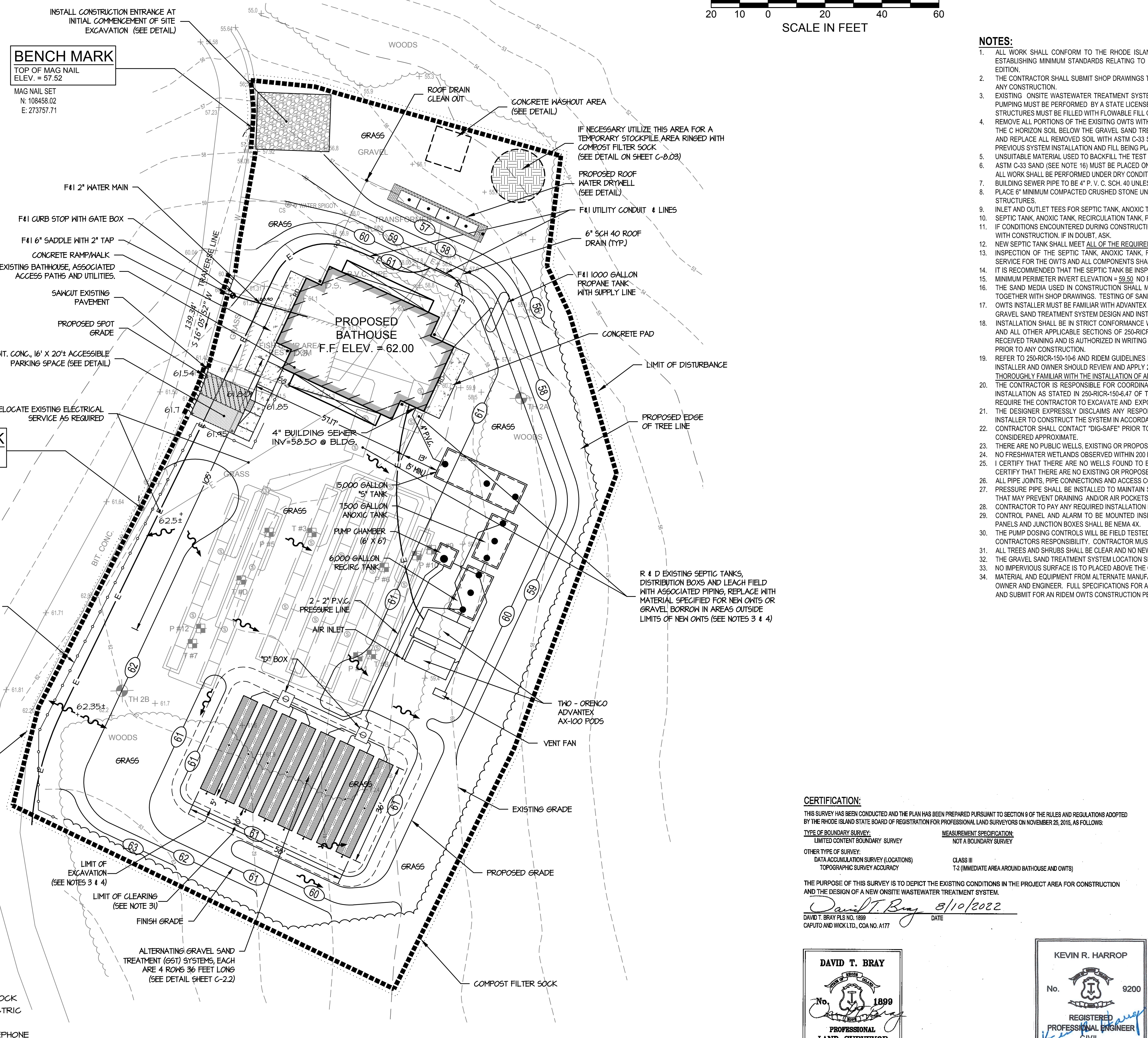
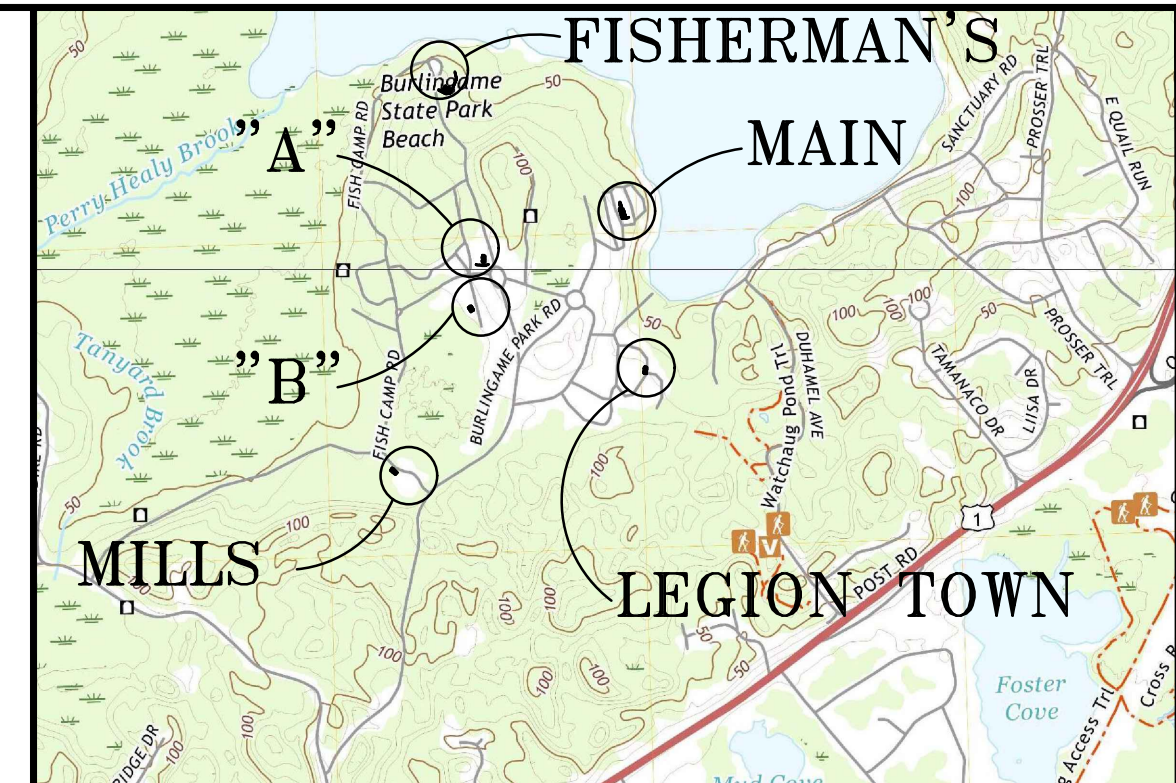
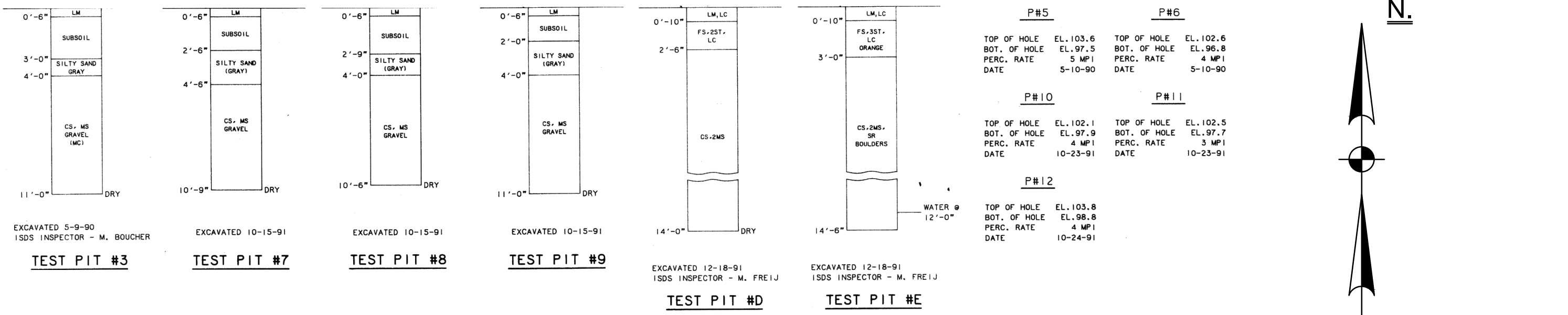
BURLINGAME STATE PARK AND CAMPGROUND

TH-2A - GROUND ELEV: 58.0 - AUGUST 17, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
A ₀	0 - 5"	C	S	2.5YR 6/3			La	Zgd	Vf	3
B _w	5" - 29"	C	S	10YR 5/6			La	Zgd	Fr	3
C ₁	29" - 120"	C	S	2.5YR 7/3			La	Zgd	Fr	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV: 48.0) PERFORMED BY: KAMAL HINGORARY

TH-2B - GROUND ELEV: 62.0 - AUGUST 17, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
A ₀	0 - 8"	C	S	2.5YR 6/3			La	Zgd	Vf	3
B _w	8" - 28"	C	S	10YR 5/6			La	Zgd	Fr	3
C ₁	28" - 120"	C	S	2.5YR 7/3			La	Zgd	Fr	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 120" (ELEV: 52.0) PERFORMED BY: KAMAL HINGORARY



- NOTES:**
- ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, OFFICE OF WATER RESOURCES' RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION AND MAINTENANCE OF 'ON-SITE WASTEWATER TREATMENT SYSTEMS', LATEST EDITION.
 - THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL OF ALL PROPOSED CONSTRUCTION MATERIALS AND EQUIPMENT PRIOR TO ANY CONSTRUCTION.
 - EXISTING 'ON-SITE WASTEWATER TREATMENT SYSTEM (OWTS)' PRECAST STRUCTURES ARE TO BE PUMPED OUT, RINSED WITH CLEAN WATER AND PUMPED OUT AGAIN. PUMPING MUST BE PERFORMED BY A STATE LICENSED SEPTIC HAULER AND THE CONTENTS OF THE TANK DISPOSED OF PROPERLY. AFTER PUMPING, THE EXISTING OWTS STRUCTURES MUST BE FILLED WITH FLOWABLE FILL OR REMOVED AND REPLACED WITH GRAVEL BORROW AND C-LOAM AND SEED.
 - REMOVE ALL PORTIONS OF THE EXISTING OWTS WITHIN 5' OF THE GRAVEL SAND TREATMENT SYSTEM, AND ALL FILL, A HORIZON SOIL, B HORIZON SOIL AND SCARIFY 3" OF THE C HORIZON SOIL BELOW THE GRAVEL SAND TREATMENT SYSTEM AND THOUGHLY MIX WITH ASTM C-33 SAND (SEE NOTE 16) TO INTERFACE THE FILL WITH THE SOIL, AND REPLACE ALL REMOVED SOIL WITH ASTM C-33 SAND. A AND B SOIL HORIZON LAYERS ARE TO BE REMOVED IN THIS APPLICATION DUE TO COMPACTION CAUSED BY PREVIOUS SYSTEM INSTALLATION AND FILL BEING PLACED ABOVE.
 - UNSATURABLE MATERIAL USED TO BACKFILL THE TEST HOLES SHALL BE REMOVED AND REPLACED WITH WITH ASTM C-33 SAND (SEE NOTE 16).
 - ASTM C-33 SAND (SEE NOTE 16) MUST BE PLACED ON SCARIFIED, RELATIVELY DRY NATURAL SOIL. THE CONTRACTOR SHALL PROVIDE FOR DEWATERING AS REQUIRED AND ALL WORK SHALL BE PERFORMED UNDER DRY CONDITIONS.
 - BUILDING SEWER PIPE TO BE 4" P. V. C. SCH. 40 UNLESS OTHERWISE NOTED.
 - PLACE 6" MINIMUM COMPACTED CRUSHED STONE UNDER SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER, ADVANTEX TREATMENT TANKS AND SYSTEM STRUCTURES.
 - INLET AND OUTLET TEES FOR SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK AND PUMP CHAMBER ARE TO BE LOCATED DIRECTLY BELOW ACCESS COVERS.
 - SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
 - IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION. IF IN DOUBT, ASK.
 - NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6.27.
 - INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
 - IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
 - MINIMUM PERIMETER INVERT ELEVATION = 59.50. NO FINISHED GRADE BELOW 59.50 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM.
 - THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL DELIVERED TO THE SITE IS REQUIRED.
 - OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEX PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEX INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL, AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
 - INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEX INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR150-6. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEM LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE VENDORS TO INSTALL THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
 - REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY AN INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEX TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
 - THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE 'REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-6.47 OF THE 'REGULATIONS'. FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE SYSTEM COMPONENTS FOR OBSERVATION.
 - THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
 - CONTRACTOR SHALL CONTACT 'DIG-SAFE' PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
 - THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
 - NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
 - I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
 - ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO BE WATER TIGHT.
 - PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR LOCKS.
 - CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
 - CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION, EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
 - THE PUMP POSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
 - ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
 - THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STAKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
 - NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
 - MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.

DESIGN DATA

DAILY SEWAGE FLOW:
50 GPD/CAMPSITE x 150 CAMPSITES = 7500 GALLONS PER DAY (G.P.D.)

GROUND WATER TABLE: 120"

DEPTH TO IMPERVIOUS: NOT ENCOUNTERED

SOIL CLASS: B, SOIL CATEGORY: 3, LOADING RATE: 0.70 GALS./S.F./DAY

SEPTIC TANK REQUIREMENTS VOLUME = 2 X 7,500 G.P.D. = 15,000 GALLONS

LEACHING AREA REQUIREMENTS:
GRAVEL SAND TREATMENT (GST) SYSTEM WITH CATEGORY 1 TREATMENT (ORENCO ADVANTEX TREATMENT AX100)
ASSIGNED EFFLUENT LOADING RATE = 3.5 GPD PER S. F.
SQUARE FOOTAGE OF GST REQUIRED = 7500 GPD / 3.5 GPD PER S.F. = 2,143 S.F.
LENGTH OF GST 6212 REQUIRED = 2,143 S.F. / 17.5 S.F./L.F. = 123 L.F.
LENGTH OF GST 6212 SPECIFIED: 288 L.F.
TOTAL GST SYSTEM CAPACITY = 288 L.F. X 17.5 S.F./L.F. X 3.5 G.P.D./S.F. = 17,640 GPD
17,640 GPD > 7,500 GPD - CAPACITY = 235% OF ANTICIPATED DESIGN FLOW

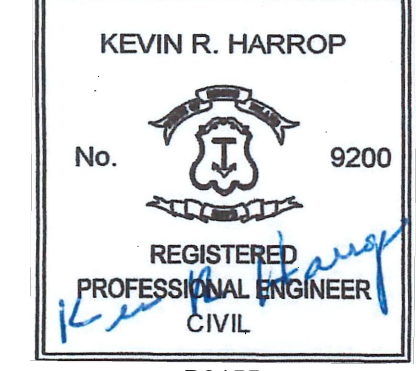
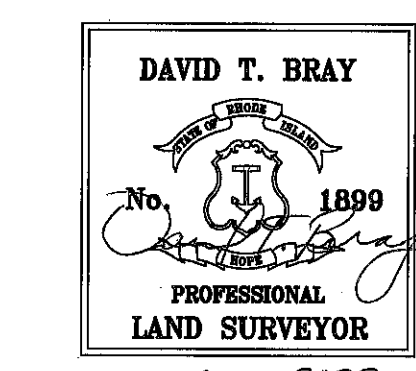
CERTIFICATION:
THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 6 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2015, AS FOLLOWS:

TYPE OF BOUNDARY SURVEY: LIMITED CONTENT BOUNDARY SURVEY
MEASUREMENT SPECIFICATION: NOT A BOUNDARY SURVEY

OTHER TYPE OF SURVEY: DATA ACQUISITION SURVEY (LOCATIONS)
CLASS II: T2 (IMMEDIATE AREA AROUND BATHHOUSE AND OWTS)

THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ON-SITE WASTEWATER TREATMENT SYSTEM.

DAVID T. BRAY PLS NO. 1999
CAPUTO AND WICK LTD., COA NO. A177
DATE: 8/10/2022



LEGEND

--- 100 ---	EXISTING CONTOUR	+ 100.00	FINISHED SPOT GRADE
--- 100.00 ---	PROPOSED CONTOUR	+ 100.00	EXISTING SPOT GRADE
RI. STD.	RHODE ISLAND STANDARD		
INV.	INVERT OF PIPE		DEEP OBSERVATION HOLE
P. V. C.	POLYVINYL CHLORIDE PIPE		OUT CROP OR SURFACE ROCK
S. D. R.	STANDARD DIMENSION RATIO		EXIST. UNDERGROUND ELECTRIC
CONC.	CONCRETE		EXIST. WATER
BIT.	BITUMINOUS		EXIST. UNDERGROUND TELEPHONE
TYP.	TYPICAL		FINISH GRADE SURFACE FLOW DIRECTION

CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

BURLINGAME STATE PARK AND CAMPGROUND

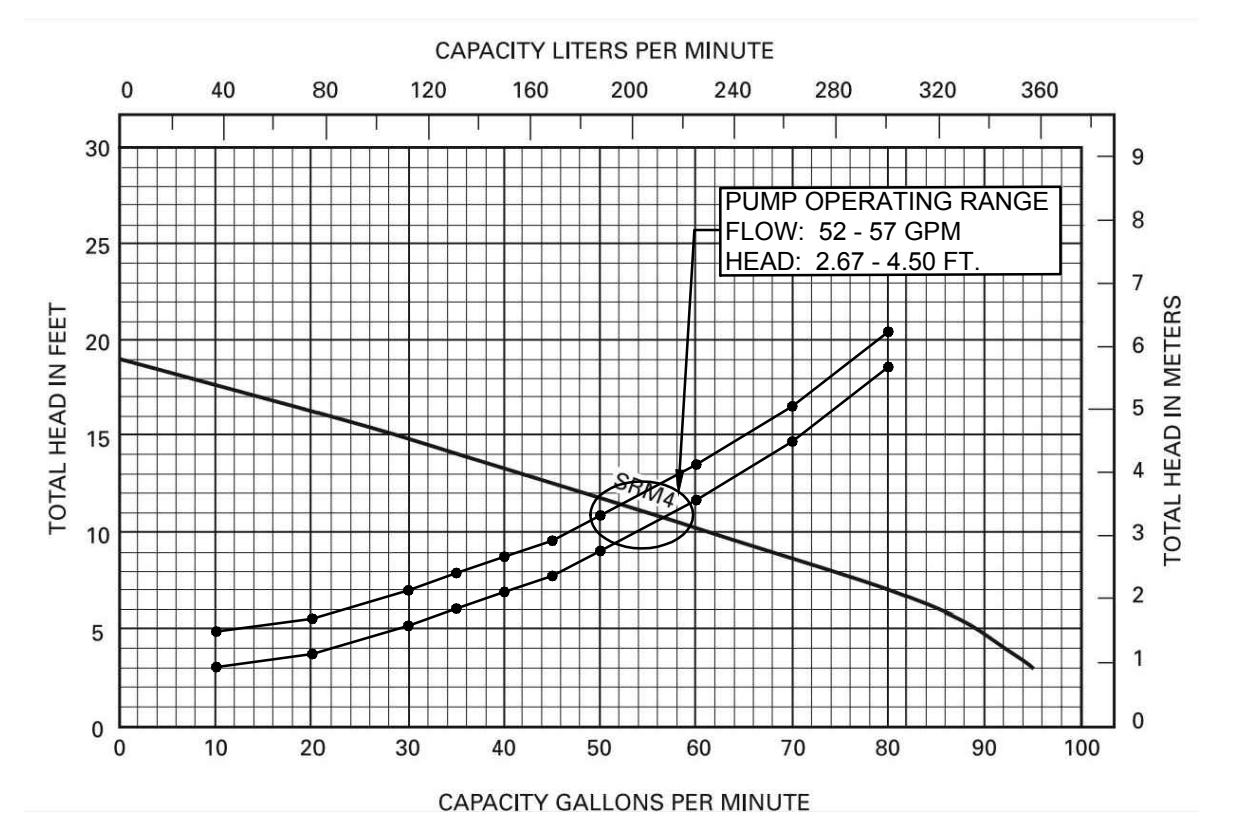
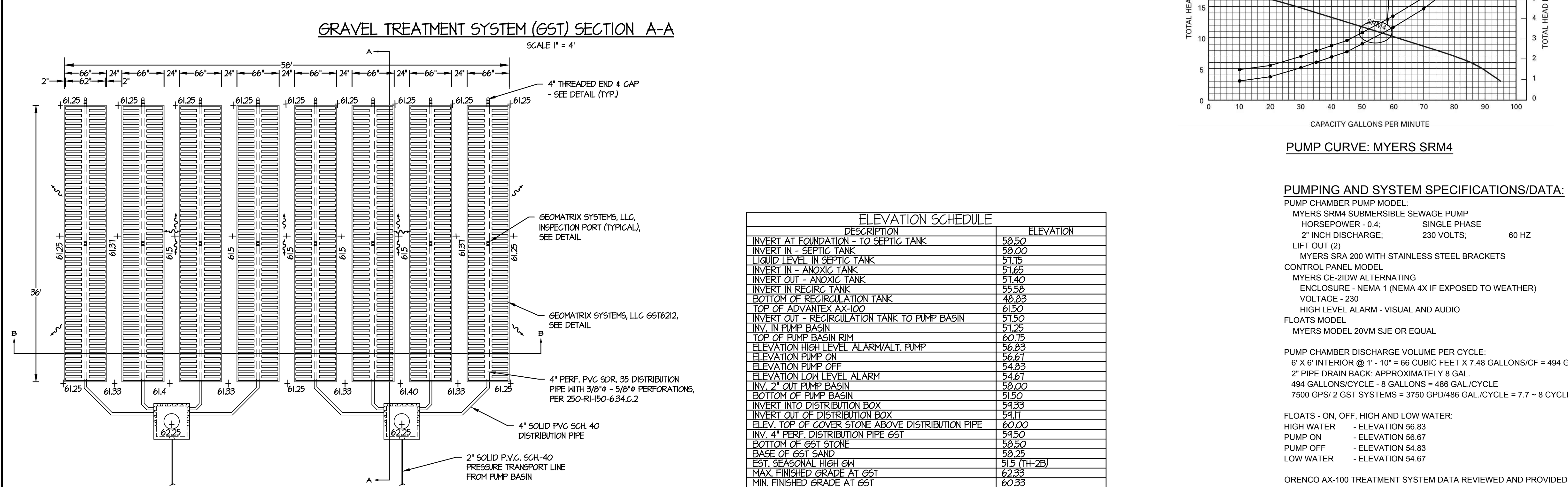
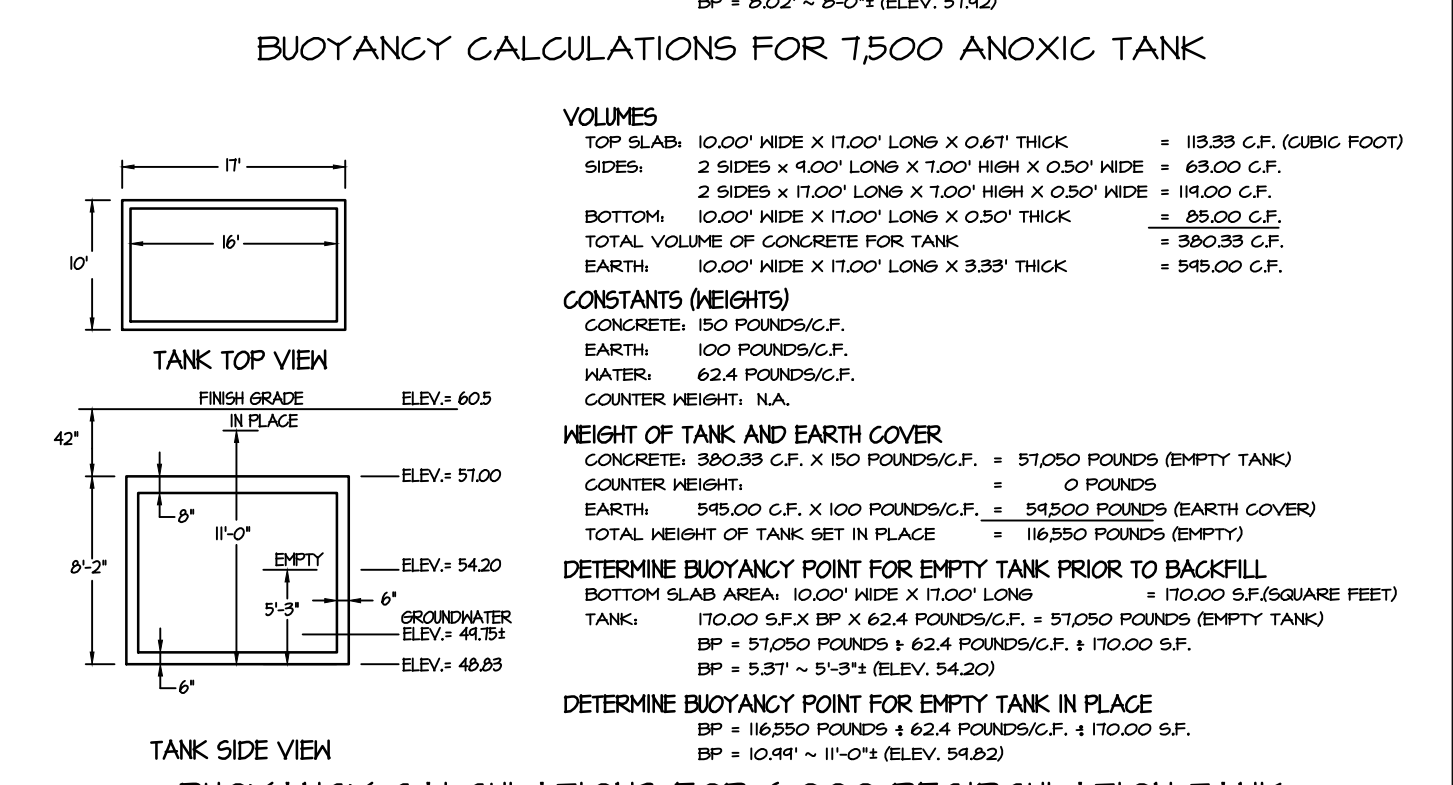
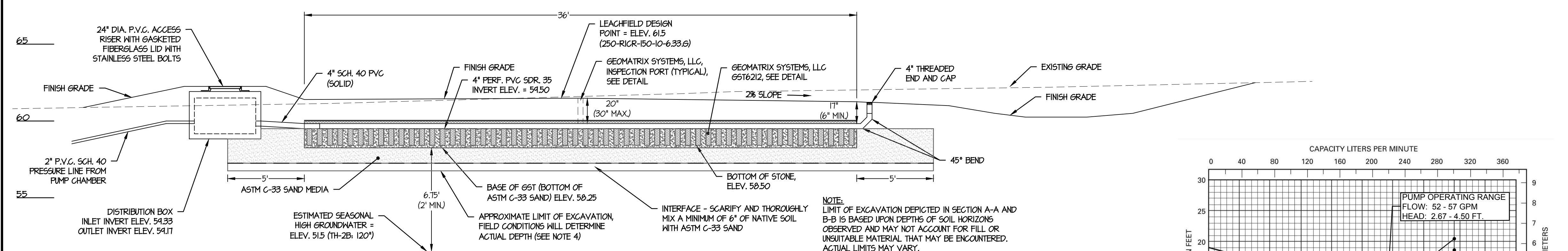
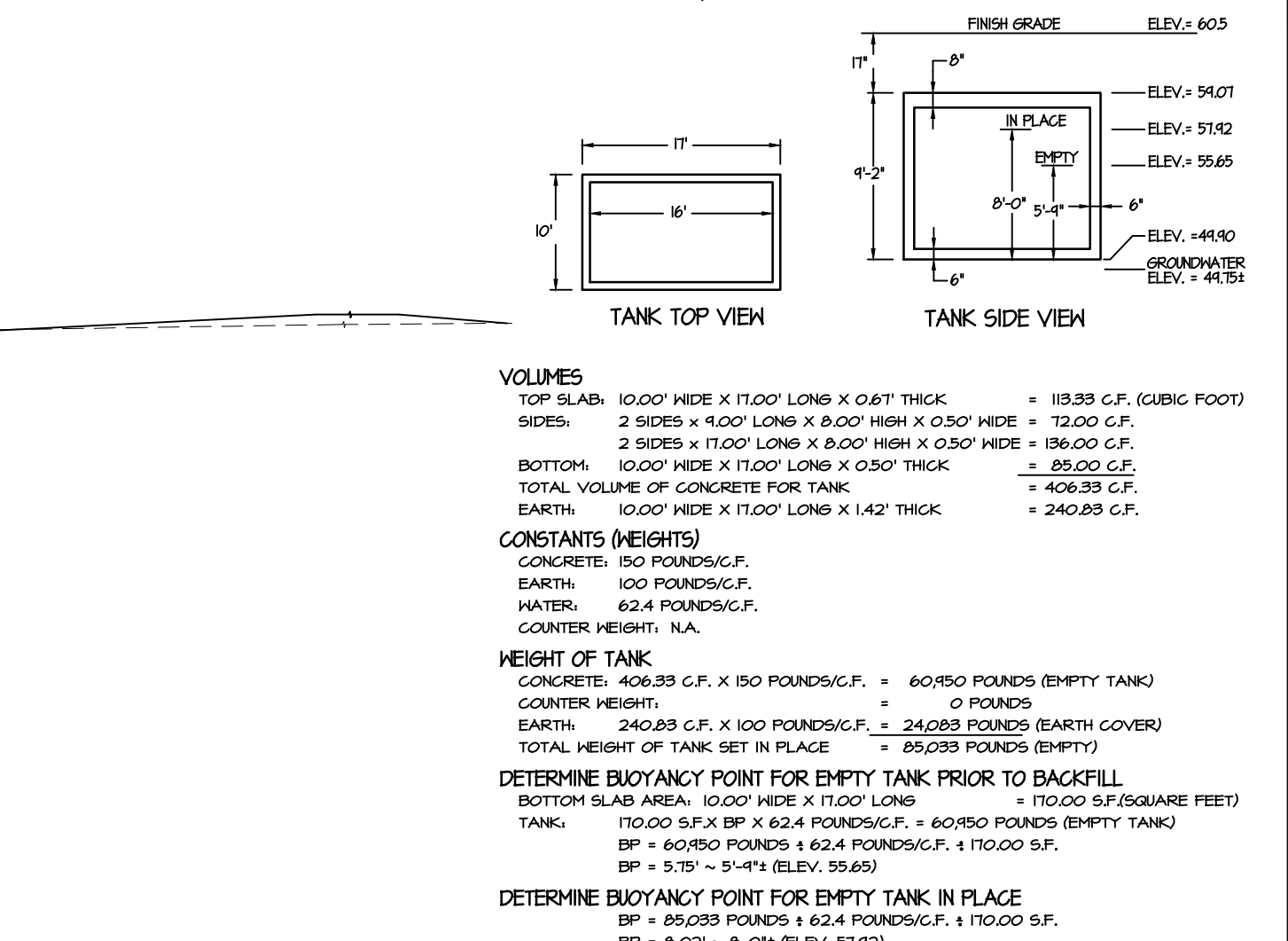
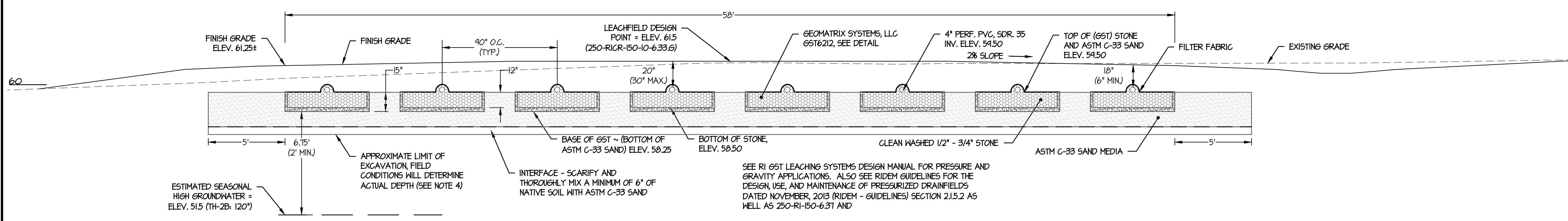
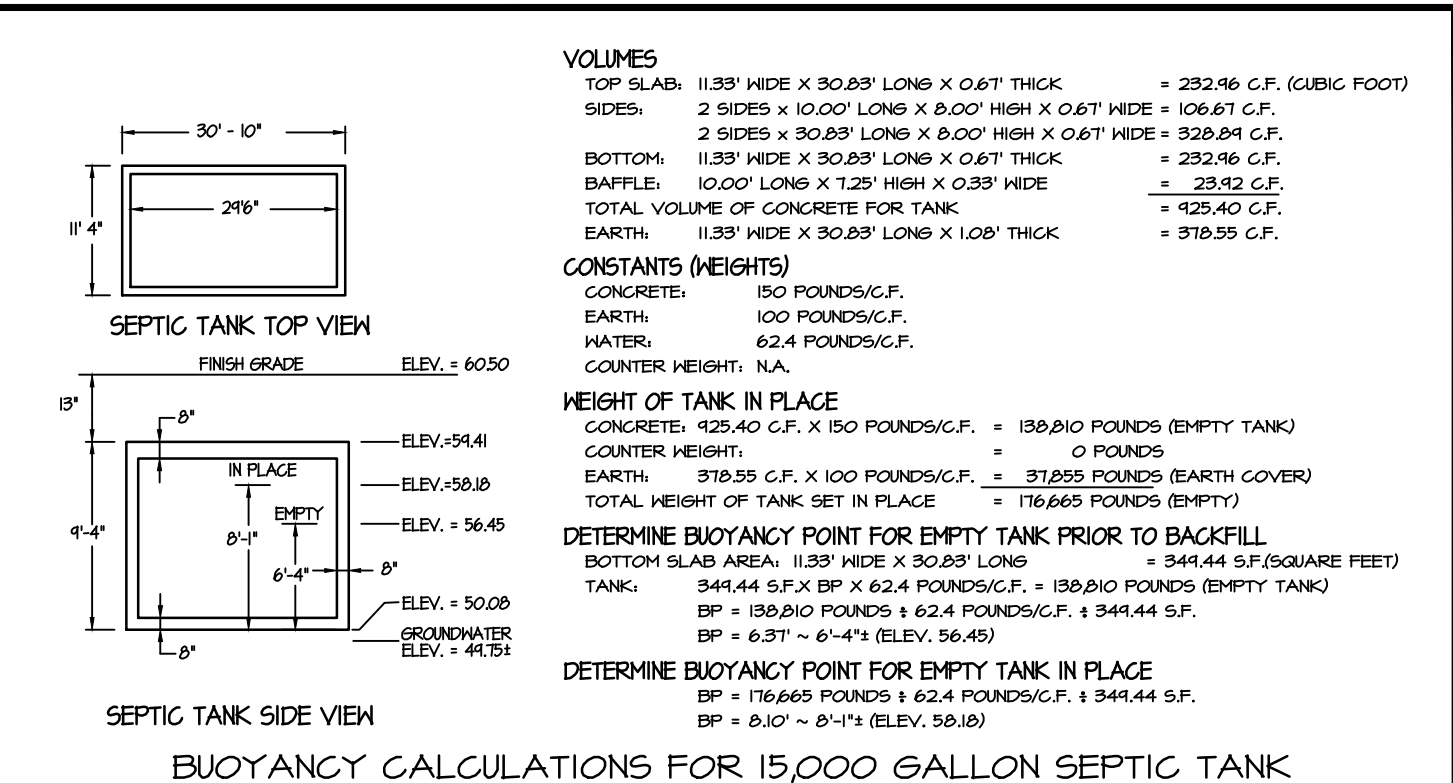
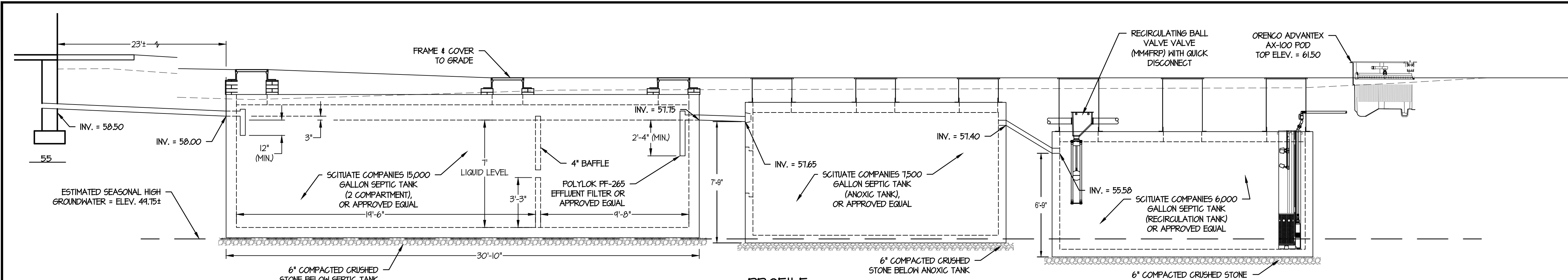
STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

FISH CAMP BATHHOUSE - SITE PLAN

Dwg: _____ Scale: 1" = 20'
Contract No. x _____ Date: MARCH, 2023

C-1.4
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PUMPING AND SYSTEM SPECIFICATIONS/DATA:
 PUMP CHAMBER PUMP MODEL:
 MYERS SRM4 SUBMERSIBLE SEWAGE PUMP
 HORSEPOWER - 0.4; SINGLE PHASE
 2" INCH DISCHARGE; 230 VOLTS; 60 HZ 6 AMPS
 LIFT OUT (2)
 MYERS SRA 200 WITH STAINLESS STEEL BRACKETS
 CONTROL PANEL MODEL
 MYERS GE-210W ALTERNATING
 ENCLOSURE - NEMA 1 (NEMA 4X IF EXPOSED TO WEATHER)
 VOLTAGE - 230
 HIGH LEVEL ALARM - VISUAL AND AUDIO
 FLOATS MODEL
 MYERS MODEL 20VM S/E OR EQUAL

DESCRIPTION	ELEVATION
INVERT AT FOUNDATION - TO SEPTIC TANK	58.50
INVERT IN - SEPTIC TANK	58.00
LIQUID LEVEL IN SEPTIC TANK	57.75
INVERT IN - ANOXIC TANK	57.65
INVERT OUT - ANOXIC TANK	57.40
INVERT IN RECIRC. TANK	55.58
BOTTOM OF RECIRCULATION TANK	49.23
TOP OF ADVANTEX AX-100	61.50
INVERT OUT - RECIRCULATION TANK TO PUMP BASIN	57.50
INV. IN PUMP BASIN	57.25
TOP OF PUMP BASIN RIM	60.75
ELEVATION HIGH LEVEL ALARM/ALT. PUMP	56.83
ELEVATION PUMP ON	56.67
ELEVATION PUMP OFF	54.83
ELEVATION LOW LEVEL ALARM	54.67
INV. 2" OUT PUMP BASIN	58.00
BOTTOM OF PUMP BASIN	51.50
INVERT INTO DISTRIBUTION BOX	54.33
INVERT OUT OF DISTRIBUTION BOX	54.17
ELEV. TOP OF COVER STONE ABOVE DISTRIBUTION PIPE	60.00
INV. 4" PERF. DISTRIBUTION PIPE GST	54.50
BOTTOM OF GST STONE	58.50
BASE OF GST SAND	58.25
EST. SEASONAL HIGH GW	51.5 (TH-2B)
MAX. FINISHED GRADE AT GST	62.33
MIN. FINISHED GRADE AT GST	60.33

PUMP CHAMBER DISCHARGE VOLUME PER CYCLE:
 6' X 6' INTERIOR @ 1' - 10" = 66 CUBIC FEET X 7.48 GALLONS/CF = 494 GAL./CYCLE
 2" PIPE DRAIN BACK: APPROXIMATELY 8 GAL.
 494 GALLONS/CYCLE - 8 GALLONS = 486 GAL./CYCLE
 7500 GPD/ 2 GST SYSTEMS = 3750 GPD/486 GAL./CYCLE = 7.7 - 8 CYCLES/DAY/GST

FLOATS - ON, OFF, HIGH AND LOW WATER:
 HIGH WATER - ELEVATION 56.83
 PUMP ON - ELEVATION 56.67
 PUMP OFF - ELEVATION 54.83
 LOW WATER - ELEVATION 54.67

ORENCO AX-100 TREATMENT SYSTEM DATA REVIEWED AND PROVIDED BY ATLANTIC SOLUTIONS (CONTROL PANEL - TIME DOSED)

GRAVEL SAND TREATMENT (GST) SYSTEM DATA REVIEWED BY GEOMATRIX SYSTEMS LLC.

STATE OF RHODE ISLAND
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
 DIVISION OF PLANNING AND DEVELOPMENT

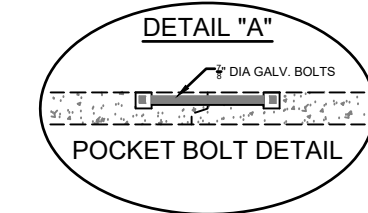
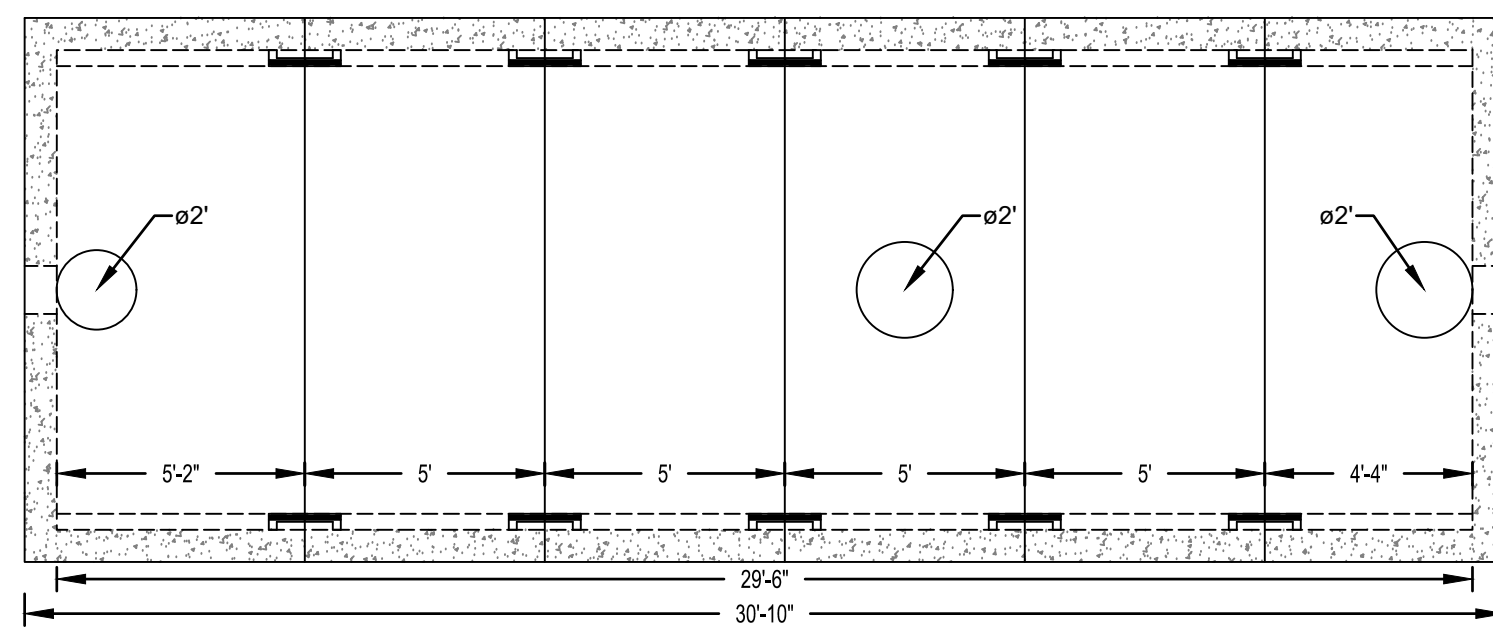
DEMOLITION AND REBUILD OF BATHHOUSES
 BURLINGAME STATE PARK AND CAMPGROUND
 CHARLESTOWN, RHODE ISLAND

FISH CAMP BATHHOUSE - OWTS DETAILS

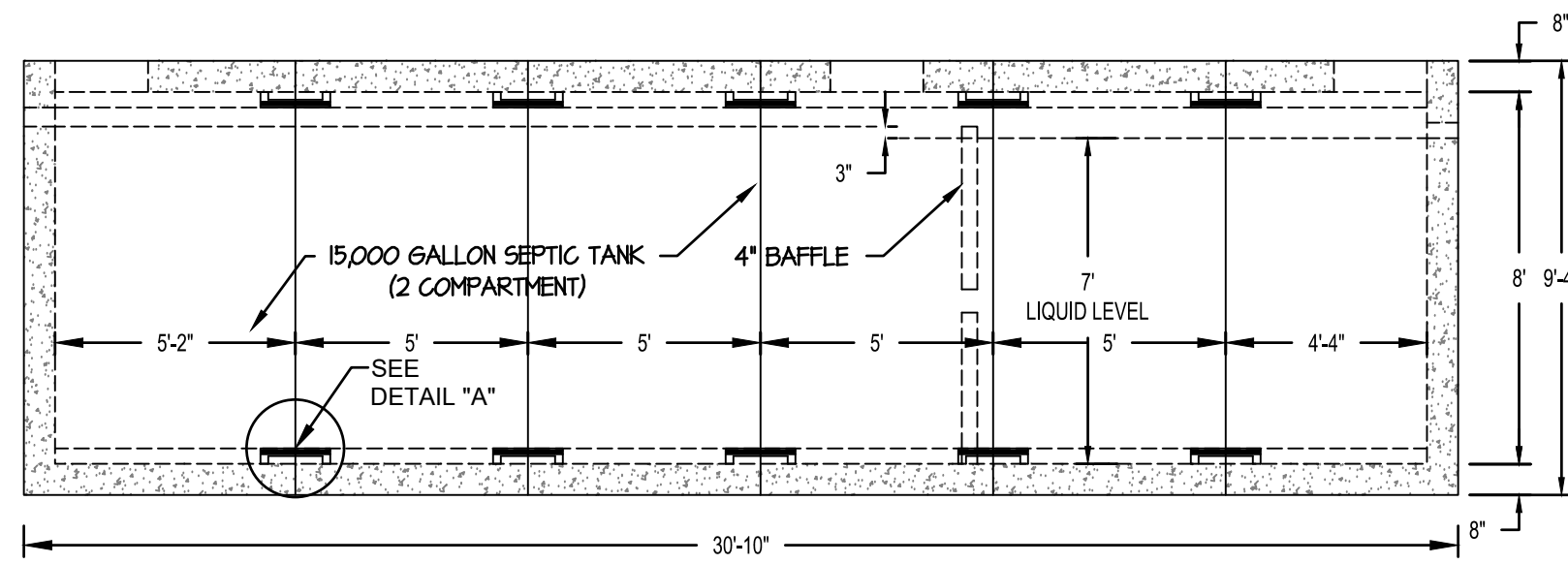
Dwg: _____ Scale: 1" = 20'
 Contract No. x _____ Date: MARCH, 2023
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 18

J:\RhodeIsland\Charlestown\RIDEM - Burlingame\009 - 025 - and S-c Site Design\2023.03.06.dwg

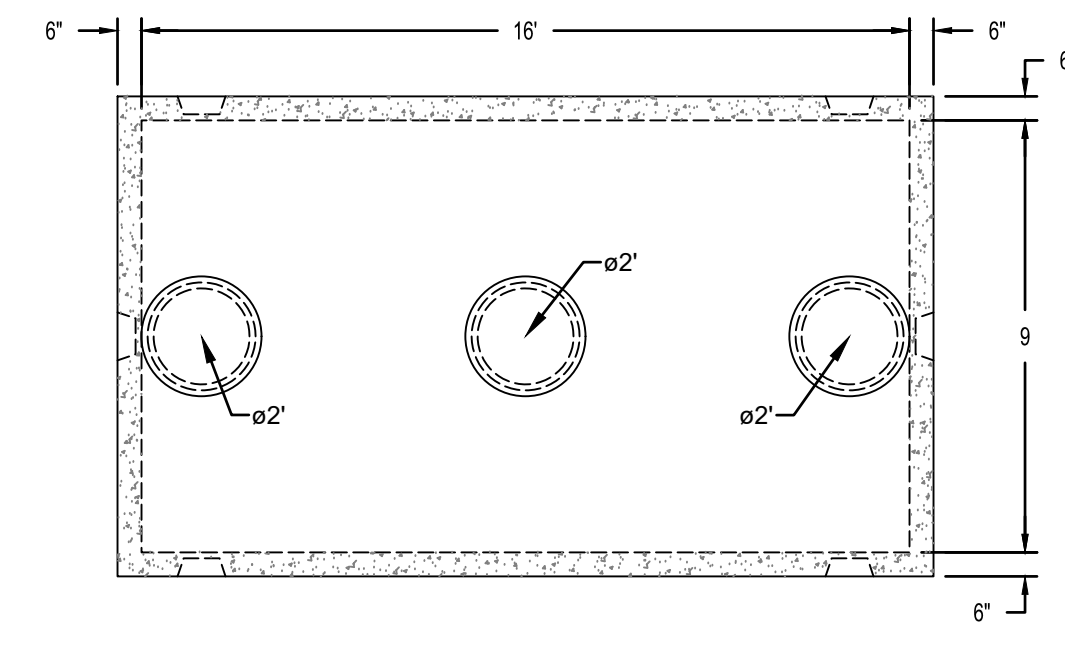
OWTS SUBMISSION - MARCH 6, 2023



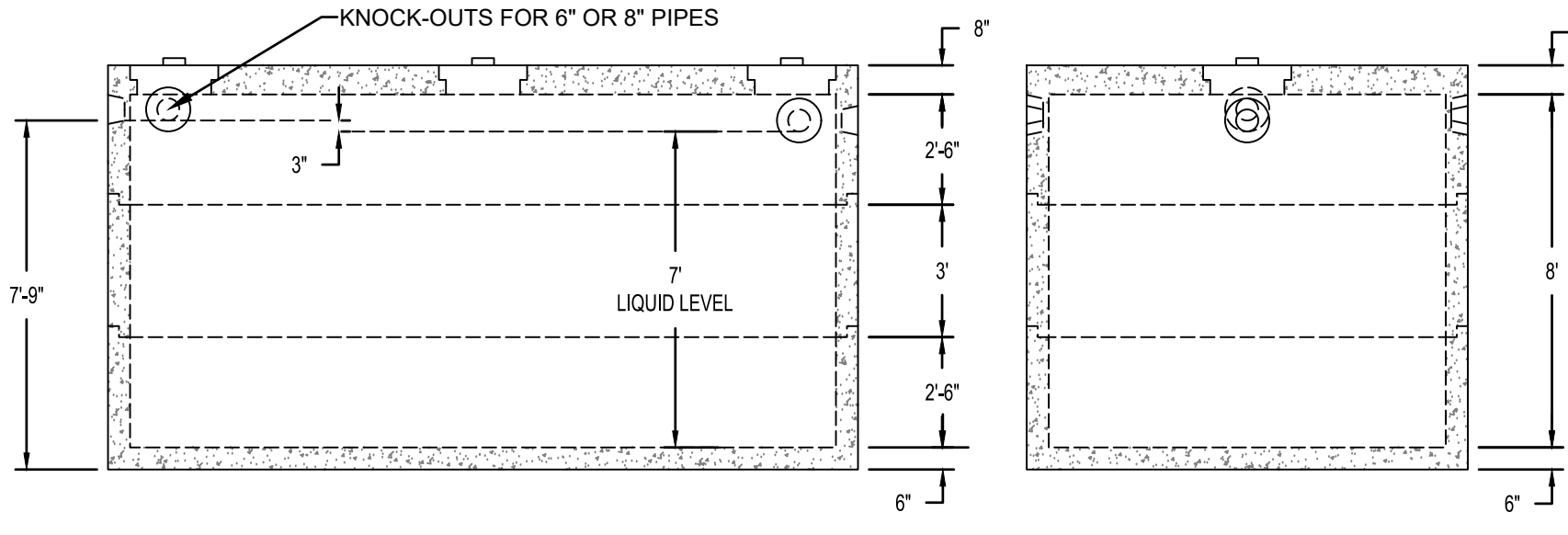
- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.



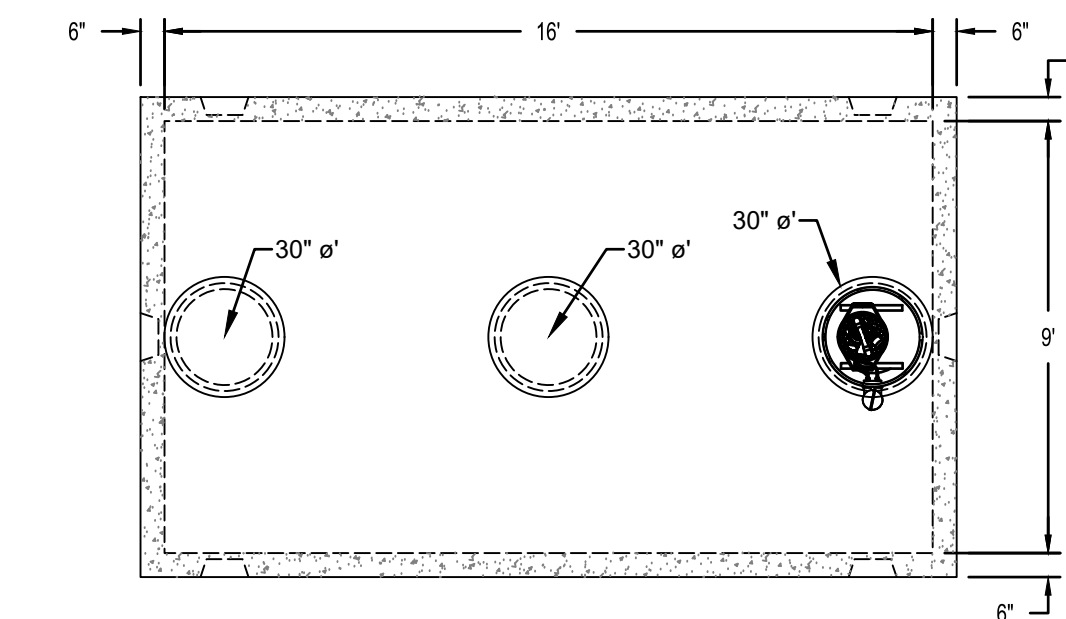
15,000 GALLON TWO COMPARTMENT SEPTIC TANK
SCALE 1" = 4"



- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

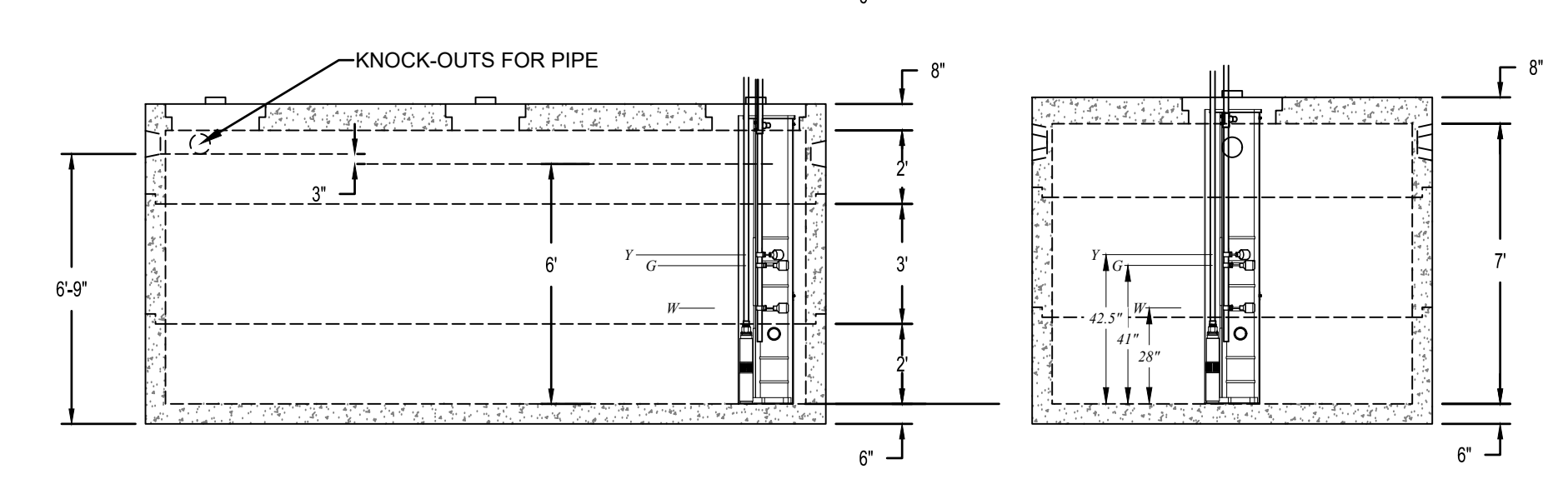


7,500 GALLON ANOXIC TANK
SCALE 1" = 4"



Float Functions	
Y	High Level Alarm & Alternate Pump On
Z	Overload Timer ON/OFF
W	LL/RR

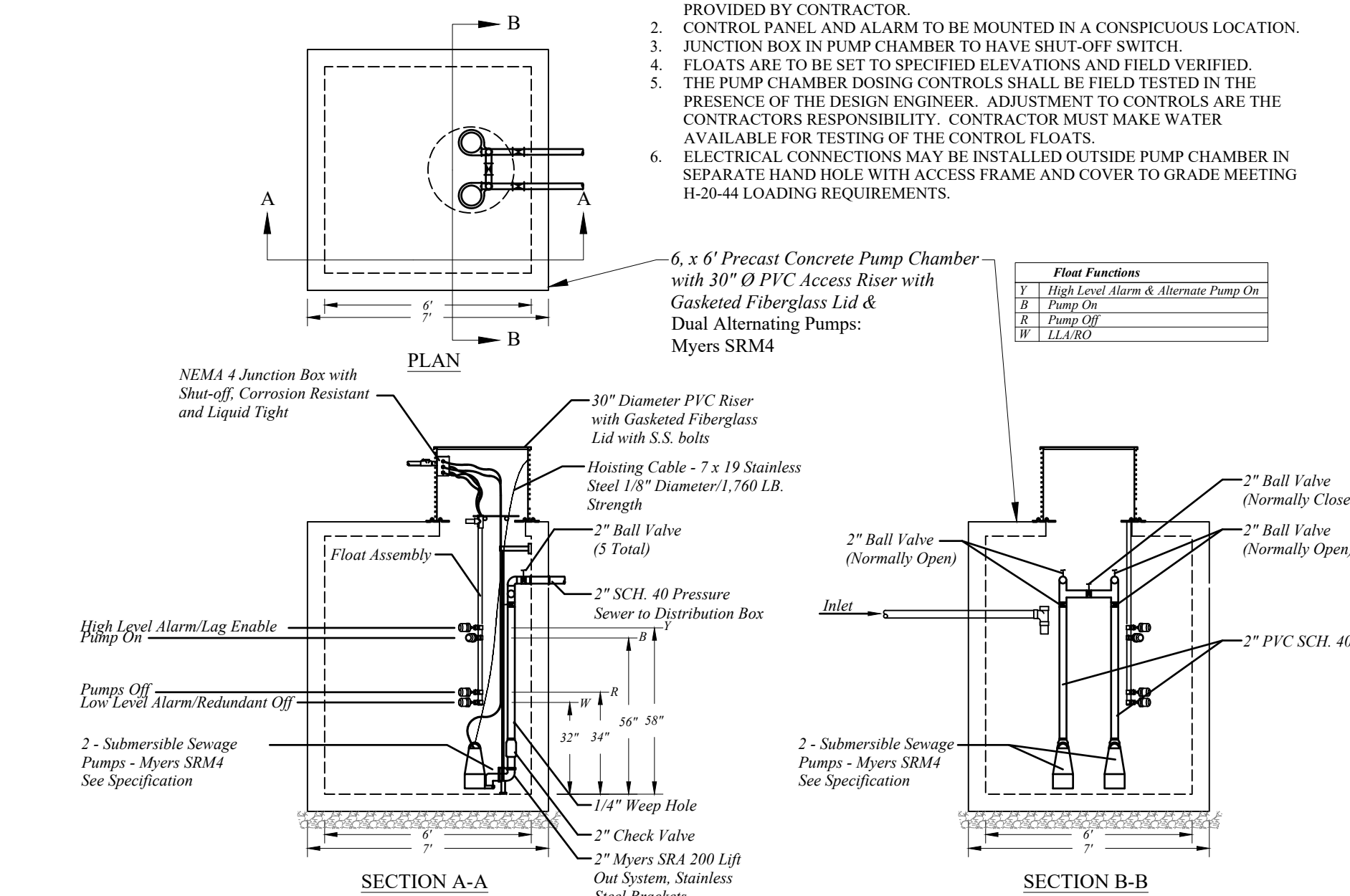
- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.



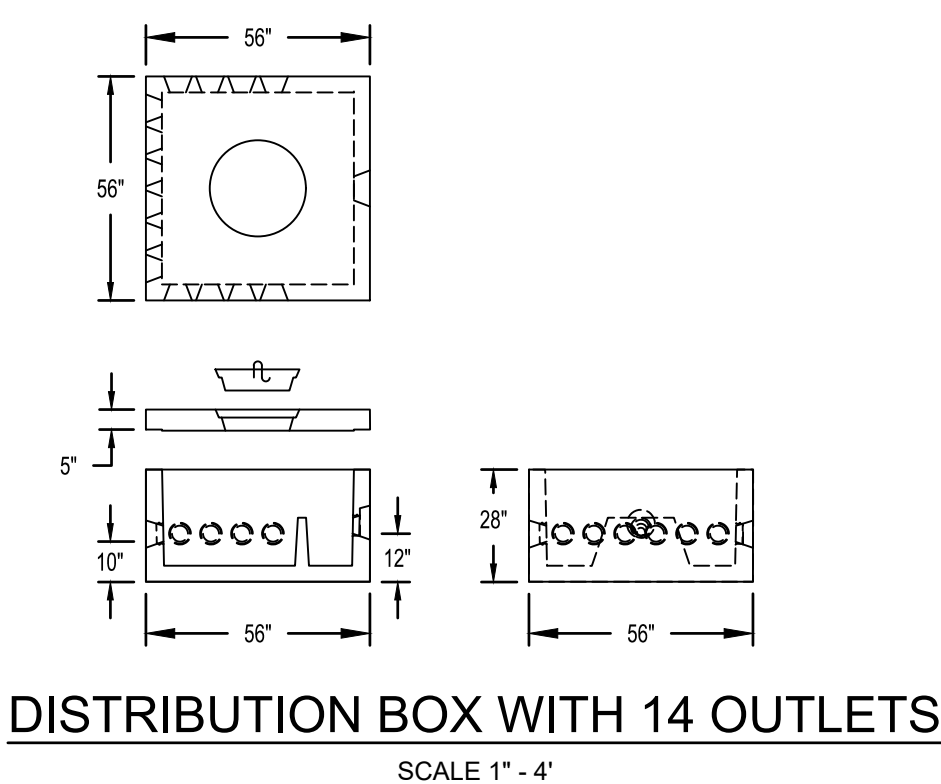
6,000 GALLON RECIRCULATION TANK
SCALE 1" = 4"

PUMPING NOTES:

1. EQUIPMENT FROM OTHER MANUFACTURERS MAY BE USED IF EQUAL APPROVAL FOR ALTERNATE EQUIPMENT REQUIRED FROM ENGINEER PRIOR TO CONSTRUCTION. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY CONTRACTOR.
2. CONTROL PANEL AND ALARM TO BE MOUNTED IN A CONSPICUOUS LOCATION.
3. JUNCTION BOX IN PUMP CHAMBER TO HAVE SHUT-OFF SWITCH.
4. FLOATS ARE TO BE SET TO SPECIFIED ELEVATIONS AND FIELD VERIFIED.
5. THE PUMP CHAMBER DOSING CONTROLS SHALL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
6. ELECTRICAL CONNECTIONS MAY BE INSTALLED OUTSIDE PUMP CHAMBER IN SEPARATE HAND HOLE WITH ACCESS FRAME AND COVER TO GRADE MEETING H-20-44 LOADING REQUIREMENTS.



PUMP CHAMBER DETAIL
SCALE 1" = 4"



DISTRIBUTION BOX WITH 14 OUTLETS
SCALE 1" = 4"

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
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DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS PRECAST STRUCTURES DETAILS

Dwg: Scale: 1" = 20'
Contract No. x Date: MARCH, 2023

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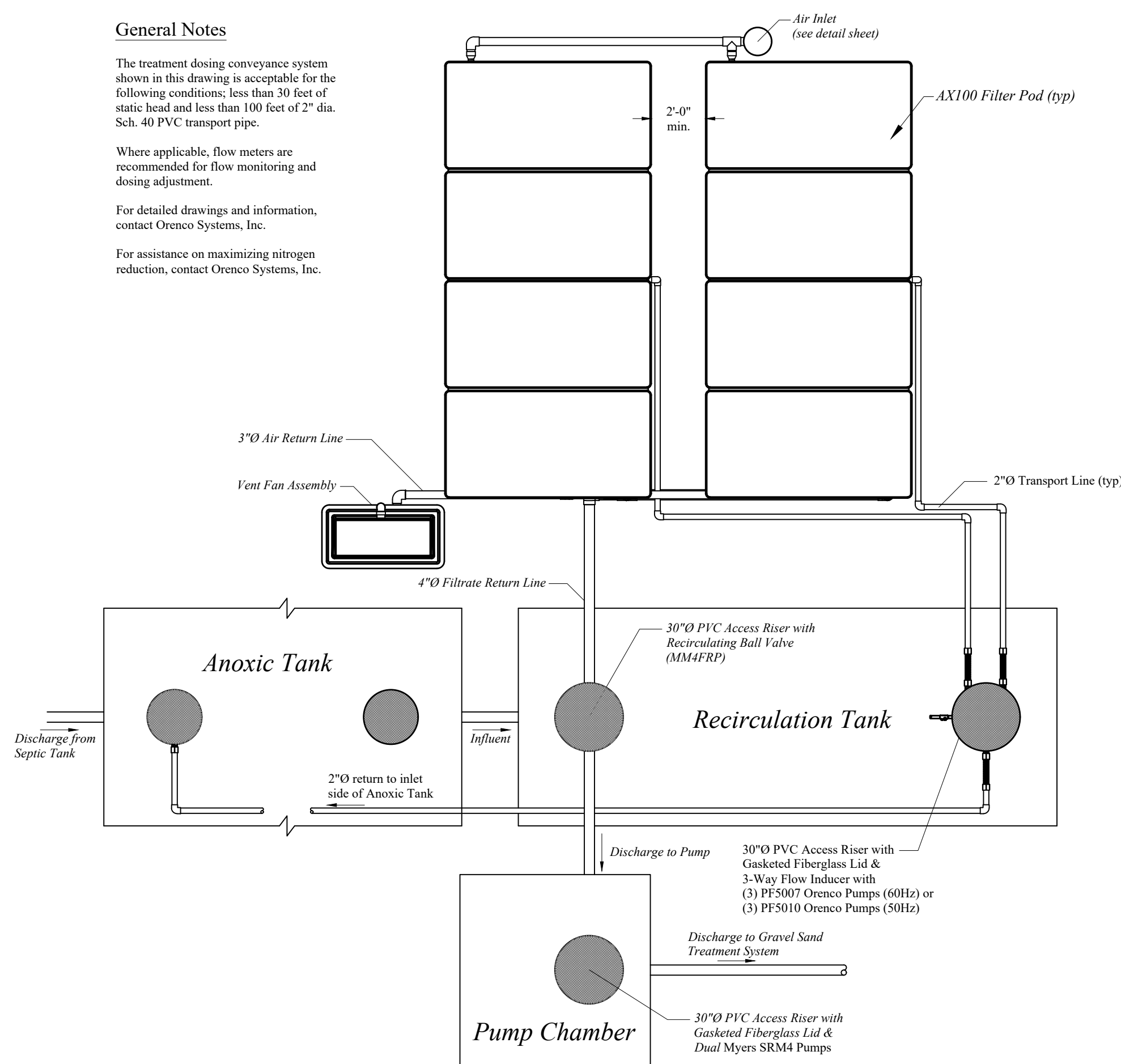
General Notes

The treatment dosing conveyance system shown in this drawing is acceptable for the following conditions: less than 30 feet of static head and less than 100 feet of 2" dia. Sch. 40 PVC transport pipe.

Where applicable, flow meters are recommended for flow monitoring and dosing adjustment.

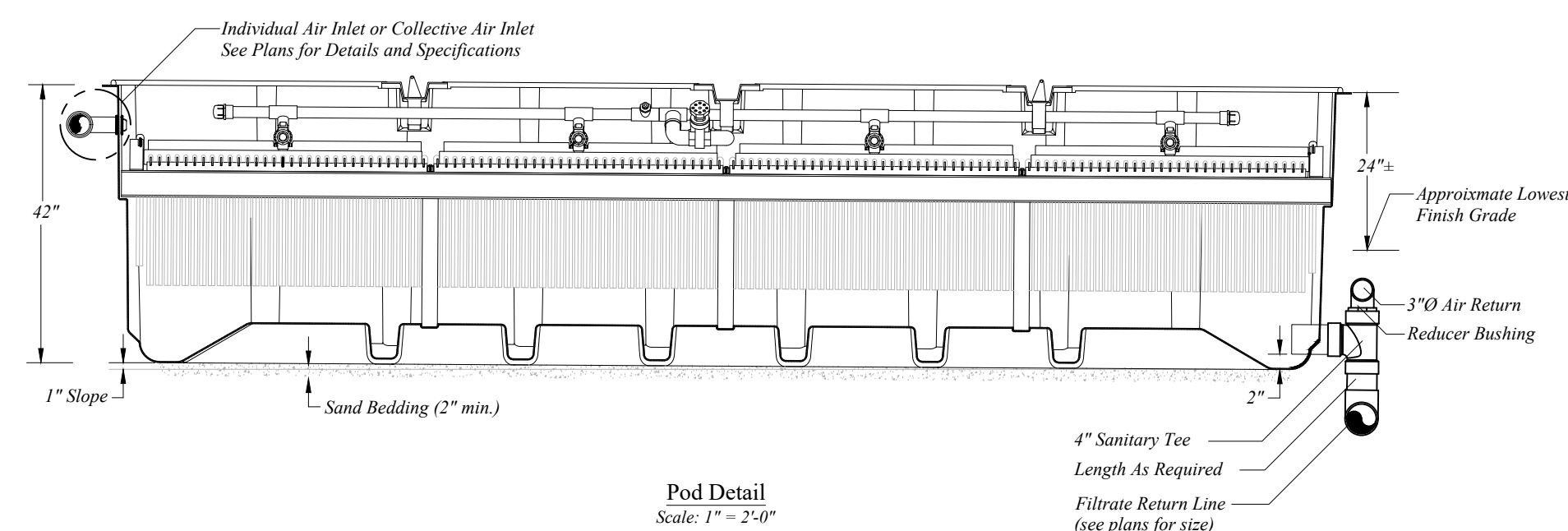
For detailed drawings and information, contact Oresco Systems, Inc.

For assistance on maximizing nitrogen reduction, contact Oresco Systems, Inc.

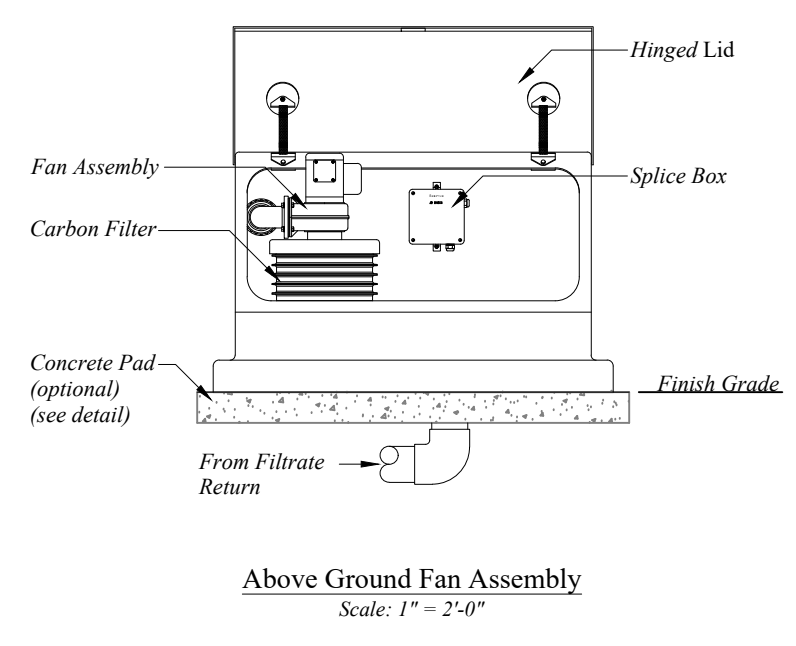


**AdvanTex AX100 SYSTEM - MANIFOLDED VENT INLET
2 POD CONFIGURATION**

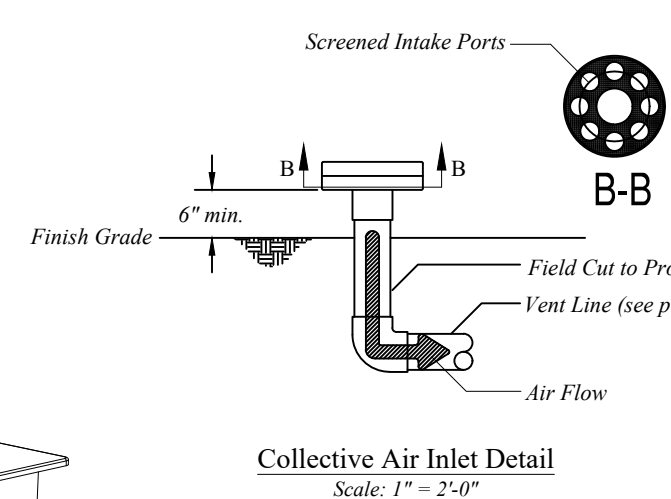
SCALE 1" = 4'



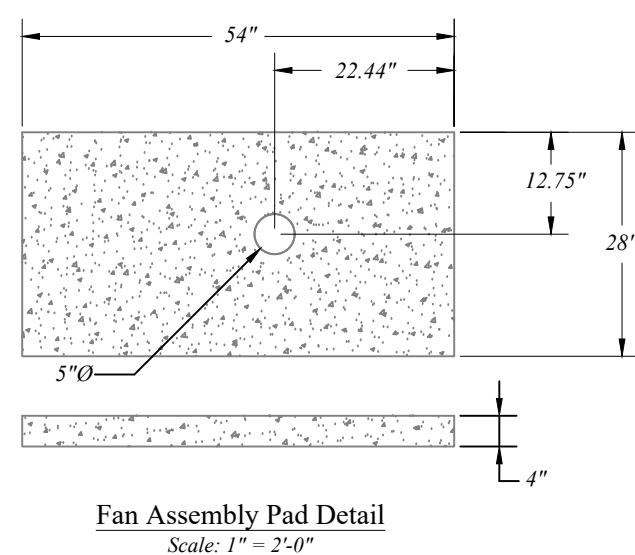
Pod Detail
Scale: 1" = 2'-0"



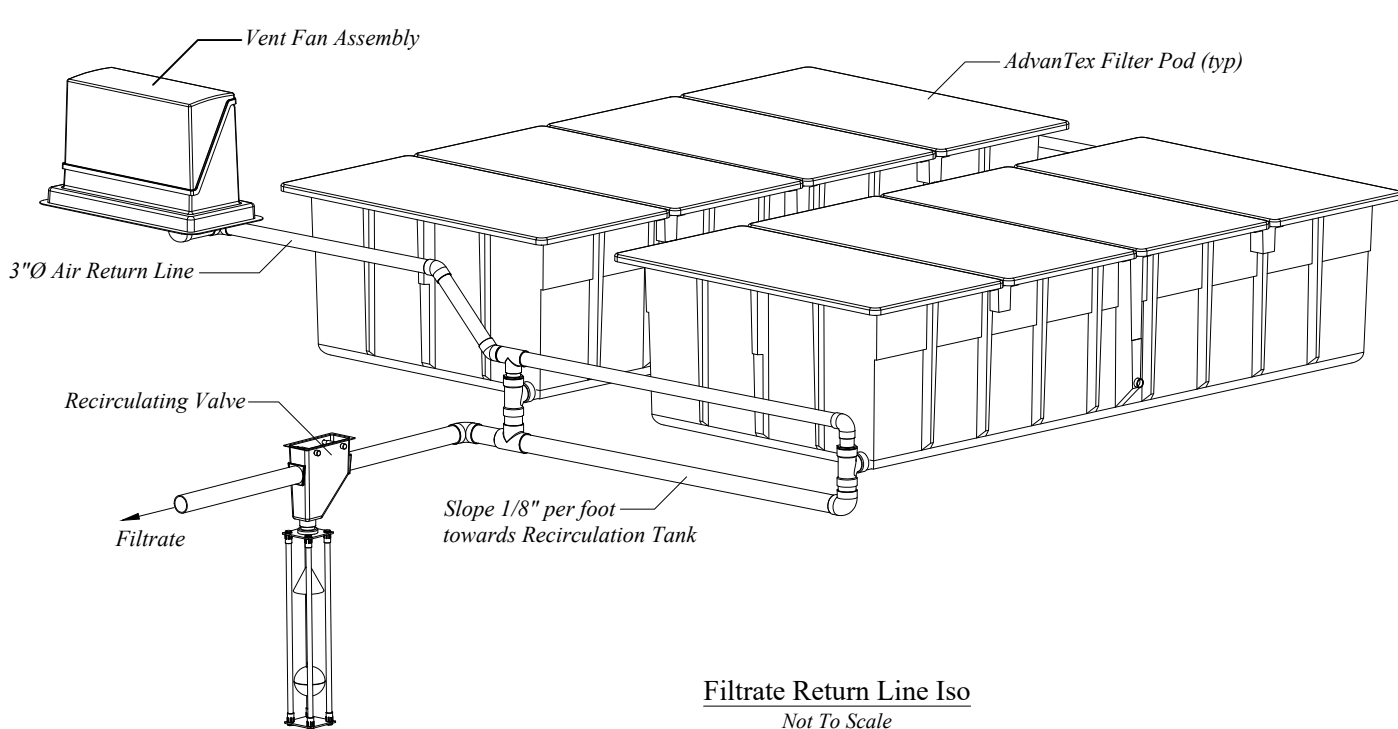
Above Ground Fan Assembly
Scale: 1" = 2'-0"



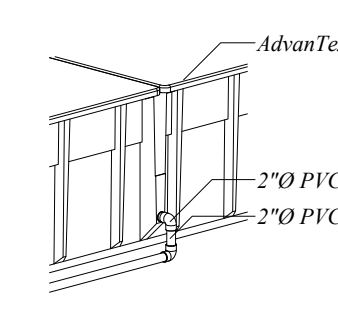
Collective Air Inlet Detail
Scale: 1" = 2'-0"



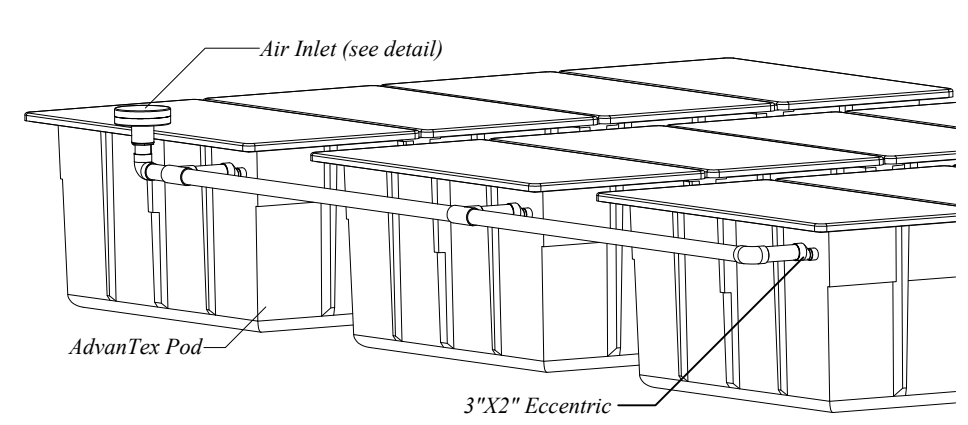
Fan Assembly Pad Detail
Scale: 1" = 2'-0"



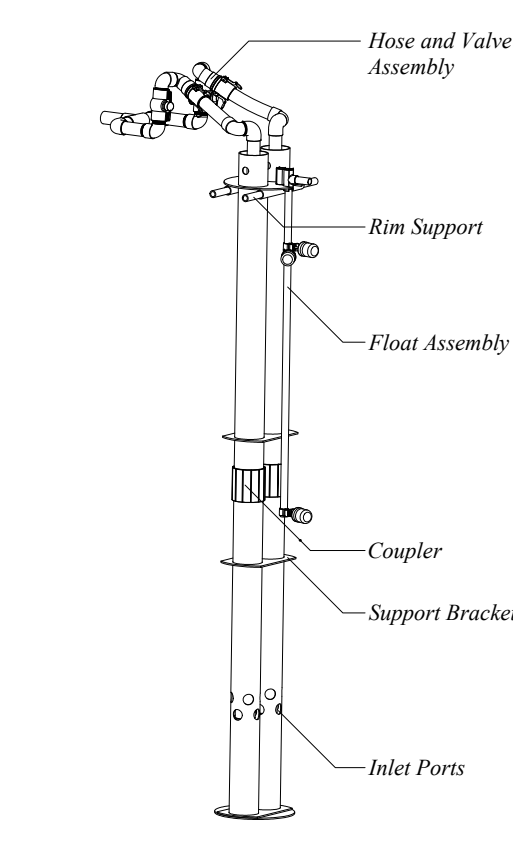
Filtrate Return Line Iso
Not To Scale



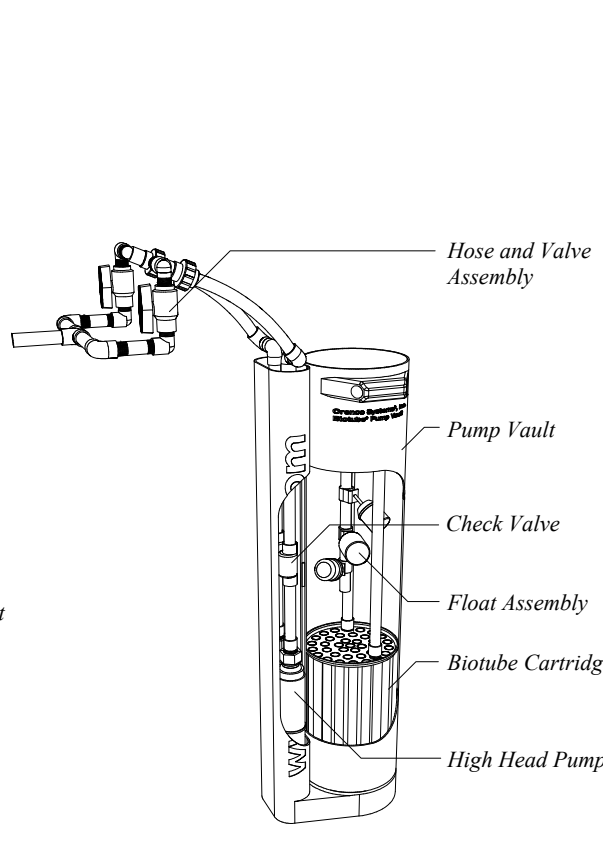
Typical Pod Inlet Connection
Not To Scale



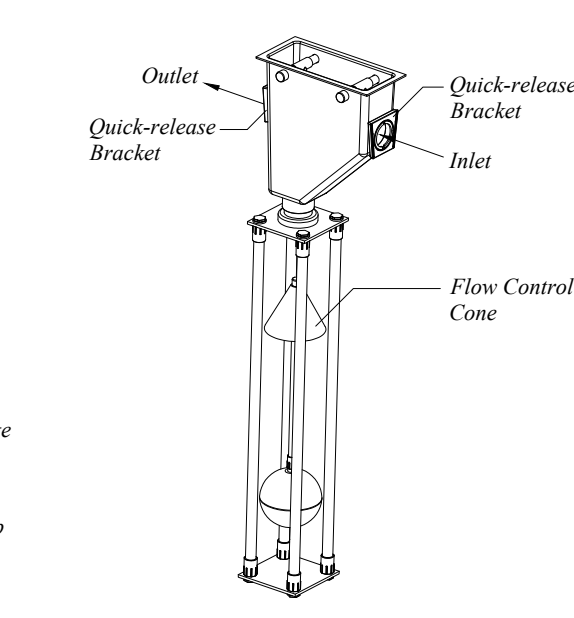
Collective Air Inlet Option
Not To Scale



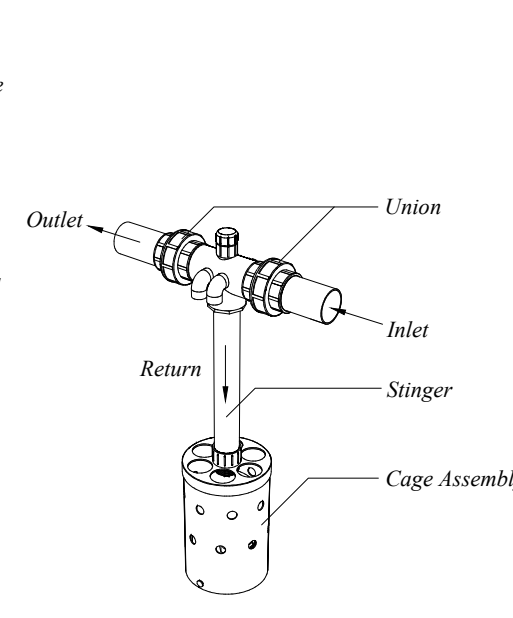
Duplex Flow Inducer Tower Detail
Scale: NTS



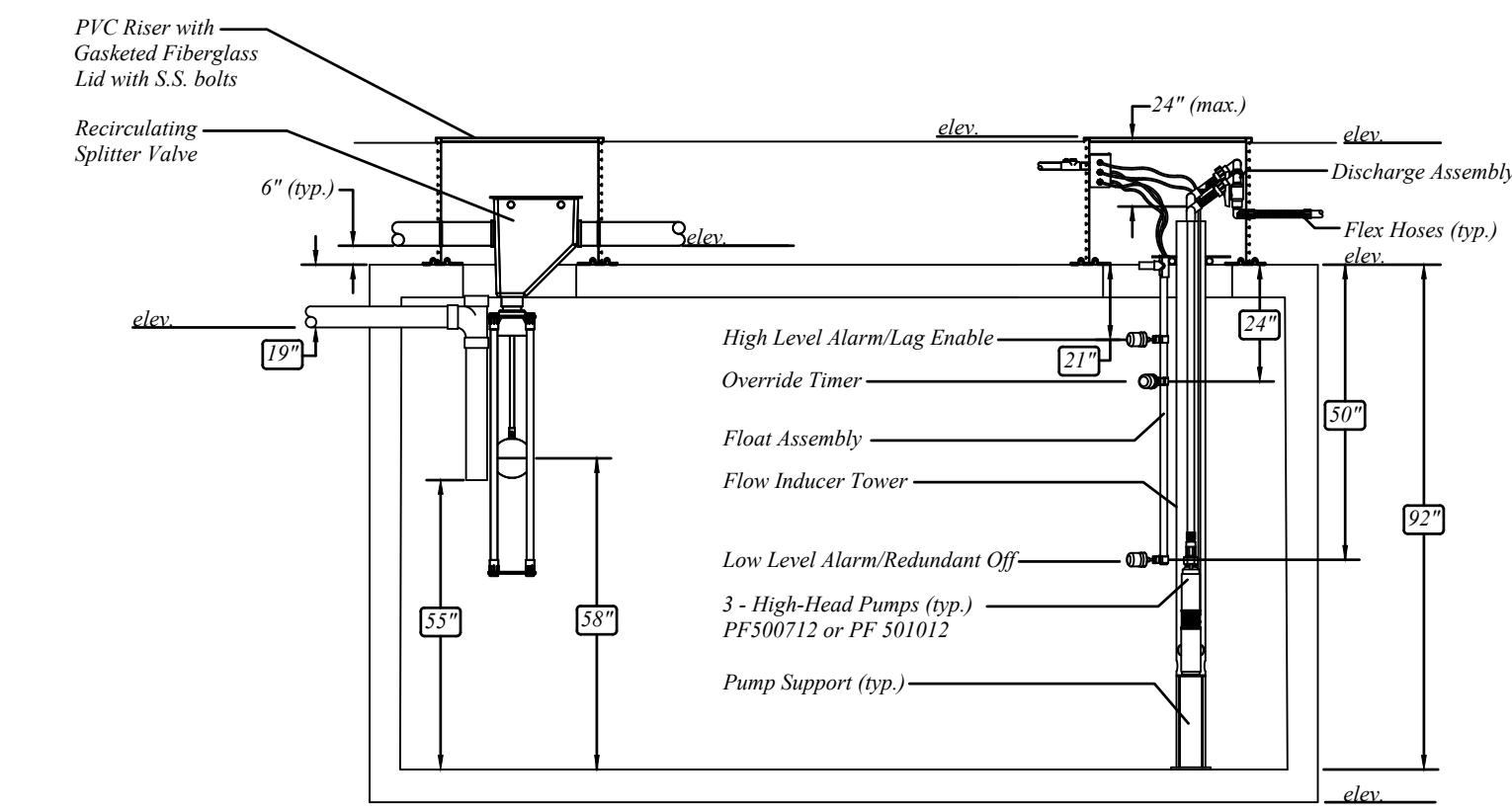
Duplex Pump Vault Detail
Scale: NTS



Recirculating Ball Valve Detail
Scale: NTS

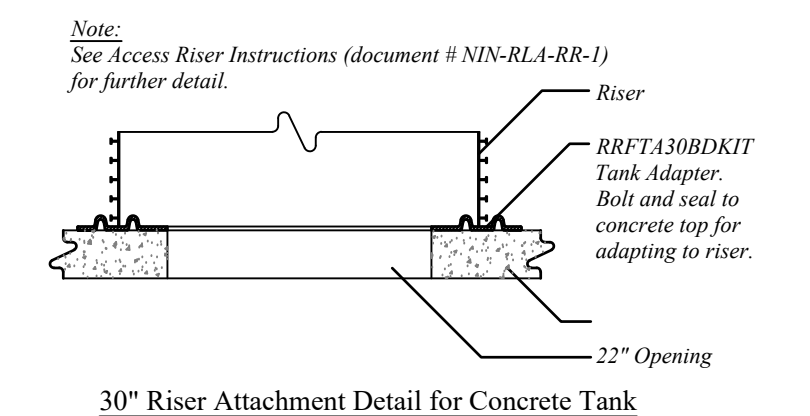


Recirculating Splitter Valve Detail
Scale: NTS

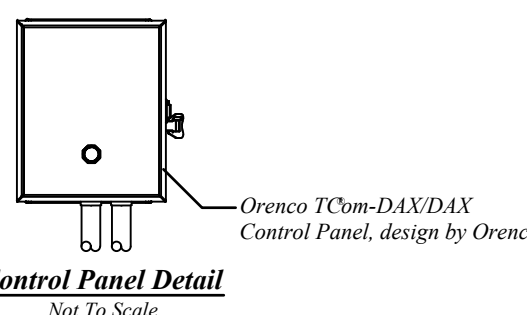


RECIRCULATION TANK FLOAT AND RSV SETTINGS

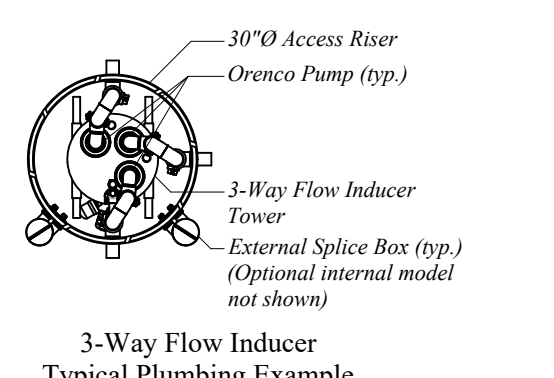
NOT TO SCALE



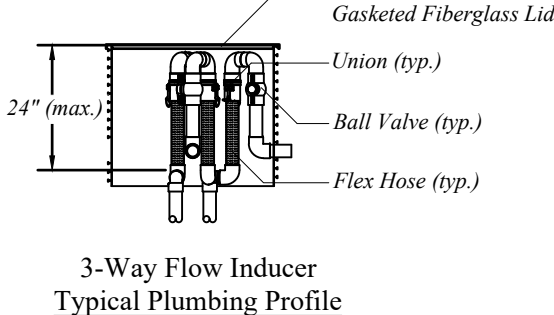
30" Riser Attachment Detail for Concrete Tank
Scale: NTS



Control Panel Detail
Not To Scale

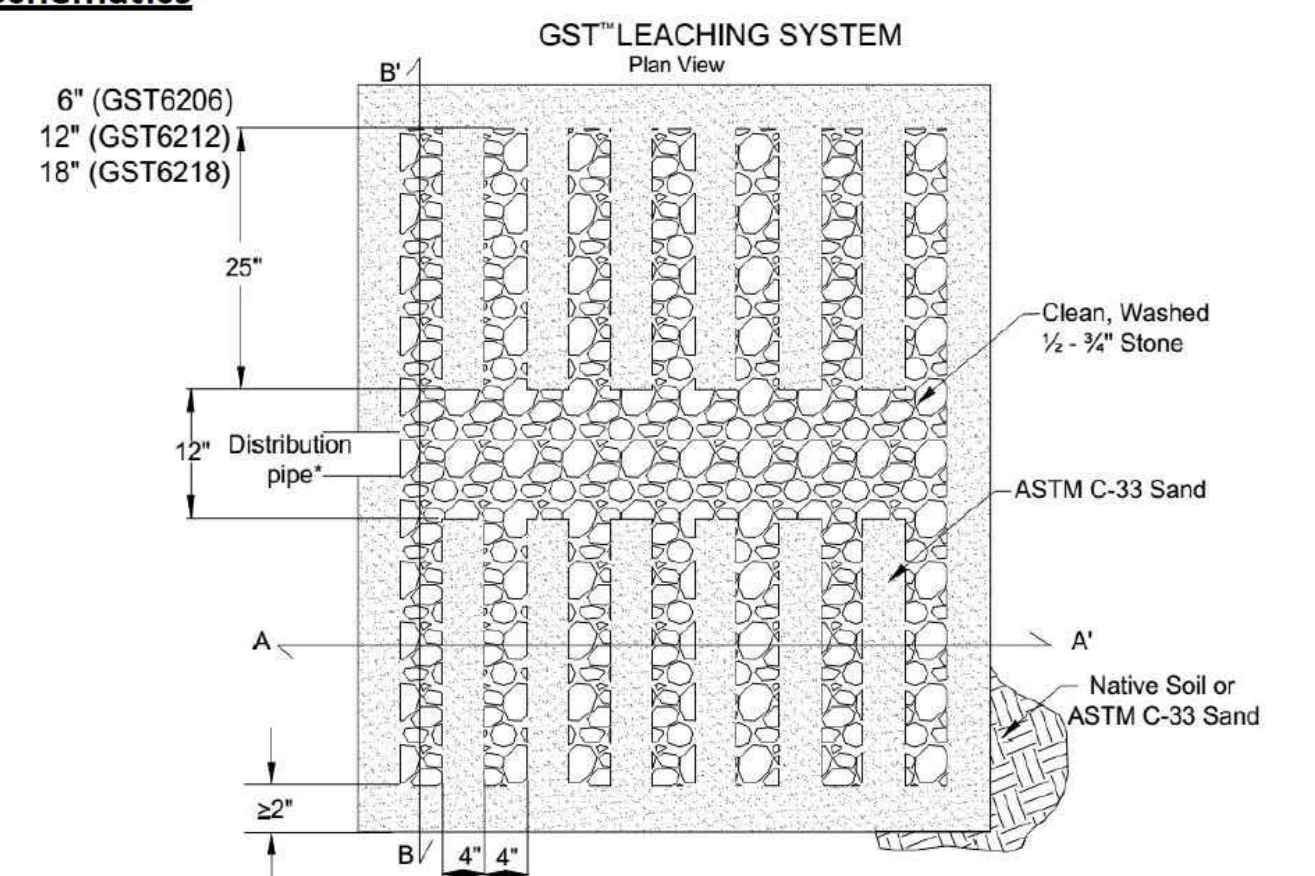


3-Way Flow Inducer Typical Plumbing Example
Scale: 1" = 3'-0"

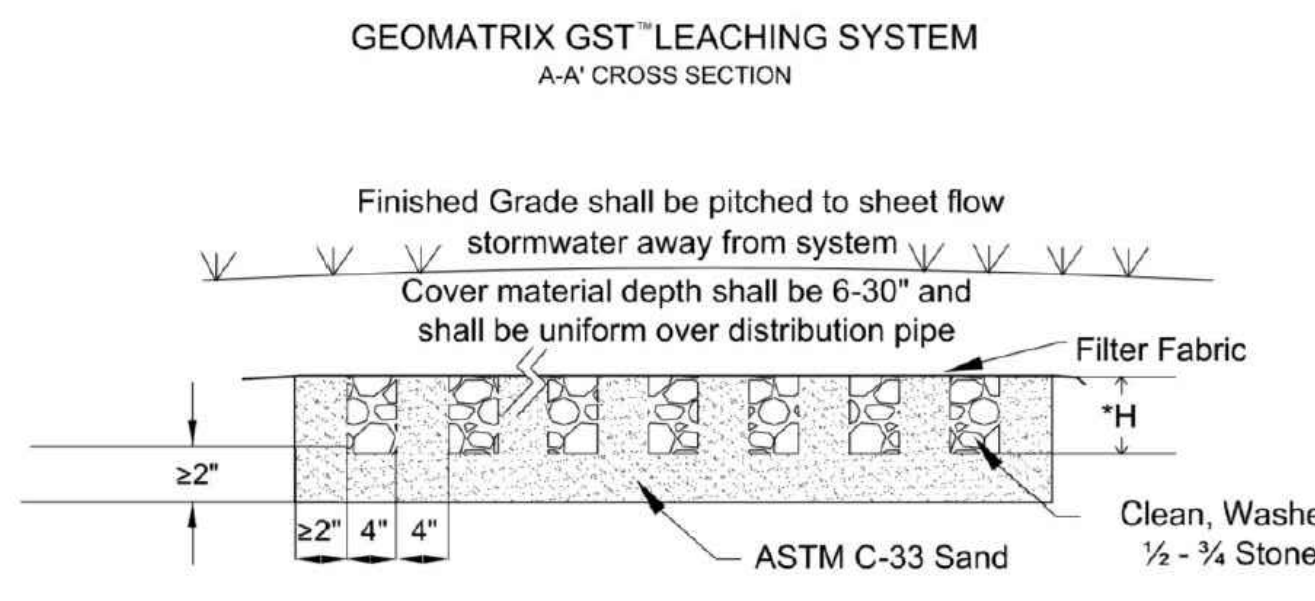


3-Way Flow Inducer Typical Plumbing Profile
Scale: 1" = 3'-0"

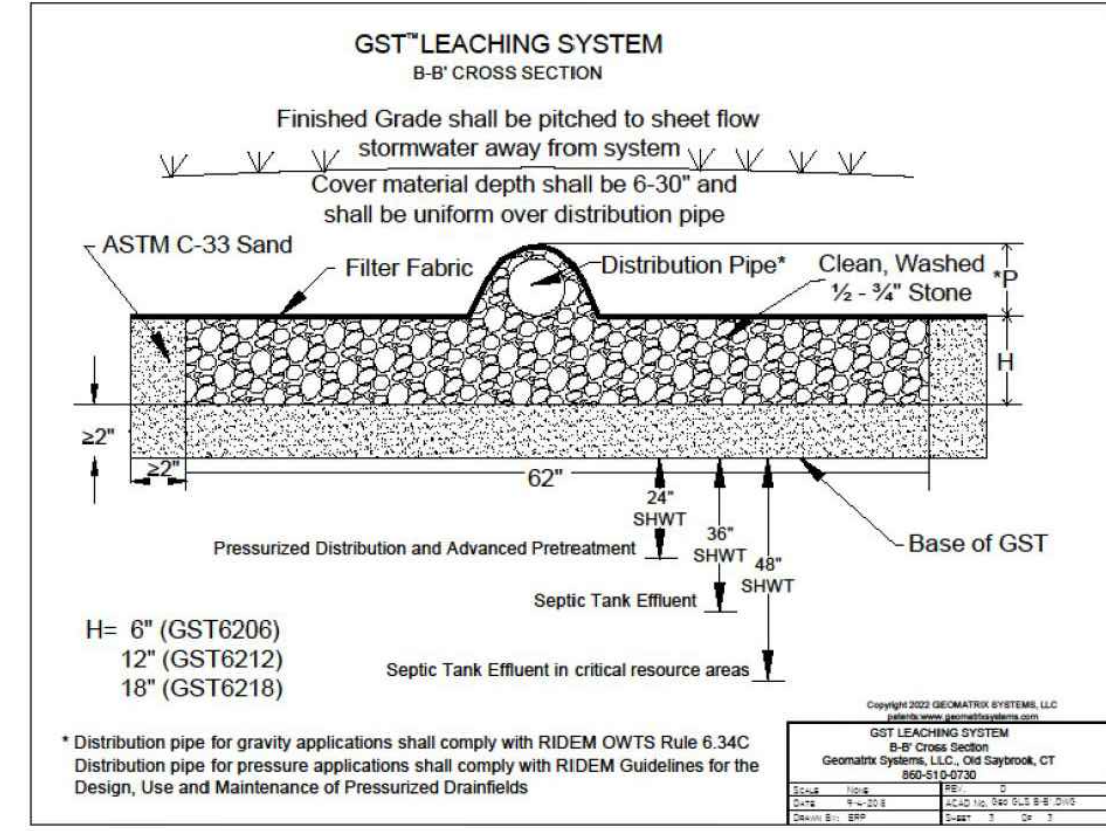
GST Schematics



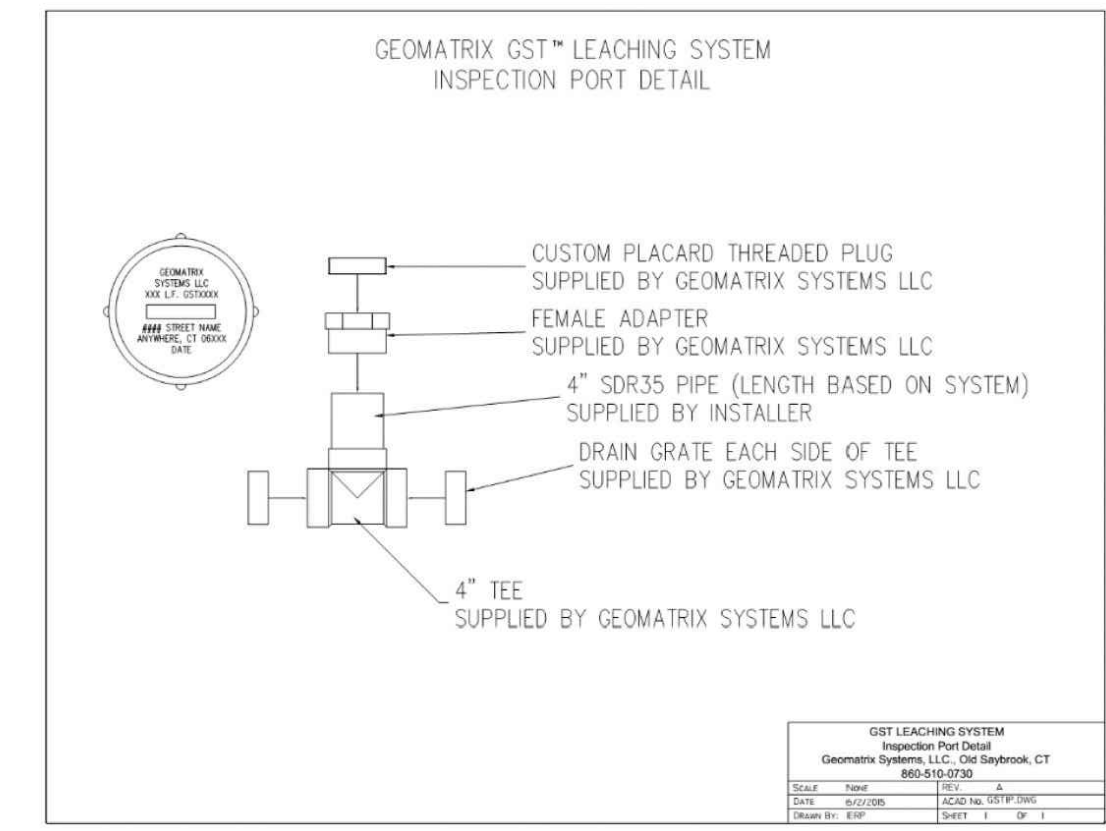
* Distribution pipe for gravity systems shall comply with RIDEM DWTS Rule 6.34C. Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.



*H= 6" (GST6206)
12" (GST6212)
18" (GST6218)



* Distribution pipe for gravity applications shall comply with RIDEM DWTS Rule 6.34C. Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.



SCALE: 1" = 4'

COLLECTIVE AIR INLET DETAIL

SCALE: VARIES

AdvanTex AX100 SYSTEM - MISCELLANEOUS DETAILS

SCALE: VARIES

OWTS DETAILS



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

20.0179 2A,2B
SHEET 1-2



Site Evaluation Form
Part A - Soil Profile Description

Application Number

Property Owner: RHODE ISLAND STATE OF (DEM) DIVISION OF PARKS

Property Location: 1-100 BURLINGAME PARK RD, CHARLESTOWN, RI PLAT 15 LOT 10

Date of Test Hole: 8/17/21

Soil Evaluator: KAMAL HINGORANY License Number: D4005

Weather: CLOUDY Shaded: Yes No Time: 9:30 AM

Table with 11 columns: TH Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Contains data for TH 2A and TH 2B horizons.

TH 2A Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 120" (og)
TH 2B Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 120" (og)

Comments:

Part B

Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer





20.0179 2A, 2B
SHEET 2-2

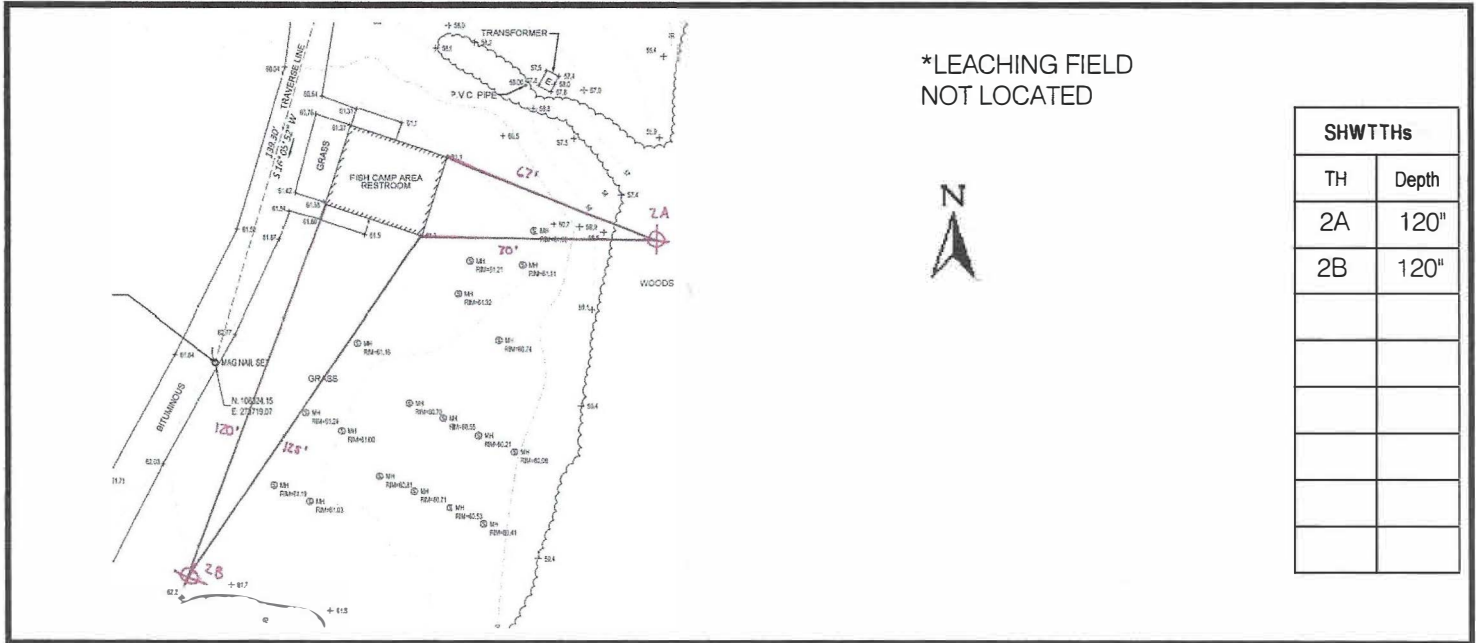
Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*

***OFFSETS MUST BE SHOWN**

Key:

-  Approximate location of test holes
-  Approximate location of bedrock test holes
-  Estimated gradient and direction of slope
-  Approximate direction of due north



SHWTTs	
TH	Depth
2A	120"
2B	120"

1. Relief and Slope: _____
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO YES
8. Site's potential for flooding or ponding: NONE SLIGHT MODERATE SEVERE
9. Landscape position: SHOULDER
10. Vegetation: GRASS
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site: _____

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: [Signature] D4005 License # _____ Part B prepared by: [Signature] D4005 License # _____

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur Inconclusive Disclaim

Unwitnessed Soil Evaluations Decision: Accept Inconclusive Disclaim

Wet Season Determination required Additional Field Review Required

Explanation: _____

Signature Authorized Agent _____ Date _____



Fish Camp Bathhouse and System Replacement Project
Burlingame State Park and Campground
Charlestown, Rhode Island

DESIGN NARRATIVE

RIDEM is in the process of replacing the Bathhouse and Onsite Wastewater System (OWTS) at this location. Soil logs can be found on Sheet C-1.4 together with the proposed site layout and System Design Data and Notes. Details for the system are on Sheets C-2.4, C-3.1 and C-3.2.

Soil evaluations for this OWTS location were conducted on August 17, 2021, soils are Category 3 and the Estimated Seasonal High Water Table depth at the OWTS is 120" or at elevation 52.0±.

In total the six bathhouses for the overall campground accommodate approximately 720 campsites. Utilizing the RIDEM wastewater design flow for a campground with washroom and toilets of 50 gallons per day we determine a daily flow for the entire campground to be approximately 36,000 gallons per day (GPD). The average daily flow per acre of the campground is (36,000 GPD / 847 Acres) 42.5 GPD/Acre. The average daily flow for each bathhouse is approximately 6,000 GPD. In calculating an estimated daily flow for the Fish Camp Bathhouse OWTS we took a conservative approach utilizing 150 campsites at 50 GPD/campsite to determine a design flow for the Fish Camp Bathhouse to be 7,500 GPD which is greater than the 6,000 GPD average. Please see the attached campsite map which depicts the campsites (as highlighted) chosen to be included within the 150 sites utilized for sizing the OWTS. Please note that sites throughout the campground overlap to agree with the conservative estimate. The system as sized is oversized and is considered a large system. The system is used on a seasonal basis between the months of April and October.

The OWTS will utilize Two (2) Orenco AdvanTEX AX100 Pods for advanced treatment. This system is a Category 1 advanced treatment technology. The system will treat the wastewater and reduce the biochemical oxygen demand (BOD) and comply with the latest Orenco system design criteria and thus the RIDEM OWTS criteria. See attached Final Design Review Letter from Orenco.

The systems drainfield is designed as a Geomatrix Gravel Sand Treatment (GST) System. The Loading Rate for Category 1 Technology for the GST is 3.5 GPD/square feet (SF). The minimum size drainfield is 7,500 GPD/3.5 GPD/SF which equals 2,143 SF. We propose to use the GST 6212 and the minimum size drainfield requirement for this application is 123 lineal feet (LF). We propose to use the 288 lineal feet (LF) of GST 6212 which provides 17.5 S.F. per LF, which equals 5,040 SF. and is greater than 2,143 SF (minimum size). The GST system has been divided into two equal drainfields and the GST are spaced 7'6" on center. The two drainfields consist of 4 rows each 36 feet long and 62" wide with a stone depth of 12" below the 4" perforated distribution pipe. See pump selection and system specifications on Sheet C-2.4 for additional information. Please see the attached review letter from Geomatrix.

WATCHAUG POND



FISH CAMP AREA

150

400 AREA

MAIN CAMP AREA

146

150

B
150

LEGIONTOWN
CAMP AREA

156

500 AREA

MILLS CAMP AREA

150

- CHECK STATION
- PERMITS
- COMFORT STATION

TO WESTERLY

TO WAKEFIELD & PROVIDENCE



DEVELOPED BY:
 PARE CORPORATION
 100 BERRY AVE. SUITE 100
 WILMINGTON, MA 01897
 617-264-1100



BURLINGAME STATE PARK
 RHODE ISLAND DEPT. OF
 ENVIRONMENTAL MANAGEMENT

LEGEND

- | | |
|---------------------------------|--------------------------|
| A TENTS ONLY | Ⓐ WATER |
| B SMALL TRAILERS | ▨ RESTROOMS WITH SHOWERS |
| C LARGE TRAILERS AND MOTORHOMES | ★ DUMPING STATIONS |
| M MOTORHOMES | ▣ CABIN |
| P PORTAJONS | D DUMPSTERS |

01/19/2023

Kevin Harrop
Caputo & Wick
1150 Pawtucket Ave
Rumford, RI 02916

Subject: Final Design Review of Burlingame Park/Fish Camp

Kevin,

Orenco Systems, Inc. (“Orenco”) has received the Plans with all required fields completed (attached to this letter), a copy of the plan set showing the designed site layout and configuration plans, and other documents that comprise the Final Design for the Burlingame Park project. Orenco staff reviews the Final Design of all wastewater collection and treatment systems for commercial applications to ensure that the design is compliant with the most current version of the system’s applicable design criteria published by Orenco for the specified parameters provided by the system’s designer in the Plans. The findings and conclusions of my review of this Final Design are as follows:

Design Basis

The system has been designed for a Type 2, Park application. Influent flow and constituent concentrations and effluent constituent concentration requirements have been provided by the system’s designer on the attached Plans and were used in my review of the Final Design.

The influent flow on the Plans were not extrapolated from the metered flows from the subject site, but in our experience, they are consistent with influent flows from other, similar Type 2, Park systems that Orenco has previously observed. As such, I have no reason to doubt the accuracy of the designer’s findings and assumptions as to the influent flow, and find that it was reasonable for the designer to use them as the design basis for the system.

System Design

The proposed Final Design of the system consists of a park. Influent will enter a 15,000 gallon Primary Tank, which will then flow into a 7,500 gallon Pre-Anoxic Tank. From here, flow will gravity discharge into a 6,000 gallon Recirculation Tank. The recirc-filtrate blend in this tank will pump into (2) AX100 pods and the filtrate will enter a splitter valve in the front of the Recirculation Tank where it will either be recirculated again or siphon to a drain field.

Design Criteria

The applicable design criteria for this system, which I used to conduct the review of its Final Design, is revision 8.0 of document NDA-ATX-1, titled *Orenco[®] AdvanTex[®] Design Criteria, Commercial Treatment Systems*, which was published by Orenco in October, 2020. A copy of the design criteria can be downloaded from Orenco’s online document library at www.orenco.com/corporate/doclibrary.cfm.

Findings

The findings of my review as to whether the Final Design complies with Orenco’s design criteria for treating wastewater to the effluent constituent concentration requirements provided in the Plans are as follows:

Primary Treatment

The Final Design specifies the use of 1 - 15,000 U.S. Gallon Primary concrete and 1 - 7,500 U.S. Gallon Primary concrete tanks in series for primary treatment. Using the flow data specified on the Plans the hydraulic retention times for grease capture and primary treatment calculate as follows:

Primary Tank(s) Hydraulic Retention Time (HRT)¹				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Effective Combined Primary Tankage (gpd)	Avg HRT (days)	Max Day HRT (days)
3,500	7,500	22,500	6.4	3.0

¹ Design Max Day Flow is the maximum daily flow a facility is expected to receive no more than one day within any week’s time.

The Primary Tank Sizing Recommendations states that the recommended primary tankage for a Park treatment system should be sized to at a minimum of 3 days of hydraulic retention time at the Design Max Day Flow. Therefore, the configuration and specifications of the primary treatment tanks in the Final Design satisfy Orenco’s recommendation for primary tankage for this Park application. This pre-anoxic tank should be sized equal to one day at maximum day design flow and is considered part of the overall primary tank volume.

Recirculation Tank — Standard Stage

The Final Design further specifies the use of 1 - 6,000 U.S. Gallon concrete tank for recirculation and blending of the AdvanTex-treated effluent with primary tank effluent. Using the flow data specified on the Plans the tank is sized to be equal to 80% of the Maximum Day Design Flow. The recirculation tank for the standard stage should be sized at a minimum of 75% of the Maximum Day Design Flow. Therefore, the specification of the recirculation-blend tank in the Final Design satisfies Orenco’s design criteria.

Hydraulic Load — Standard Stage

The Final Design specifies the use of 2 - AX100 pods, which contain a nominal surface area of 200 square feet of treatment media. Using the flow data specified on the Plans the hydraulic loading rate for the system calculates as follows:

Hydraulic Loading Rate (HLR) — Standard Stage				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Nominal Textile Area (sq. ft.)	Average HLR (gal. per day/sq. ft.)	Peak HLR (gal. per day/sq. ft.)
3,500	7,500	200	17.5	37.5

According to the AdvanTex System Loading Chart in the applicable design criteria, the standard AdvanTex treatment system (Stage 1) should not be hydraulically loaded more than 25 gpd/square foot at Design Average Flow or 50 gpd/square foot at Design Max Day Flow. Therefore, the specified type and number of AdvanTex pods in the Final Design satisfy Orenco’s design criteria to achieve the effluent quality listed in the design criteria at a 95% confidence level for this Type 2, Park application.

Organic Load — Standard Stage

The following influent characteristics provided on the Plans were estimated and not derived from direct sampling. Even though the influent characteristics were not derived from direct sampling, the values provided are consistent with values we have seen in other, similar Type 2, Park applications.

Influent (Primary Tank Effluent) Characteristics — Loading to Textile	
Average BOD ₅ (mg/L)	Average TSS (mg/L)
250	200

Based on the average influent biochemical oxygen demand (BOD₅) concentration and flow data specified on the Plans, the system will receive approximately 7.3 pounds of BOD₅ per day at Design Average Flow, and 15.6 pounds of BOD₅ per day at Maximum Day Design Flow. Using this information, the organic loading rate of the system calculates as:

Organic Loading Rate (OLR) — Standard Stage				
Average Organic Load (lbs/day)	Maximum Organic Load (lbs/day)	Nominal Treatment Area (sq. ft.)	Average OLR (lbs BOD/sq. ft./day)	Maximum OLR (lbs BOD/sq. ft./day)
7.3	15.6	200	0.04	0.08

Conclusions

I have reviewed the Final Design of the Burlingame Park wastewater treatment system, and have found that the design is compliant with the most current version of the system's applicable design criteria published by Orenco for the specified parameters provided by the system's designer in the Plans. In addition, I noted no anomalies in the site layout or configuration of the system during my review.

Compliance Table — Meets Minimum Design Standards	
	Standard Stage
Recirc Tank Size	Yes
Hydraulic Load	Yes
Organic Load	Yes

As such, the system as designed satisfactorily complies with Orenco's design criteria to meet the following effluent limits specified in the Plans at a 95% confidence level, provided that all influent flows and constituent concentrations specified in the Plans are not exceeded:

Expected Effluent Quality	
Constituent	Average (mg/L)
BOD ₅	20
TSS	20

It is important to note that even though the AdvanTex Treatment System has the capability to meet or exceed the required treatment parameters, there is no way that Orenco can guarantee that a particular system will be operated or maintained in a manner consistent with the Final Design reviewed. Once the facility is placed into operation, the influent flows and constituent concentrations to the facility should be monitored, and if flow or any of the influent constituent concentrations exceed those listed in the Plans, measures should be taken to reduce the flow or constituent concentration to those listed. However, if additional treatment capacity becomes necessary, the system is designed to have the capability to expand to account for the new flow or constituent concentration.

Proper air ventilation is a critical feature of all commercial AdvanTex Treatment Systems, and as such, adequate active ventilation is required for all systems. In addition, please note that disposing of toxics or chemicals into the system is strictly prohibited. Examples of toxics include restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo, waste products, or any other toxins. Furthermore, water softener brine discharge is prohibited from being discharged into the AdvanTex Treatment System. Failure to adhere to these policies will void Orenco's limited product warranties.

If you have any questions about my review process, findings, or conclusions, please feel free to call or e-mail me.

Sincerely,



Caleb Castleman
Systems Engineering
Orenco Systems Inc.
(800) 348-9843 ext. 548
ccastleman@orencocom

Project: Burlingame State Park and Camp Ground
 Location: Fish Camp

Description	Input values	Units
Finish Grade	60.50	Elevation
Water Table Elevation	49.75	Elevation
Bottom of Tank Elevation	50.08	Elevation
Lowest Pipe Invert	57.75	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	13.00	Inches
Length of Tank	30.83	Feet
Width of Tank	11.33	Feet
Depth of Tank	9.33	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	8.00	Inches
Sides Concrete Thickness	8.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	4.00	Inches
Compartment Wall Height	87.00	Inches
	Computed Value	
Submerged Depth	-0.33	Feet
Top/Bottom Surface Area of Tank	349.43	SF
Displaced Volume	-115.31	CF
Volume of Tank Top	232.96	CF
Volume of Tank Sides	435.53	CF
Volume of Tank Bottom	232.96	CF
Volume of Baffle	24.17	CF
Weight of Tank Top	34,943.38	lbs
Weight of Tank Sides	65,330.02	lbs
Weight of Tank Bottom	34,943.38	lbs
Weight of Baffle	3,624.88	lbs
Total Weight of Tank	138,841.66	lbs
Volume of Soil	378.55	CF
Weight of Soil Above Tank	37,855.33	lbs
Uplift Created by Submerged Tank	-7,195.54	lbs
Total Weight of Tank, Counter Weight and Soil	176,696.99	lbs
Exceeds Displaced Volume by	183,892.53	lbs
Buoyance Point for Empty Tank	6.37	Feet (above bottom)
Buoyance Point for Empty Tank	56.45	Elev
Buoyance Point for Tank in Place	8.10	Feet (above bottom)
Buoyance Point for Tank in Place	58.18	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Fish Camp

Description	Input values	Units
Finish Grade	60.50	Elevation
Water Table Elevation	49.75	Elevation
Bottom of Tank Elevation	50.08	Elevation
Lowest Pipe Invert	57.75	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	13.00	Inches
Length of Tank	30.83	Feet
Width of Tank	11.33	Feet
Depth of Tank	9.33	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	8.00	Inches
Sides Concrete Thickness	8.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	4.00	Inches
Compartment Wall Height	87.00	Inches
Computed Value		
Submerged Depth	-0.33	Feet
Top/Bottom Surface Area of Tank	349.43	SF
Displaced Volume	-115.31	CF
Volume of Tank Top	232.96	CF
Volume of Tank Sides	435.53	CF
Volume of Tank Bottom	232.96	CF
Volume of Baffle	24.17	CF
Weight of Tank Top	34,943.38	lbs
Weight of Tank Sides	65,330.02	lbs
Weight of Tank Bottom	34,943.38	lbs
Weight of Baffle	3,624.88	lbs
Total Weight of Tank	138,841.66	lbs
Volume of Soil	378.55	CF
Weight of Soil Above Tank	37,855.33	lbs
Uplift Created by Submerged Tank	-7,195.54	lbs
Total Weight of Tank, Counter Weight and Soil	176,696.99	lbs
Exceeds Displaced Volume by	183,892.53	lbs
Buoyance Point for Empty Tank	6.37	Feet (above bottom)
Buoyance Point for Empty Tank	56.45	Elev
Buoyance Point for Tank in Place	8.10	Feet (above bottom)
Buoyance Point for Tank in Place	58.18	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Fish Camp

Description	Input values	Units
Finish Grade	60.50	Elevation
Water Table Elevation	49.75	Elevation
Bottom of Tank Elevation	49.90	Elevation
Lowest Pipe Invert	57.40	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	17.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	9.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
	Computed Value	
Submerged Depth	-0.15	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	-25.50	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	208.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	31,199.74	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	60,949.74	lbs
Volume of Soil	240.83	CF
Weight of Soil Above Tank	24,083.33	lbs
Uplift Created by Submerged Tank	-1,591.20	lbs
Total Weight of Tank, Counter Weight and Soil	85,033.07	lbs
Exceeds Displaced Volume by	86,624.27	lbs
Buoyance Point for Empty Tank	5.75	Feet (above bottom)
Buoyance Point for Empty Tank	55.65	Elev
Buoyance Point for Tank in Place	8.02	Feet (above bottom)
Buoyance Point for Tank in Place	57.92	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Fish Camp

Description	Input values	Units
Finish Grade	61.25	Elevation
Water Table Elevation	50.50	Elevation
Bottom of Chamber Elevation	51.50	Elevation
Lowest Pipe Invert	57.25	Elevation
Counter Weight	0.00	lbs
Soil Above Chamber	15.00	Inches
Chamber Length	7.00	Feet
Chamber Width	7.00	Feet
Diameter of Opening	2.50	Feet
Chamber Interior Height	7.00	Feet
Top of Concrete Thickness	6.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Concrete Wall Thickness	6.00	Inches
	Computed Value	
Submerged Depth	-1.00	Feet
Top Surface Area of Chamber	44.09	SF
Surface Area of Chamber Sides	182.00	SF
Bottom Surface Area of Chamber	49.00	SF
Displaced Volume	-49.00	CF
Volume of Chamber Top	22.05	CF
Volume of Chamber Sides	91.00	CF
Volume of Chamber Bottom	24.50	CF
Weight of Chamber Top	3,306.84	lbs
Weight of Tank Side	13,650.00	lbs
Weight of Chamber Bottom	3,675.00	lbs
Total Weight of Chamber	20,631.84	lbs
Volume of Soil	55.11	CF
Weight of Soil Above Chamber	5,511.41	lbs
Uplift Created by Submerged Chamber	-3,057.60	lbs
Total: Chamber, Counter Weight and Soil	26,143.25	lbs
Exceeds Displaced Volume by	29,200.85	lbs
Buoyance Point for Empty Chamber	6.75	Feet (above bottom)
Buoyance Point for Empty Chamber	58.25	Elev
Buoyance Point for Chamber in Place	8.55	Feet (above bottom)
Buoyance Point for Chamber in Place	60.05	Elev

(Soil friction has not been taken into account)

Duplex Control Panels

Applications

Orenco Duplex Control Panels are used to control dual pumps, alarms, and other equipment as specified in pressure sewers and onsite septic systems.



Orenco[®] DAX2 Control Panel



General

Orenco Duplex Control Panels are specifically engineered for pressure sewer (STEP) systems and onsite septic treatment systems that require the use of two alternating pumps. Standard features include circuit breakers, an automatic/manual/off motor control toggle for each pump, an audio/visual high level alarm, an alarm reset, and a duplex alternator. Other standard features and options are listed on page 2. Orenco panels are designed for use with mechanical and/or mercury float switches. Listed per UL 508 in the US and Canada.

Standard Models

DAX1, DAX2

Product Code Diagram



Standard options (list in order):
 PT = programmable timer
 RO = redundant off relay
 CS = current sensor
 ETM = elapsed time meter
 CT = event counter
 HT = heater
 SA = surge arrester
 PRL = pump run light
 PL = power light

Intrinsically safe relays:
 Blank = standard, no IR relays
 IR = intrinsically safe relays

Pump voltage:
 1 = 120 VAC
 2 = 120 VAC or 240 VAC

DAX series duplex control panel

Materials of Construction

Enclosure	UV-resistant fiberglass, UL Type 4X
Hinges	Stainless steel

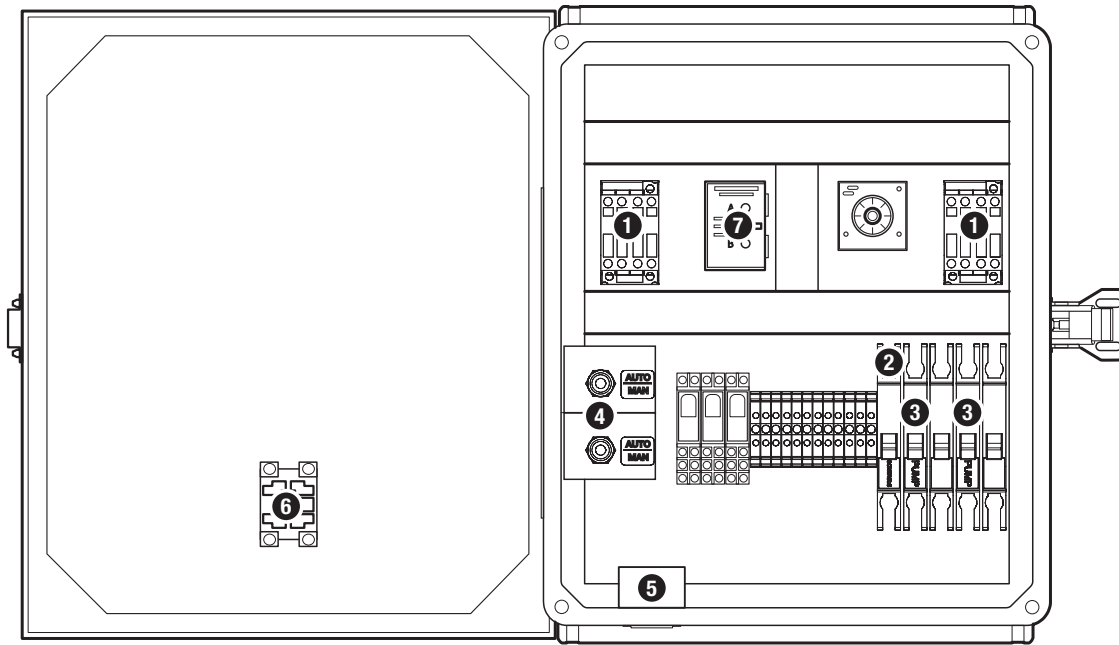
Specifications

Panel Ratings

DAX1:	120 V, 1 hp, 16 amps, single phase, 60 Hz.
DAX2:	240 V, 3 hp, 16 amps, single phase, 60 Hz.

Dimensions

Height, in. (mm)	15.5 (394)
Width, in. (mm)	13.5 (343)
Depth, in. (mm)	6.7 (170)



Orenco® DAX2PTR0 240 V panel

Standard Components

Feature	Specification(s)
1. Motor-Start Contactor	120 V, 16 FLA, 1 hp (0.75 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA). 240 V, 16 FLA, 3 hp (2.24 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).
2. Controls Circuit Breaker	10 A, OFF/ON switch. Single-pole 120 V. DIN rail mounting with thermal magnetic tripping characteristics.
3. Pump Circuit Breakers	20 A, OFF/ON switch. Single-pole 120 V or double-pole 240 V. DIN rail mounting with thermal magnetic tripping characteristics.
4. Toggle Switches	20 A, 1hp (0.75 kW). Single-pole, double-throw HOA switch,
5. Audible Alarm	95 dB at 24 in. (610 mm), warble-tone sound.
6. Visual Alarm	7/8-in. (22-mm) diameter red lens, "Push-to-silence." UL Type 4X rated, 1 W LED light, 120 V.
7. Duplex Alternator	120 V. Cross-wired style for independent lag pump function. Selector switch for locking one pump into lead position.
Audible Alarm Silence Relay (Not shown)	120 V. Automatic reset. DIN rail mount.

Optional Features

Feature	Specification(s)	Code Adder
Intrinsically Safe Control Relays	Listed per UL 698A, for Class 1 Div. 1, groups A, B, C, D hazardous locations (requires larger enclosure).	IR
Programmable Timer	120 V. Repeat cycle from 0.05 seconds to 30 hours. Separate variable controls for OFF & ON time periods.	PT
Redundant Off Relay	120 V. Provides a secondary off. Sounds alarm on low level condition. DIN rail mount.	RO
Elapsed Time Meter	120 V, 7-digit, non-resettable. Limit of 99,999 hours; accurate to 0.01 hours.	ETM
Event Counter	120 V, 6-digit, non-resettable.	CT
Heater	Anti-condensation heater. Self-adjusting: radiates additional wattage as temperature drops.	HT
Surge Arrestor	Status light on unit; protects incoming power supply from electrical surges.	SA
Pump Run Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PRL
Power Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PL

PF-Series Submersible Effluent Pumps: 1-Phase, 60-Hz, 4-inch (100-mm)

Applications

Our PF-Series 4-inch (100-mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or dosing tanks. These pumps are constructed of light-weight, corrosion-resistant stainless steel and engineered plastics, and are field-serviceable and repairable with common tools. They're also CSA- and UL-certified to U.S. and Canadian safety standards for effluent pumps.

PF-Series pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.



Features/Specifications

To specify this pump for your installation, require the following:

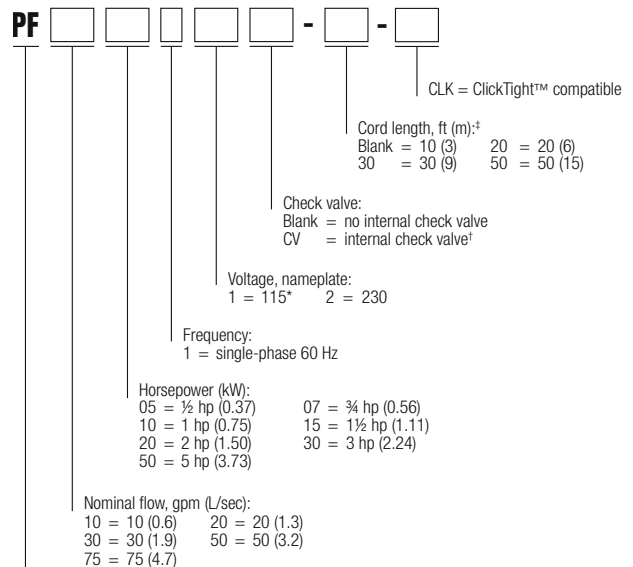
- Minimum 24-hour run-dry capability (liquid end) with no deterioration in pump life or performance*
- 1/8-inch (3-mm) bypass orifice to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid-end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10, 20, and 30 gpm (0.6, 1.3, and 1.9 L/sec) models; floating stack design on 50 and 75 gpm (3.2 and 4.7 L/sec) models
- Franklin Electric Super Stainless motor, rated for continuous use and frequent cycling
- Type SOOW 600-V motor cable (model PF751512 uses 14 AWG, SJ00W, 300-V cord)

* Not applicable for 5-hp (3.73 kW) models

Standard Models

See specifications chart on page 2 for a list of standard pumps. For a complete list of available pumps, call Orenco.

Product Code Diagram



Pump, PF Series

* ½-hp (0.37 kW) only

† Available for 10 gpm (0.6 L/sec), 1/2 hp (0.37 kW)

‡ Note: 20-ft cords are available only for pumps through 1½ hp



C US
LR80980
LR2053896



Powered by
Franklin Electric

Specifications

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Discharge size and material ¹	Length in. (mm)	Min. liquid level in. (mm)	Weight lb (kg)	Rated cycles per day
PF100511 ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100511CV ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512 ⁹	10 (0.6)	0.50 (0.37)	1	230	240	6.3	6.3	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712 ^{4,5,9}	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	1 ¼ in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF101012 ^{5,6,9}	10 (0.6)	1.00 (0.75)	1	230	240	9.6	9.6	1 ¼ in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF200511 ⁹	20 (1.3)	0.50 (0.37)	1	115	120	12.3	12.5	1 ¼ in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512 ⁹	20 (1.3)	0.50 (0.37)	1	230	240	6.4	6.5	1 ¼ in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF201012 ^{4,5,9}	20 (1.3)	1.00 (0.75)	1	230	240	10.5	10.5	1 ¼ in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF201512 ^{4,5}	20 (1.3)	1.50 (1.11)	1	230	240	12.4	12.6	1 ¼ in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF300511 ⁹	30 (1.9)	0.50 (0.37)	1	115	120	11.8	11.8	1 ¼ in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512 ⁹	30 (1.9)	0.50 (0.37)	1	230	240	6.2	6.2	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712 ⁹	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	1 ¼ in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF301012 ^{4,9}	30 (1.9)	1.00 (0.75)	1	230	240	10.4	10.4	1 ¼ in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF301512 ^{4,5}	30 (1.9)	1.50 (1.11)	1	230	240	12.6	12.6	1 ¼ in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF302012 ^{5,6,7}	30 (1.9)	2.00 (1.49)	1	230	240	11.0	11.0	1 ¼ in. SS	35.5 (902)	26 (660)	44 (20)	100
PF303012 ^{5,6,7,8}	30 (1.9)	3.00 (2.23)	1	230	240	16.8	16.8	1 ¼ in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF305012 ^{5,6,7,8}	30 (1.9)	5.00 (3.73)	1	230	240	25.6	25.8	1 ¼ in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF500511 ⁹	50 (3.2)	0.50 (0.37)	1	115	120	12.1	12.1	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512 ⁹	50 (3.2)	0.50 (0.37)	1	230	240	6.2	6.2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500712 ⁹	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501012 ⁹	50 (3.2)	1.00 (0.75)	1	230	240	10.1	10.1	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF501512 ⁴	50 (3.2)	1.50 (1.11)	1	230	240	12.5	12.6	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF503012 ^{4,5,7,8}	50 (3.2)	3.00 (2.23)	1	230	240	17.7	17.7	2 in. SS	43.0 (1092)	37 (940)	55 (25)	100
PF505012 ^{5,6,7,8}	50 (3.2)	5.00 (3.73)	1	230	240	26.2	26.4	2 in. SS	65.4 (1661)	55 (1397)	64 (29)	100
PF751012 ⁹	75 (4.7)	1.00 (0.75)	1	230	240	9.9	10.0	2 in. SS	27.0 (686)	27 (686)	34 (15)	100
PF751512	75 (4.7)	1.50 (1.11)	1	230	240	12.1	12.3	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

1 GFP = glass-filled polypropylene; SS = stainless steel. The 1 ¼-in. NPT GFP discharge is 2 7/8 in. octagonal across flats; the 1 ¼-in. NPT SS discharge is 2 1/8 in. octagonal across flats; and the 2-in. NPT SS discharge is 2 7/8 in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

2 Minimum liquid level is for single pumps when installed in an Orenco Biotube® Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

3 Weight includes carton and 10-ft (3-m) cord.

4 High-pressure discharge assembly required.

5 Do not use cam-lock option (Q) on discharge assembly.

6 Custom discharge assembly required for these pumps. Contact Orenco.

7 Capacitor pack (sold separately or installed in a custom control panel) required for this pump. Contact Orenco.

8 Torque locks are available for all pumps and are supplied with 3-hp and 5-hp pumps.

9 ClickTight™ compatible.

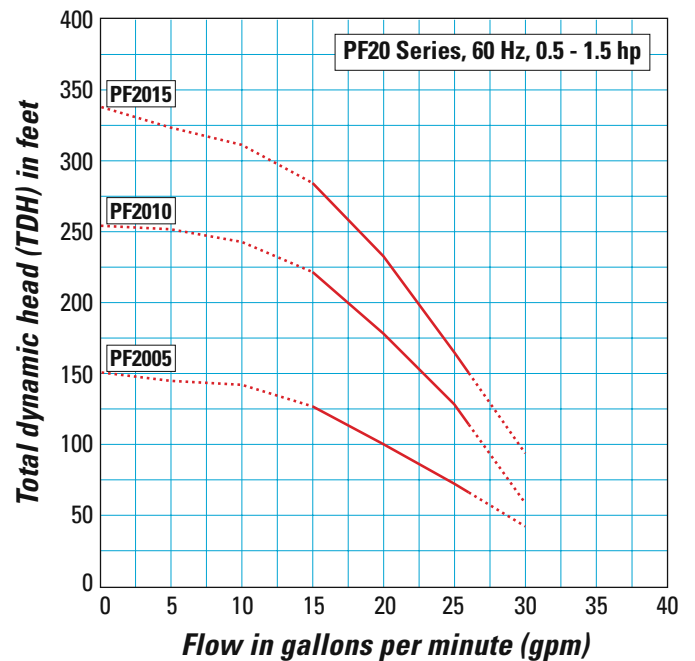
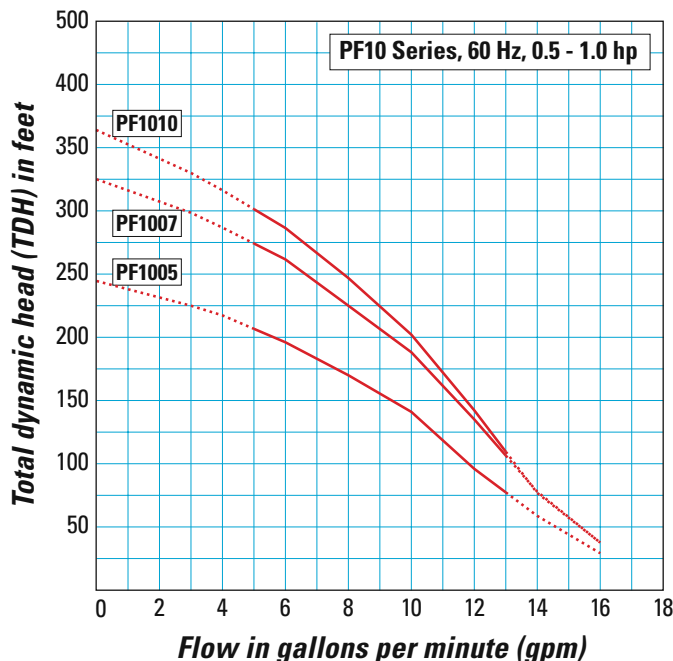
Materials of Construction

Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (Noryl GFN3)
Impellers	Celcon® acetal copolymer on 10-, 20-, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	7/16-in. hexagonal stainless steel, 300 series
Coupling	Sintered stainless steel, 300 series
Shell	Stainless steel, 300 series
Motor	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing ensures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Single-phase motors are equipped with surge arrestors for added security. Single-phase motors through 1.5 hp (1.11 kW) have built-in thermal over-load protection, which trips at 203-221° F (95-105° C).

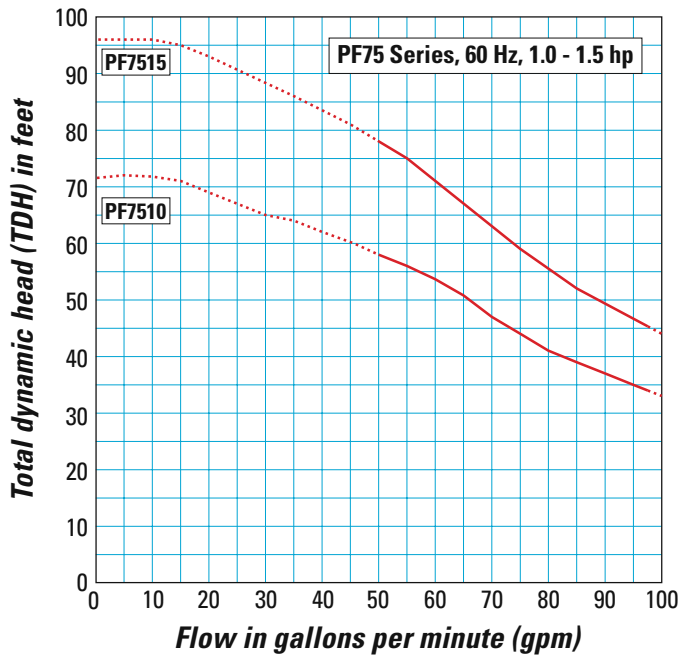
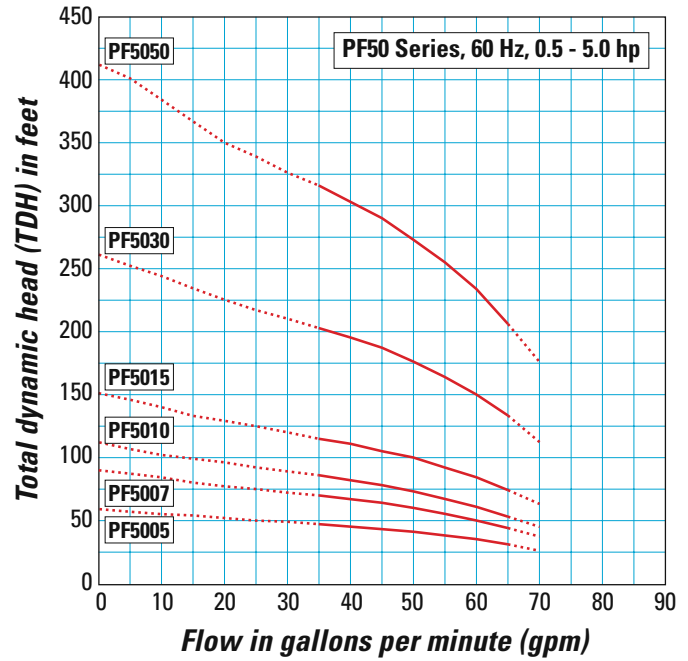
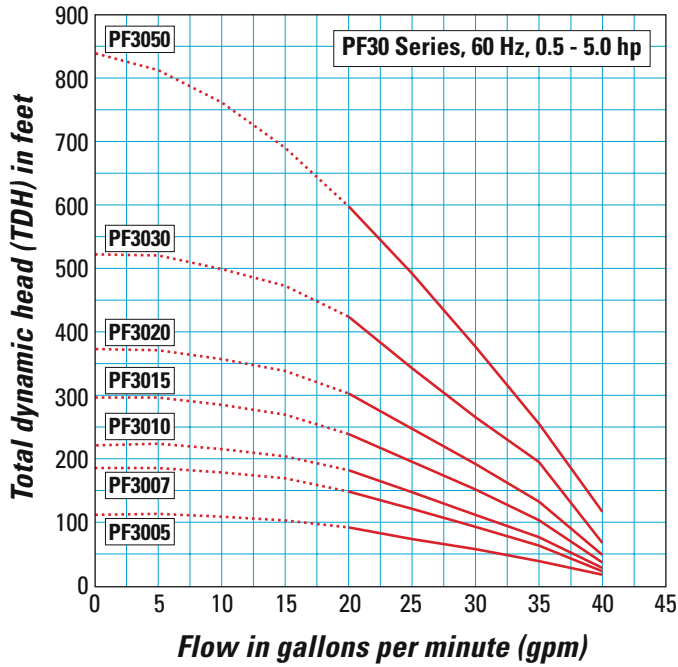
Using a Pump Curve

A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow and pressure (total dynamic head or “TDH”), providing a graphical representation of a pump’s optimal performance range. Pumps perform best at their nominal flow rate. These graphs show optimal pump operation ranges with a solid line and show flow rates outside of these ranges with a dashed line. For the most accurate pump specification, use Orenco’s PumpSelect™ software.

Pump Curves



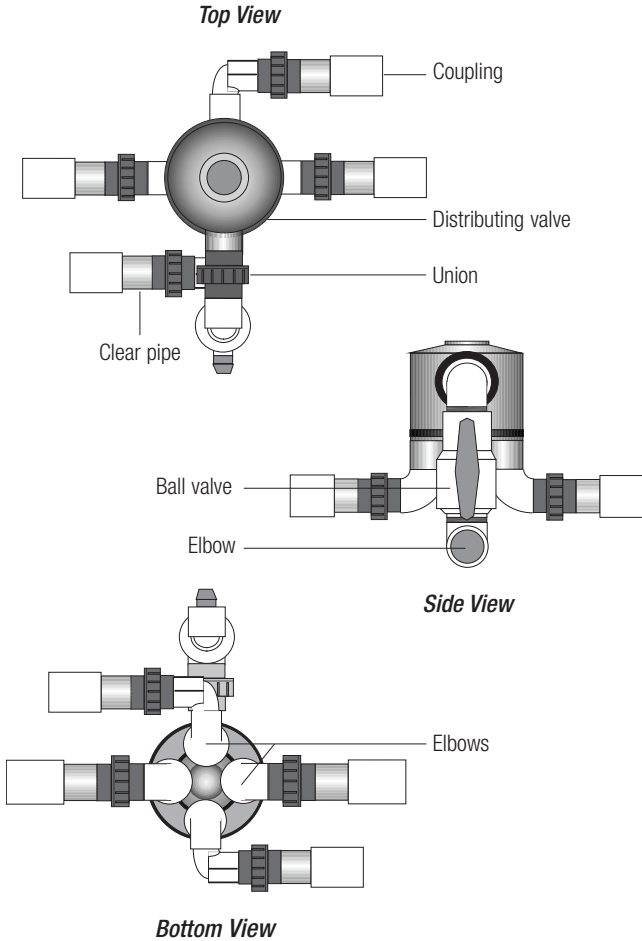
Pump Curves, cont.



Distributing Valves

Applications

Automatic Distributing Valve Assemblies are used to pressurize multiple zone distribution systems including textile filters, sand filters and drainfields.



General

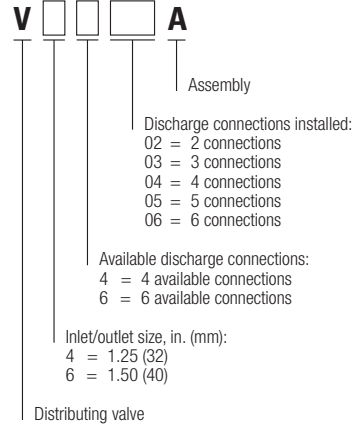
Orenco's Automatic Distributing Valve Assemblies are mechanically operated and sequentially redirect the pump's flow to multiple zones or cells in a distribution field. Valve actuation is accomplished by a combination of pressure and flow. They allow the use of smaller horsepower pumps on large sand filters and drainfields. For example, a large community drainfield requiring 300 gpm (18.90L/sec) can use a six-line valve assembly to reduce the pump flow rate requirement to only 50 gpm (3.14L/sec).

Orenco only warrants Automatic Distributing Valves when used in conjunction with High-Head Effluent Pumps with Biotube[®] pump vaults to provide pressure and flow requirements, and to prevent debris from fouling valve operation. An inlet ball valve, a section of clear pipe, and a union for each outlet are provided for a complete assembly that is easy to maintain and monitor. Ideal valve location is at the high point in the system. Refer to Automatic Distributing Valve Assemblies (NTP-VA-1) for more information.

Standard Models

V4402A, V4403A, V4404A, V4605A, V4606A, V6402A, V6403A, V6404A, V6605A, V6606A.

Product Code Diagram



Materials of Construction

All Fittings	Sch. 40 PVC per ASTM specification
Unions	Sch. 80 PVC per ASTM specification
Ball Valve	Sch. 40 PVC per ASTM specification
Clear Pipe	Sch. 40 PVC per ASTM specification

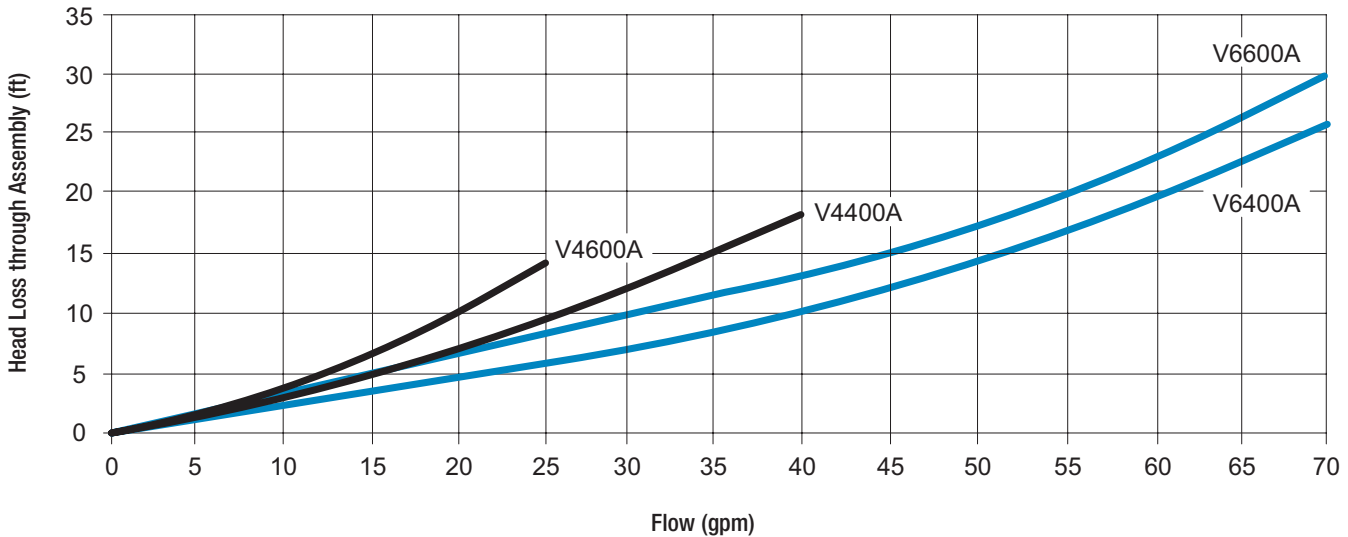
Specifications

Model	Inlet Size, in. (mm)	Outlets Size, in. (mm)	Flow Range, gpm (L/sec)	Max Head, ft (m)	Min. Enclosure*
V4402A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4403A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4404A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4605A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V4606A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V6402A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6403A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6404A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6605A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6606A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418

* When using an enclosed basin, choose the next larger-sized diameter.

Table 1. Automatic Distributing Valve Assembly Headloss Equations

Model Series	Equation	Operating Range, gpm (L/sec)
V4400A	$H_L = 0.085 \times Q^{1.45}$	10 - 40 (0.63 – 2.52)
V4600A	$H_L = 0.085 \times Q^{1.58}$	10 - 25 (0.63 – 1.57)
V6400A	$H_L = 0.0045 \times Q^2 + 3.5 \times (1 - e^{-0.06Q})$	15 - 70 (0.95 – 4.42)
V6600A	$H_L = 0.0049 \times Q^2 + 5.5 \times (1 - e^{-0.1Q})$	15 - 70 (0.95 – 4.42)



AdvanTex® AX100 Textile Filter

Applications

Orenco's AdvanTex® AX100 Treatment System is an innovative technology for onsite treatment of domestic-strength wastewater. The heart of the system is the AdvanTex Filter, a sturdy, watertight fiberglass basin filled with an engineered textile material. This lightweight, highly absorbent textile material treats a tremendous amount of wastewater in a small space. AX100 Treatment Systems are ideal for:

- New construction
- System upgrades and repairs
- Small sites
- Poor soils
- Pretreatment
- Nitrogen reduction
- Price-sensitive markets

For sizing, see AdvanTex® Design Criteria (NDA-ATX-COMM-1-PKG).



The heart of the AdvanTex® AX100 Treatment System is this sturdy, watertight fiberglass basin filled with an engineered textile material.

Features/Specifications

To specify this product, require the following:

- Wastewater treatment to better than secondary treatment standards
- Consistent treatment, even during peak flows
- Timer operation for flow monitoring, flow modulation, and surge control
- Fixed-film, engineered textile media, operated in an unsaturated condition
- Consistent media quality
- Low energy consumption
- Low maintenance requirements
- Complete pre-manufactured package, ready to install
- Watertight construction, corrosion-proof materials, and components
- Foam-core lid provides insulation value of R-6 (RSI-1.1)
- Quiet operation

Standard Model

AX100

Specifications**

Length, in. (mm)	191 (4851)
Width, in. (mm)	94 (2388)
Height, in. (mm)	42 (1067)
Area (footprint), ft ² (m ²)	128 (11.9)
Dry Weight, lb (kg)	1616 (733)

* Covered by U.S. patent numbers 6,540,920; 6,372,137; 5,531,894; 5,480,561; 5,360,556

** Nominal values provided. See AdvanTex® Treatment System drawings for exact dimensions.

AdvanTex[®] Vent Fan Assembly

Applications

Oreco's AdvanTex[®] Vent Fan Assembly consists of a water-proof fiberglass enclosure with equipment for venting onsite wastewater treatment systems. One enclosure can hold a vent fan with carbon filter and an optional heater.

The vent fan is used in commercial-sized AdvanTex Treatment Systems to gently pull air through the textile media, ensuring that adequate oxygen is available for biological treatment. The carbon filter scrubs the air that the system exhausts. An optional heater can be added where climate requires heating of the air that enters the AdvanTex textile filter pods.



Standard Models

AXVFACF — AX above ground Vent Fan Assembly with LMF-3 Fan

AXVFACF-HT — AX above ground Vent Fan Assembly with LMF-3 Fan and HT10 Heater

Enclosure

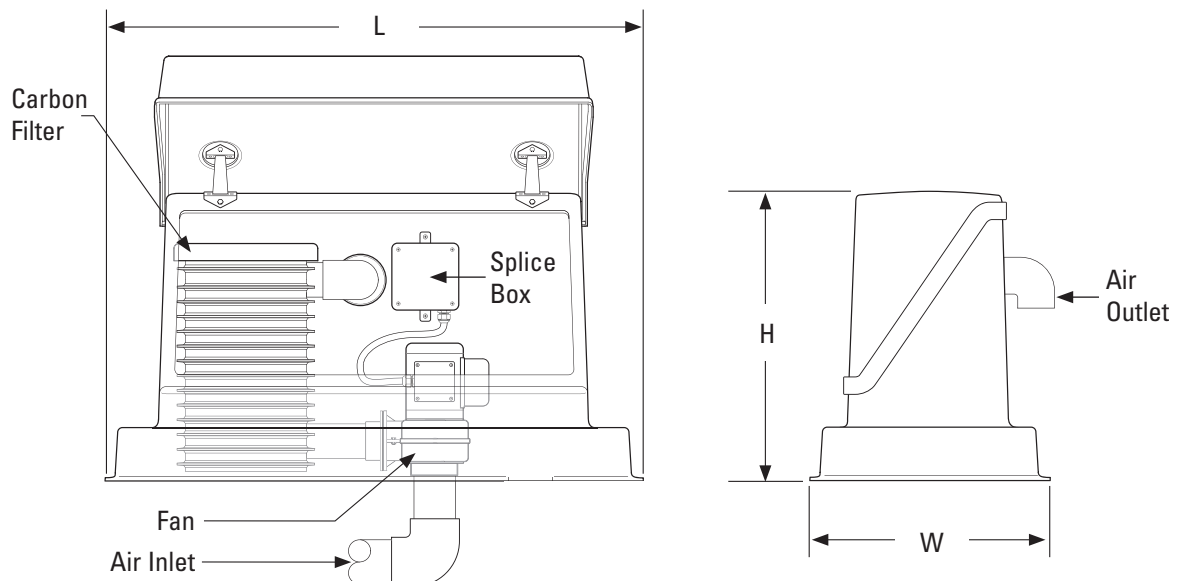
Physical Specifications

Materials of Construction

Shell	Fiberglass-reinforced polyester (FRP)
Hardware	Stainless steel
Exterior finish	Green, textured, UV resistant
Straps	Nylon

Dimensions

Length (L)	50 in. (1270 mm)
Width (W)	24 in. (610 mm)
Height (H)	30 in. (762 mm)
Volume	15.1 ft ³ (0.43 m ³)
Area (footprint)	8.3 ft ² (0.77 m ²)



AdvanTex® Vent Fan Assembly (continued)

Fan

Physical Specifications

Dimensions

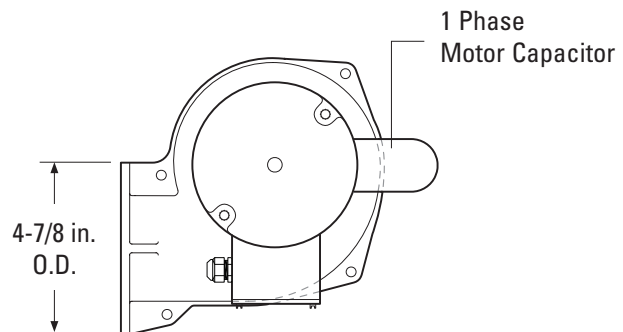
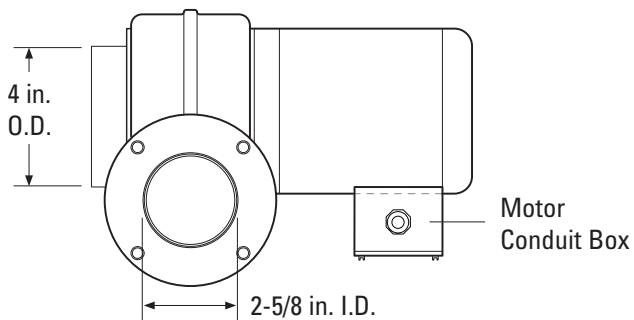
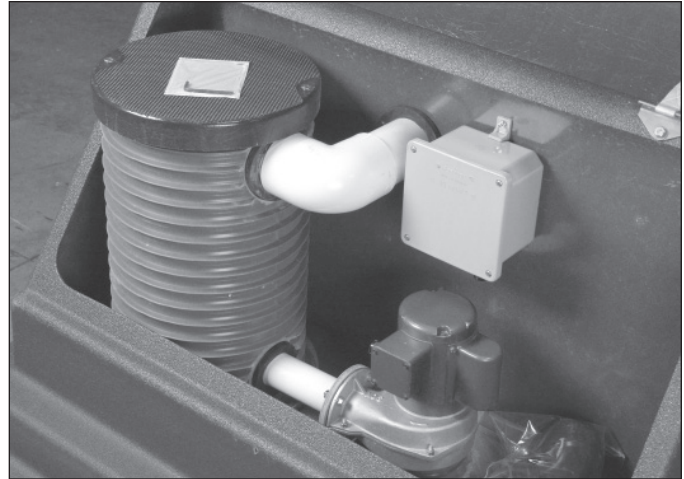
Inlet O.D.	4 in. (100 mm)
Inlet nominal pipe size	4 in. (100 mm)
Outlet I.D.	2-5/8 in. (67 mm)
Outlet Flange O.D.	4-7/8 in. (124 mm)

Materials of Construction

Housing	Aluminum
Wheel	Steel

Performance Data

	60 Hz	50 Hz
Horsepower (kW)	0.08 (0.06 kW)	0.08 (0.06 kW)
Phase	1 phase	1 phase
Volts	115/230	110/220
Amperage	1.4 A/0.7 A	1.8 A/0.9 A
RPM	3400	2900
CFM at 0" H ₂ O static pressure	245	205
CFM at 0.4" H ₂ O static pressure	220	170
CFM at 0.8" H ₂ O static pressure	190	130
CFM at 1.5" H ₂ O static pressure	120	N/A



AdvanTex® Vent Fan Assembly (continued)

Carbon Filter Basin

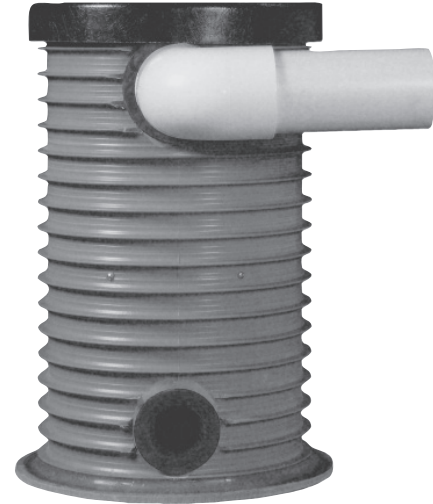
Physical Specifications

Dimensions

Outlet diameter	Accepts nominal 3-in. PVC pipe
Inlet diameter	Accepts nominal 2-in. PVC pipe
Height	21.5 in. (546 mm)
Diameter	12 in. (305 mm)

Materials of Construction

Housing	PVC
Bottom	Fiberglass-reinforced polyester (FRP)
Interior supports	Polypropylene grid and polyethylene screen
Support rings	PVC
Lid	Fiberglass
Fill material	Activated carbon



Heater (Optional)

Physical Specifications

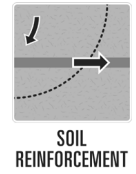
Dimensions

Outlet diameter	Fits nominal 3-in. Class 125 PVC pipe
Length (inlet to outlet)	11.75 in. (297 mm)
Width	11.25 in. (286 mm)
Depth	8.25 in. (210 mm)

Performance Data

Watts	1000
Volts	120
Amps	8.3





Miragrid® 22XT

Miragrid® 22XT geogrid is composed of high molecular weight, high tenacity polyester multifilament yarns woven in tension and finished with a PVC coating. Miragrid® 22XT geogrid is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Miragrid 22XT geogrid is used as soil reinforcement in MSE structures such as segmental retaining walls, precast modular block walls, wire faced walls, geosynthetic wrapped faced walls and steepened slopes. Miragrid 22XT is also used in MSE stabilized platforms for voids bridging, embankments on soft soils, landfill veneer stability, reducing differential settlement and for foundation seismic stability.

TenCate Geosynthetics Americas is accredited by Geosynthetic Accreditation Institute – Laboratory Accreditation Program ([GAI-LAP](#)).

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE
			MD
Tensile Strength @ Ultimate	ASTM D6637 (Method B)	lbs/ft (kN/m)	20559 (300.0)
Tensile Strength @ 5% strain	ASTM D6637 (Method B)	lbs/ft (kN/m)	6700 (97.8)
Mass/Unit Area ¹	(ASTM D5261)	oz/yd ² (g/m ²)	28.2 (956)
			MINIMUM ROLL VALUE
Creep Rupture Strength ²	ASTM D5262/D6992	lbs/ft (kN/m)	14277 (208.3)
Long Term Design Strength ³		lbs/ft (kN/m)	12361 (180.4)
PHYSICAL PROPERTIES		UNIT	ROLL CHARACTERISTIC
Roll Dimensions ⁴ (width x length)		ft (m)	12 x 200 (3.6 x 61)
Roll Area		yd ² (m ²)	267 (220)
Estimated Roll Weight		lbs (kg)	470 (213)
Label Roll Color			WHITE

¹ Typical Value

² 75-year design life based on NTPEP Report [REGEO-2016-01-069](#).

³ Long Term Design Strength for sand, silt, clay. $RF_{CR} = 1.44$; $RF_{ID} = 1.05$; $RF_D = 1.1$ (Installation damage reduction factor for other soils available upon request).

⁴ Special order roll lengths are available upon request

Disclaimer: TenCate assumes no liability for the accuracy or completeness of this information or for the ultimate use by the purchaser. TenCate disclaims any and all express, implied, or statutory standards, warranties or guarantees, including without limitation any implied warranty as to merchantability or fitness for a particular purpose or arising from a course of dealing or usage of trade as to any equipment, materials, or information furnished herewith. This document should not be construed as engineering advice. Mirafi™ is a registered trademark of Nicolon Corporation. Copyright © 2021 Nicolon Corporation. All Rights Reserved
FGS000105
ETQR19



MYERS[®]
MODEL SRM4
4/10 HORSEPOWER
RESIDENTIAL SEWAGE PUMP



MYERS® MODEL SRM4

Residential Sewage Pump

The Right Choice

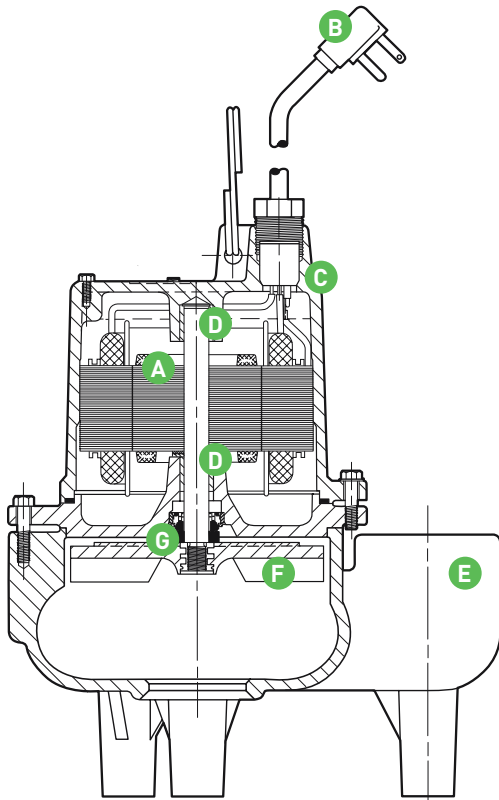
The SRM4 solids handling pump is the most reliable 4/10 horsepower residential sewage pump available today. The SRM4 is a plumbers/contractors dream! Its recessed impeller design allows 2" solids to pass freely through the volute without the chance of jamming the impeller. The SRM4 series pump has a national field-proven record of reliability. Look to your Myers distributor for the answer to your residential sewage handling needs ... and across the counter will be the Myers mini solids handling, the SRM4. It works for you! For more information, call your Myers distributor today, or the Myers Ohio sales office at 419-289-6898.



Product Capabilities		
Capacities To	95 gpm	360 lpm
Heads To	18 ft. 19 ft. shutoff	5.5 m 5.8 m
Pump Down Range Float Switch	7 to 14 in.	178 to 356 mm
Solids Handling Capacity	2 in.	50.8 mm
Liquids Handling	raw sewage, effluent, drain water	
Intermittent Liquid Temp.	up to 140°F	up to 60°C
Motor Electrical Data	4/10 HP shaded pole 1650 RPM	
Electrical	115V, 12A or 230V, 6A, 1Ø, 60 Hz.	
Acceptable pH Range	6 - 9	
Discharge, NPT	2 in.	50.8 mm
Min. Sump Diameter		
Simplex	18 in.	457 mm
Duplex	30 in.	762 mm

Note: Consult factory for applications outside these recommendations.

Pump Features and Applications



A. 4/10 HP Motor

Pressed in place and oil-filled for best alignment and heat transfer. Built-in overload protection.

B. Power Cord

Quick-disconnect watertight fitting.

C. Motor Housing

Heavy cast iron for efficient heat transfer.

D. Dual Thrust Washers, Sleeve Bearings

Oil lubricated, enhance smooth operation and extend pump life..

E. Cast Iron Volute

Passes 2" diameter solids.

F. Recessed Impeller

Operates out of volute passage, allowing maximum flow of liquids and solids.

G. Mechanical Shaft Seal

Carbon and ceramic faces, body is stationary, prevents string or trash from winding on seal..

Mechanical Float Switch

Mercury-free, 90° angle operation. (Piggyback models only).

Durable Motor Will Deliver Many Years Of Reliable Service.

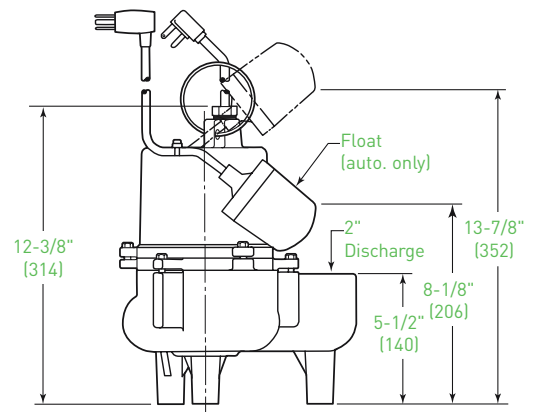
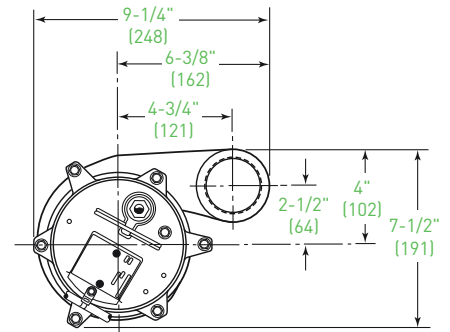
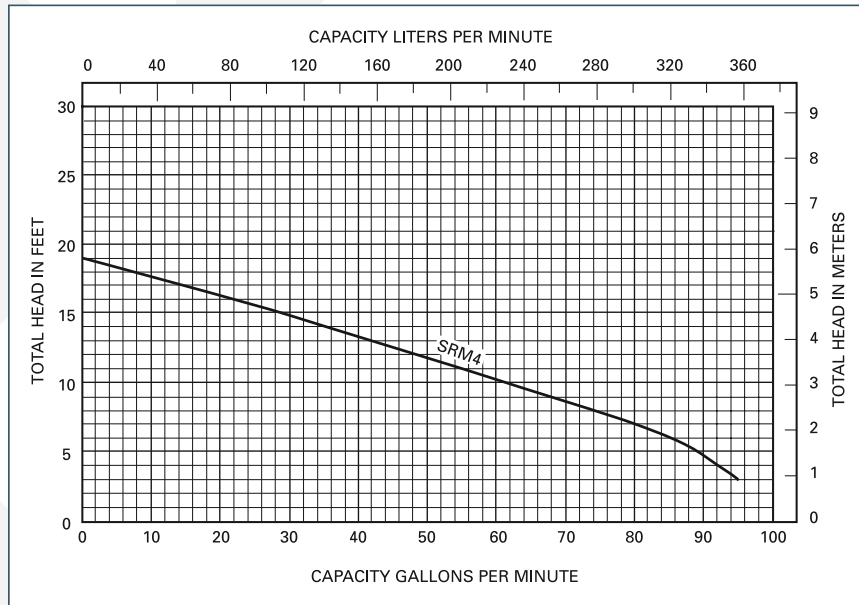
- Oil-filled motor for maximum heat dissipation and continuous bearing lubrication.
- Overload protected shaded pole motor eliminates starting switches.
- Recessed vortex impeller provides minimal radial loading for long bearing life.

The SRM4P Is Engineered For Many Years Of Maintenance-Free Operation.

- Wide-angle piggy-back float switch for maximum draw down. (Automatic models.)
- Pump can be operated manually by unplugging piggy-back switch and plugging pump directly into outlet (Automatic models).
- Recessed vortex impeller operates completely out of volute and provides free flow through passage for solids and liquids.

Performance Data and Dimensions [Dimensions in mm]

1650 RPM



740 EAST 9TH STREET,
ASHLAND, OHIO 44805
WWW.FEMYERS.COM

269 TRILLIUM DRIVE, KITCHENER,
ONTARIO, CANADA N2G 4W5
WWW.FEMYERS.COM

Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.
K3305 1/2/13 © 2013 Pentair Ltd. All Rights Reserved.



January 13, 2023

David T. Bray, PLS
President
Caputo & Wick LTD
1150 Pawtucket Ave.
Rumford, RI 02916-1897
Phone: (401) 434-8880

RE: Burlingame State Park and Camp Ground, Charlestown, RI

Dear Mr. Bray:

This letter will confirm that you have been trained and certified to design GST™ Leaching Systems by Geomatrix Systems, LLC ("Geomatrix") in the State of Rhode Island.

This letter also confirms that Geomatrix has reviewed the design of the GST Leaching System proposed for installation at Burlingame State Park and Camp Ground, Charlestown, RI and found the site and design to be suitable and in compliance with the approved design manuals for the aforementioned product.

If you have any questions, please contact me.

Sincerely,
GEOMATRIX SYSTEMS, LLC

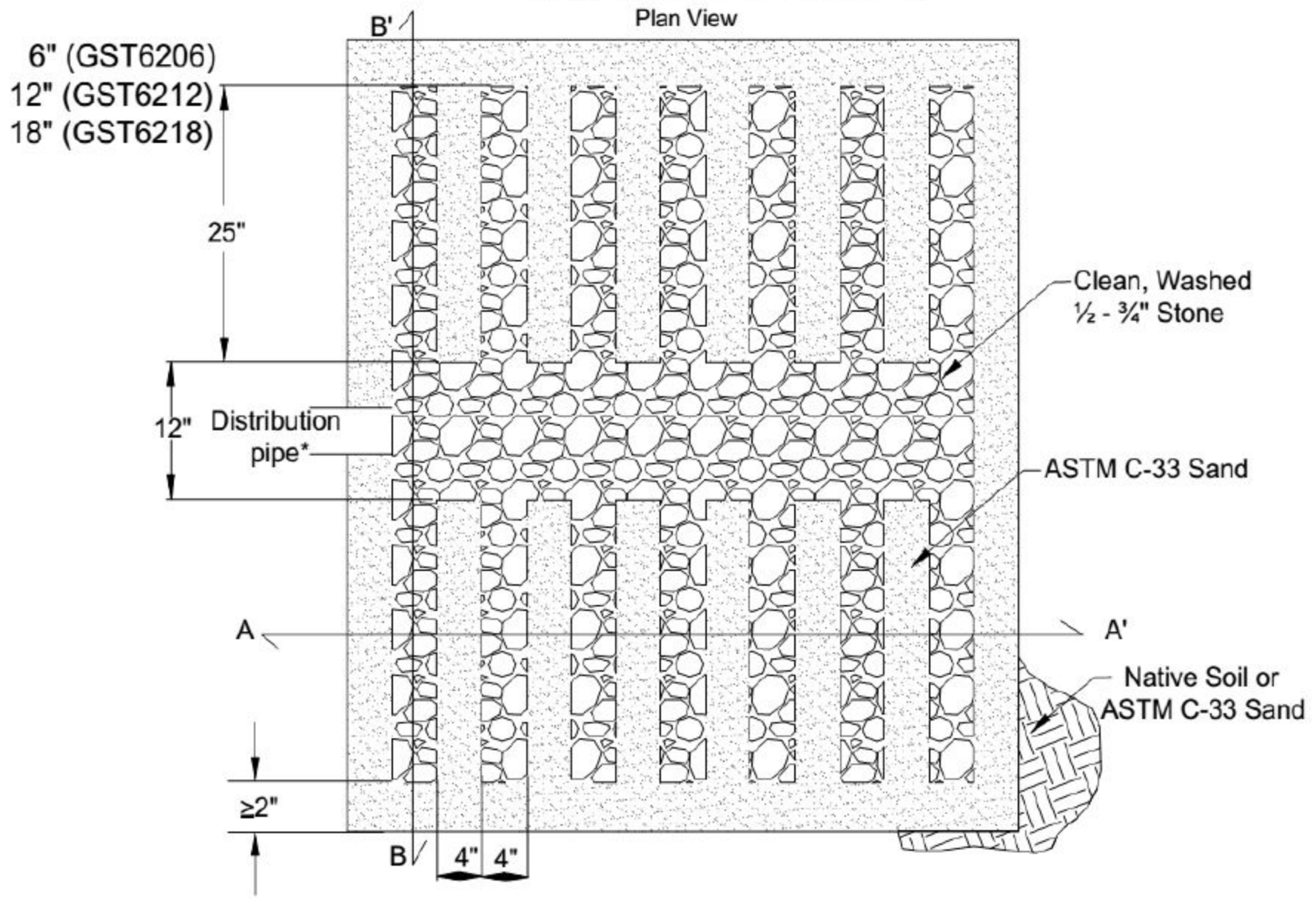
A handwritten signature in black ink that reads "David Jewett". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

David Jewett

Geomatrix Systems, LLC
114 Mill Rock Road East - Old Saybrook, CT 06475
Phone: 860-510-0730 – Fax: 860-510-0735

GST Schematics

GST™ LEACHING SYSTEM



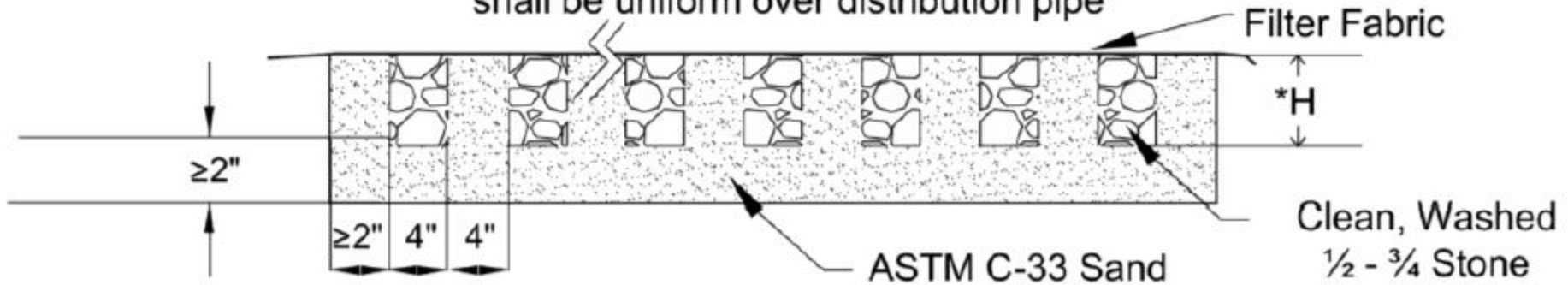
* Distribution pipe for gravity systems shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

GEOMATRIX GST™ LEACHING SYSTEM

A-A' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



*H= 6" (GST6206)

12" (GST6212)

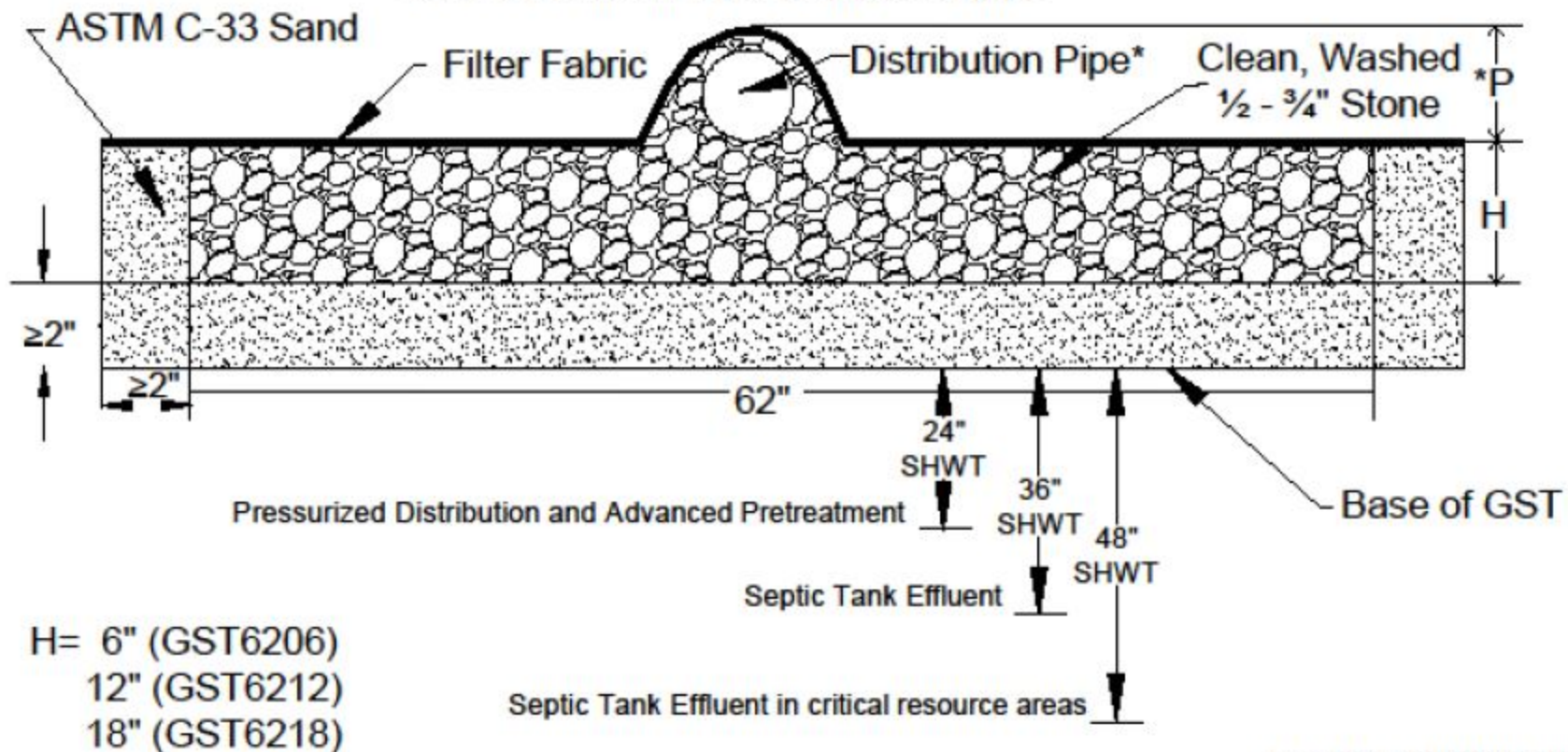
18" (GST6218)

GST™ LEACHING SYSTEM

B-B' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



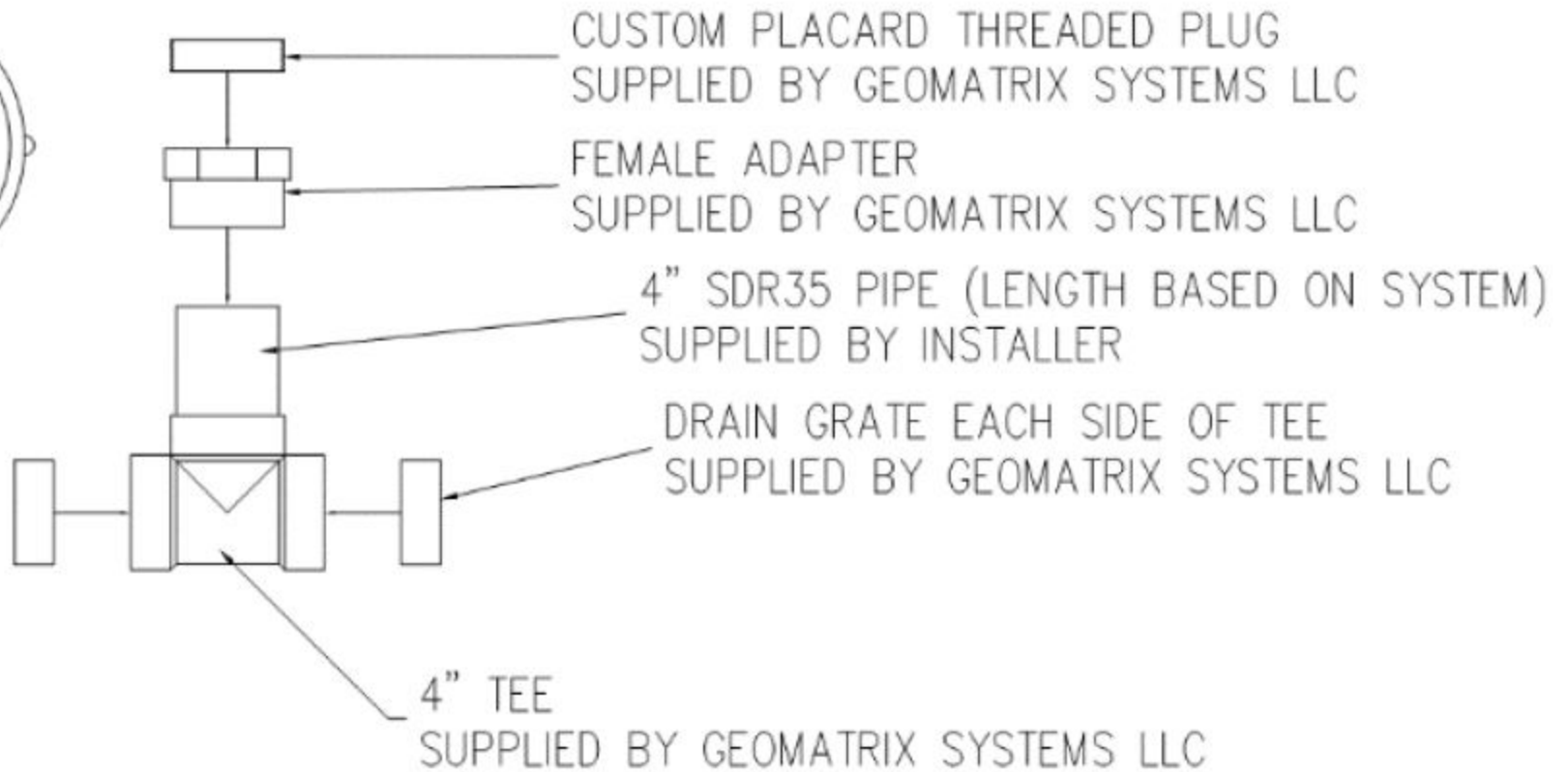
* Distribution pipe for gravity applications shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the
Design, Use and Maintenance of Pressurized Drainfields

Copyright 2022 GEOMATRIX SYSTEMS, LLC
patents: www.geomatrixsystems.com

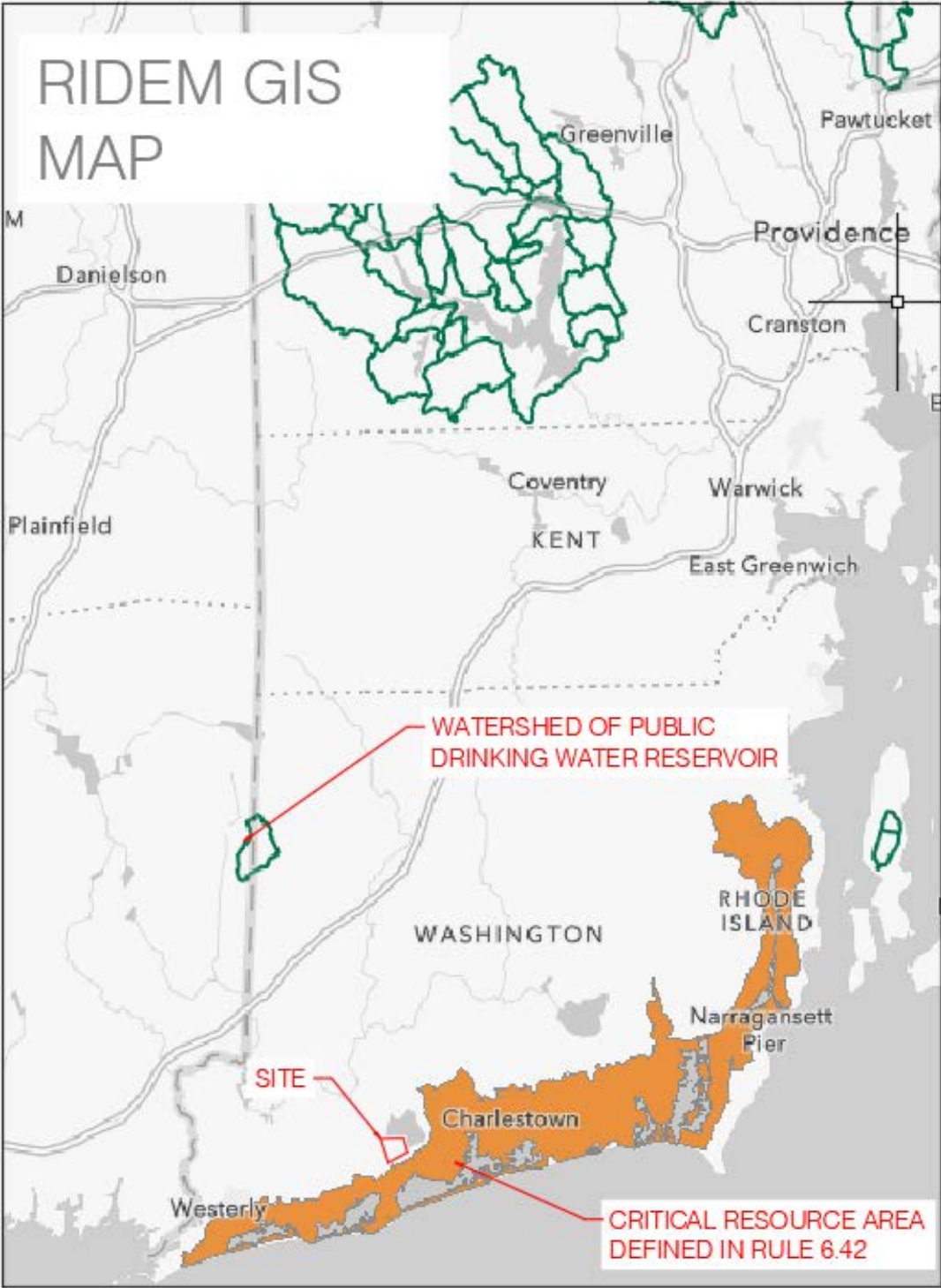
GST LEACHING SYSTEM
B-B' Cross Section
Geomatrix Systems, LLC., Old Saybrook, CT
860-510-0730

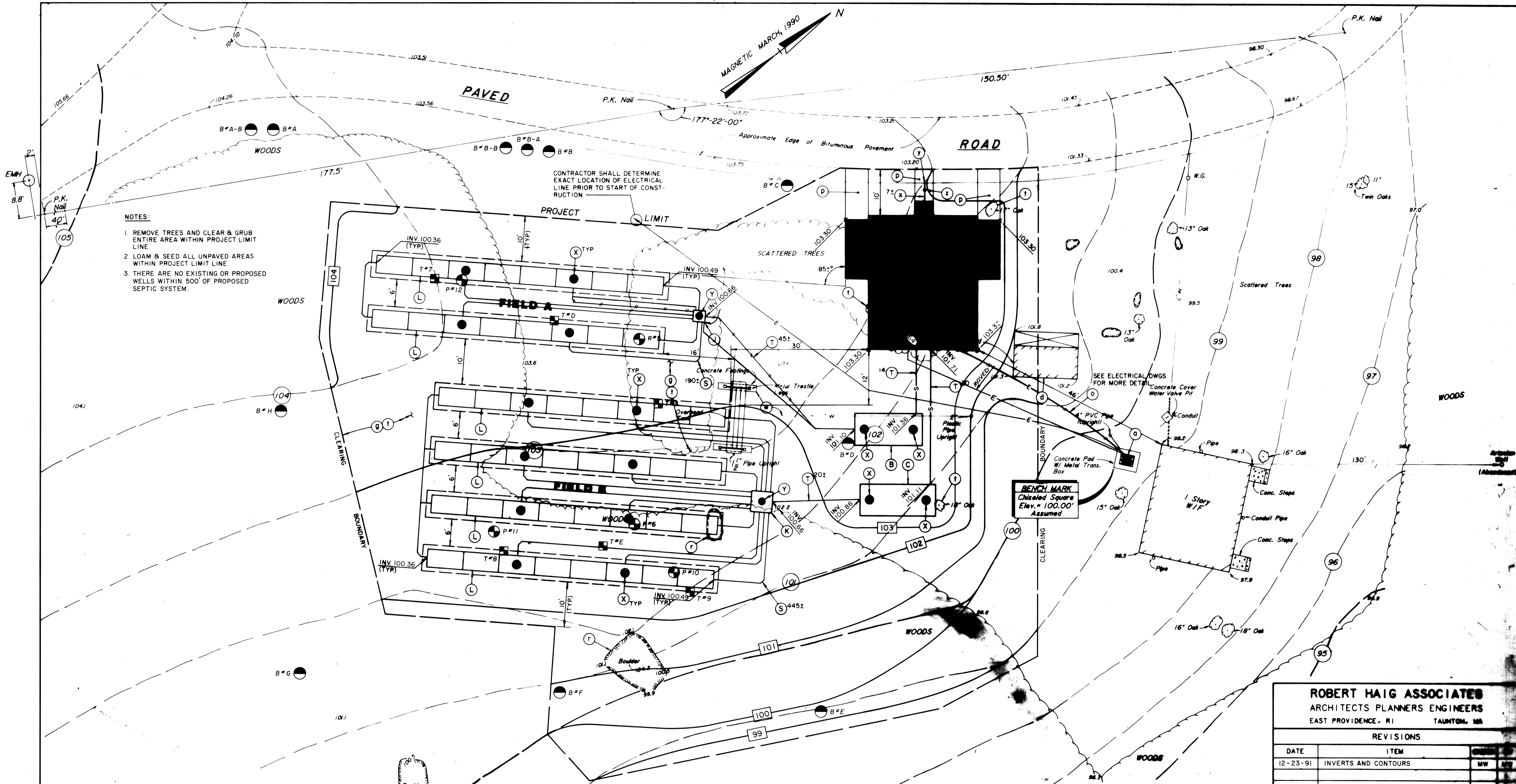
SCALE	None	REV.	0
DATE	9-4-2018	ACAD No.	040 GLS B-B'.DWG
DRAWN BY:	ERP	SHEET	3 Of 3

GEOMATRIX GST™ LEACHING SYSTEM INSPECTION PORT DETAIL



GST LEACHING SYSTEM			
Inspection Port Detail			
Geomatrix Systems, LLC., Old Saybrook, CT			
860-510-0730			
SCALE	None	REV.	A
DATE	6/2/2015	ACAD No.	GSTIP.DWG
DRAWN BY:	ERP	SHEET	1 OF 1





- NOTES:**
1. REMOVE TREES AND CLEAR & GRUB ENTIRE AREA WITHIN PROJECT LIMIT LINE.
 2. LOAM & SEED ALL UNPAVED AREAS WITHIN PROJECT LIMIT LINE.
 3. THERE ARE NO EXISTING OR PROPOSED WELLS WITHIN 500' OF PROPOSED SEPTIC SYSTEM.

CONTRACTOR SHALL DETERMINE EXACT LOCATION OF ELECTRICAL LINE PRIOR TO START OF CONSTRUCTION.

BENCHMARK
Chiseled Square
Elev. = 100.00'
Assumed

Allstate Drilling Co.
227 Wampanoag Trail • East Providence, R.I.
Client: Robert Haig & Assoc., Project: Burlingame State Park - Charlestown, RI
Drawn: J. Gellier, Date: 11/15/91 and 11/19/91

REPORT OF BAR SOUNDINGS

NO.	STA.	DEPTH	REMARKS	REMARKS
A		7.2'	Yes	
A-B		14.0'	No	
B		8.8'	Yes	
B-A		7.5'	Yes	
B-B		15.0'	No	
C		14.0'	No	
D		14.0'	No	
E		15.0'	No	
F		15.0'	No	
G		15.0'	No	
H		12.1'	Yes	

- LEGEND:**
- 98 — EXISTING CONTOURS
 - ◯ — BOULDER
 - ▨ — EXISTING BUILDING
 - — SURVEY TRAVERSE LINE
 - ◯ — TREE
 - — EDGE OF WOODS
 - - - - EDGE OF BITUMINOUS PAVEMENT
 - EMH — ELECTRIC MANHOLE

ALTERNATE NO. 1

TOPOGRAPHICAL SURVEY
STANLEY ENGINEERING, INC.
FISHERMAN'S CAMP

APPROVED DEPT. DIRECTOR
RECORD DRAWING
APPROVED DIV. CHIEF

ROBERT HAIG ASSOCIATES
ARCHITECTS PLANNERS ENGINEERS
EAST PROVIDENCE, RI TAUNTON, MA

REVISIONS

DATE	ITEM	BY	CHKD
12-23-91	INVERTS AND CONTOURS	MW	MT

MAINTENANCE BUILDING AND TOILET/SHOWER FACILITIES
BURLINGAME STATE PARK
CHARLESTOWN, RI

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING & DEVELOPMENT

SITE PLAN - FISHERMAN'S CAMP
(ALT. NO. 1)

DRAWN BY: M.W. DATE: July 1991
CHECKED BY: M.W. SCALE: 1" = 10'



“Main Camp Bathhouse and Onsite Wastewater Treatment System Replacement”

For

Rhode Island Department of Environmental Management
Burlingame State Park and Campground

Burlingame Park Road
Charlestown, Rhode Island

Assessors Map 15 – Lot 10
Area: 847 Acres±

July 2022
Rev.: February 2023

Prepared by

Caputo & Wick Ltd.
1150 Pawtucket Avenue
Rumford, Rhode Island 02916-1897
401-434-8880



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**



www.dem.ri.gov/septic

FOR RIDEM USE ONLY

APPLICATION No. 2205-1188 DATE RECEIVED 08/24/22 AMOUNT RECEIVED \$ 1000 CHECK # 1000 NOTE 1000

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- | | |
|--|---|
| <input type="checkbox"/> NEW BUILDING CONSTRUCTION | <input checked="" type="checkbox"/> A/E TECHNOLOGY TYPE <u>PRELIM</u> |
| <input type="checkbox"/> ALTERATION | <input type="checkbox"/> VARIANCE |
| <input type="checkbox"/> REPAIR | <input type="checkbox"/> REDESIGN |
| <input type="checkbox"/> TRANSFER | <input type="checkbox"/> JOINT OWTS / WETLANDS PD |

CERTIFICATION

I, KEVIN HARRIS (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

SITE INFORMATION

BURLINGAME STATE PARK AND CAMPGROUND (MAIN CAMP)
1400 BURLINGAME PARK ROAD MARLBOROUGH
NO. STREET CITY/TOWN POLE #
PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.
LOT SIZE 337 SF/ACRES
SUBDIVISION NAME N.A.
SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

Designer's Signature Kevin Harris License # D 3155

Designer's Email kharris@cutliff.net Phone # 414-474-3380

Business/Company Name CUTLIFF & HUNTER LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

OWNER INFORMATION

STATE OF R.I.
LAST NAME FIRST NAME M.I.
235 PROMENADE ST PROVIDENCE 02108
NO. STREET CITY/TOWN ZIP CODE

Owner's Phone Number (401) 222-4700 ext 2774307

Owner's Email MEGAN.DIPRETE@DEM.RI.GOV

Owner(s) Signature M Diprete

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A) Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B) System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C) Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D) Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E) A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F) Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G) Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H) Proper erosion and sedimentation controls must be installed prior to start of construction.
- I) Transfer: See original permit for all applicable conditions.
- J) Other

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1188
DEPTH TO APPROVED WATER TABLE 30" HOW DETERMINED SOIL EVALUATION
TEST HOLE # SA DATE EXCAVATED 8/13/21 WETLANDS within 200' OF OWTS YES NO
WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE 1/1
LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE Environmental Management

DESIGN INFORMATION

BUILDING USE: Residential Commercial MAR 6 2023
 Other BATHHOUSE
WATER SUPPLY: public water public well private well Office of Water Resources
OF DESIGN UNITS 150
UNIT DESIGN FLOW 50 gallons per UNIT (unit) TOTAL DAILY FLOW 7,500 gallons
TANK SIZE 15,000 gallons DESIGN LOADING RATE 3.5 gpd/sf
MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet
LEACHFIELD TYPE GRAVEL SAND TREATMENT SYSTEM (GST)
TOTAL AREA OF LEACHFIELD PROVIDED 4,100 square feet

Signature of RIDEM Official	Date of Approval	Date of Expiration
<u>[Signature]</u>	<u>8/24/22</u>	<u>1/1/25</u>

DESIGNER



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**



www.dem.ri.gov/septic

FOR RIDEM USE ONLY

APPLICATION No. _____ DATE RECEIVED ____/____/____ AMOUNT RECEIVED \$ _____ CHECK # _____ NOTE _____

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- | | |
|--|--|
| <input type="checkbox"/> NEW BUILDING CONSTRUCTION | <input checked="" type="checkbox"/> A/E TECHNOLOGY TYPE <u>ORFENCO AX100/BSE</u> |
| <input type="checkbox"/> ALTERATION | <input type="checkbox"/> VARIANCE |
| <input type="checkbox"/> REPAIR | <input type="checkbox"/> REDESIGN |
| <input type="checkbox"/> TRANSFER | <input type="checkbox"/> JOINT OWTS / WETLANDS PD |

CERTIFICATION

I, KEVIN HARROP (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

Designer's Signature Kevin Harrop License # D 3155

Designer's Email Kharrop@cw1td.net Phone # 401-434-8880

Business/Company Name CAPUTO and WICK LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

SITE INFORMATION

BURLINGAME STATE PARK AND CAMPGROUND (MAIN CAMP)
1-100 BURLINGAME PARK ROAD CHARLESTOWN

NO. STREET _____ CITY/TOWN _____ POLE # _____

PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.

LOT SIZE 847 S/F ACRES

SUBDIVISION NAME N.A.

SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

OWNER INFORMATION

STATE OF RI DEM

LAST NAME _____ FIRST NAME _____ M.I. _____

235 PROMENADE ST. PROVIDENCE 02908

NO. STREET _____ CITY/TOWN _____ ZIP CODE _____

Owner's Phone Number (401) 222-4700 ext. 2774307

Owner's Email MEGAN.DIPRETE@DEM.RI.GOV

Owner(s) Signature _____

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other _____

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # _____

DEPTH TO APPROVED WATER TABLE 30" HOW DETERMINED SOIL EVALUATION

TEST HOLE # 5A DATE EXCAVATED 8/18/21 WETLANDS within 200' OF OWTS YES NO

WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE ____/____/____

LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial _____
 Other BATHHOUSE

WATER SUPPLY: public water public well private well

OF DESIGN UNITS 150

UNIT DESIGN FLOW 50 gallons per SITE (unit) TOTAL DAILY FLOW 7,500 gallons

TANK SIZE 15,000 gallons DESIGN LOADING RATE 3.5 gpd/sf

MINIMUM REQUIRED LEACHFIELD AREA 2,143 square feet

LEACHFIELD TYPE BOTTOMLESS SAND FILTER

TOTAL AREA OF LEACHFIELD PROVIDED 2,304 square feet

Signature of RIDEM Official _____	Date of Approval _____	Date of Expiration _____
-----------------------------------	------------------------	--------------------------



RHODE ISLAND

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

OFFICE OF WATER RESOURCES

235 Promenade Street, Providence, Rhode Island 02908

March 15, 2023

State of Rhode Island
Rhode Island Department of Environmental Management Division of Planning and Development
235 Promenade Street
Providence, RI 02908

**RE: Main Camp Bathhouse
Burlingame State Park and Campground
Charlestown, RI
OWTS Application No. 2105-1188**

Dear Applicant:

Attached herewith are revised monitoring and reporting requirements applicable to the above listed permit. As you are aware the above listed Onsite Wastewater Treatment System (OWTS) permit is granted based on a maximum daily design flow of **7,500** gallons per day and includes 1 - 15,000-gallon septic tank, 1 - 7,500-gallon anoxic tank, 1 - 6,000-gallon recirculation tank, 2 - Advantex AX 100 filter pods followed by a 6 x 6 pump chamber to a Gravel Sand Treatment (GST) type of leaching system.

Advanced treatment systems are utilized to mitigate against possible adverse impacts of residual onsite wastewater pollutants on groundwater quality and surface water quality. Owners of advanced OWTSs with design flows $\geq 2,000$ gallons per day are subject to regular monitoring and reporting. The following stipulations now apply to your permit:

1. The following discharge limits as measured at the 6 x 6 pump chamber shall apply:

Orengo Systems, Inc. AdvanTex AX-100 – Mode 1
Biochemical Oxygen Demand (5 Day) ≤ 20 mg/L
Total Suspended Solids ≤ 20 mg/L
Oil & Grease ≤ 5 mg/L

2. Wastewater flow shall not exceed a maximum daily flow of **7,500** gallons per day. Wastewater flow shall be monitored and recorded to ensure compliance with this stipulation.
3. Sampling and testing shall be conducted quarterly at the compliance point specified in Item 1 above. Sampling and measurements shall be representative of the monitored activity. The Permittee shall sample and test the wastewater in each system as follows:

Dissolved Oxygen (mg/L) – *Field Test*
Effluent Temperature (°F) – *Field Test*
pH (s.u.) – *Field Test*
Biochemical Oxygen Demand (5-Day) (mg/L)
Total Suspended Solids (mg/L)
Oil and Grease (mg/L)
Alkalinity (mg/L)

4. Corrective Action – Corrective action must be taken as soon as practicable following receipt of monitoring results which indicate that system modifications or maintenance is required. The system must be resampled no sooner than seven (7) days after any adjustment is made to the system and within thirty (30) days of the routine quarterly sample date. Samples must be analyzed for each of the parameters listed in Item 3 for any post corrective action sampling events.
5. Annual Report – All monitoring results including wastewater flow data shall be submitted to the DEM in the form of an annual report. The annual report is due **February 15th** of each year. The annual report must summarize all monitoring results and corrective actions implemented during the previous calendar year. A clear determination regarding the compliance status of the OWTS must be made as part of the annual report. The annual report must include a copy of the most recent Operation and Maintenance Contract as proof of compliance with this requirement.
6. The Permittee shall properly operate and maintain all facilities and equipment associated with the OWTS in accordance with the most recent operation and maintenance (O&M) plan. The O&M plan specifies procedures for operation, process control, record keeping, monitoring, weekly maintenance checks, other routine and periodic maintenance, safety and security. Also, the O&M plan includes a contingency plan to address emergency actions and procedures in the event of equipment failure and power loss.
7. Your permit approval is for the discharge of sanitary waste only. No toxic, hazardous or industrial processing waste may be discharged into the system.
8. All septage, sludges, screenings or other pollutants removed from the system shall be disposed in accordance with all applicable state and federal laws.
9. The permit may be automatically transferred by the Permittee to a new owner provided:
 - a. The current Permittee notifies the DEM by certified mail at least thirty (30) days in advance of the proposed transfer date;
 - b. The notice includes the name and address of the new Permittee and a written agreement between the existing and new Permittee containing a specific date for the transfer of permit responsibility, surety and liability between them and;
 - c. The DEM does not notify the existing Permittee and the proposed new Permittee of its intent to modify or reissue the permit.
10. The operator or person in responsible charge of the OWTS shall have at a minimum a Rhode Island Class 1 Wastewater Treatment Plant Operator Certification or an equivalent certification from another jurisdiction acceptable to the DEM. If the operator is not employed directly by the Permittee, a service agreement with the operator shall be entered into and continuously maintained, and a copy of the active service agreement shall be submitted to the DEM as part of the annual report.
11. The permit may be modified, suspended, or revoked for cause. The DEM reserves the right to revise the permit to ensure compliance with applicable state and federal regulations. Failure to comply with the conditions of this permit approval letter may result in an enforcement action.

12. The Permittee shall allow the DEM or their authorized representative to access the OWTS and work areas to inspect equipment, practices, records pertinent to this permit and stipulated compliance requirements, and to sample and monitor the wastewater for the purposes of determining compliance.
13. In the event of treatment interruption, bypass or sewage overflow, the Permittee shall notify the DEM verbally within twenty-four (24) hours. Such incident shall be reported in writing within five (5) days after it becomes known to the Permittee, the report shall include the date and time(s) of the incident, the duration of the incident, and actions taken to correct the problem and prevent a reoccurrence.
14. For purposes of notification, monitoring, compliance or inquiries pursuant to this permit, all correspondence, telephone calls and other contacts must reference the OWTS permit number and shall be directed to:

The Rhode Island Department of Environmental Management
Onsite Wastewater Treatment Systems Program
235 Promenade Street
Providence, RI 02908
Telephone: (401) 222-3961
www.dem.ri.gov/septic

Should you have any questions concerning these permit requirements, please contact Tom Angelone by email at tom.angelone@dem.ri.gov or by phone at 401-222-3961, extension 2777607.

Very truly yours,



Mohamed J. Freij, P.E., PLS
Supervising Sanitary Engineer

KF

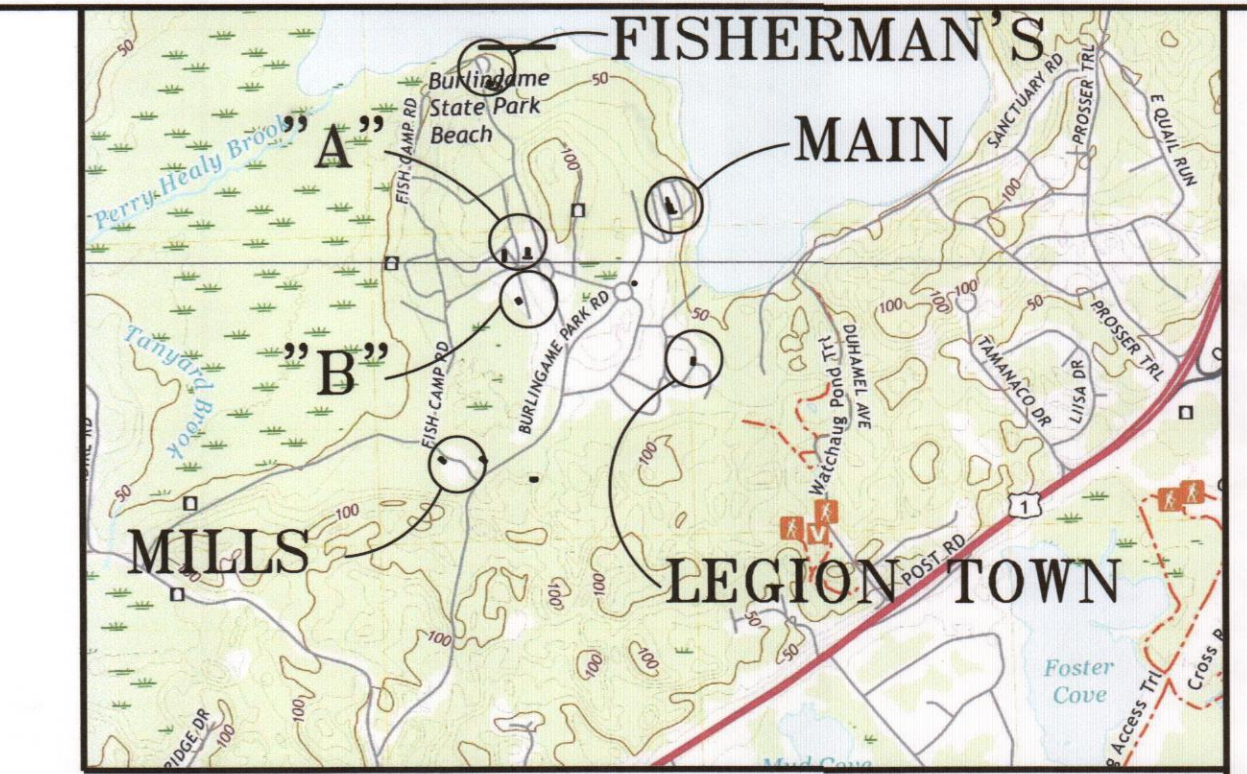
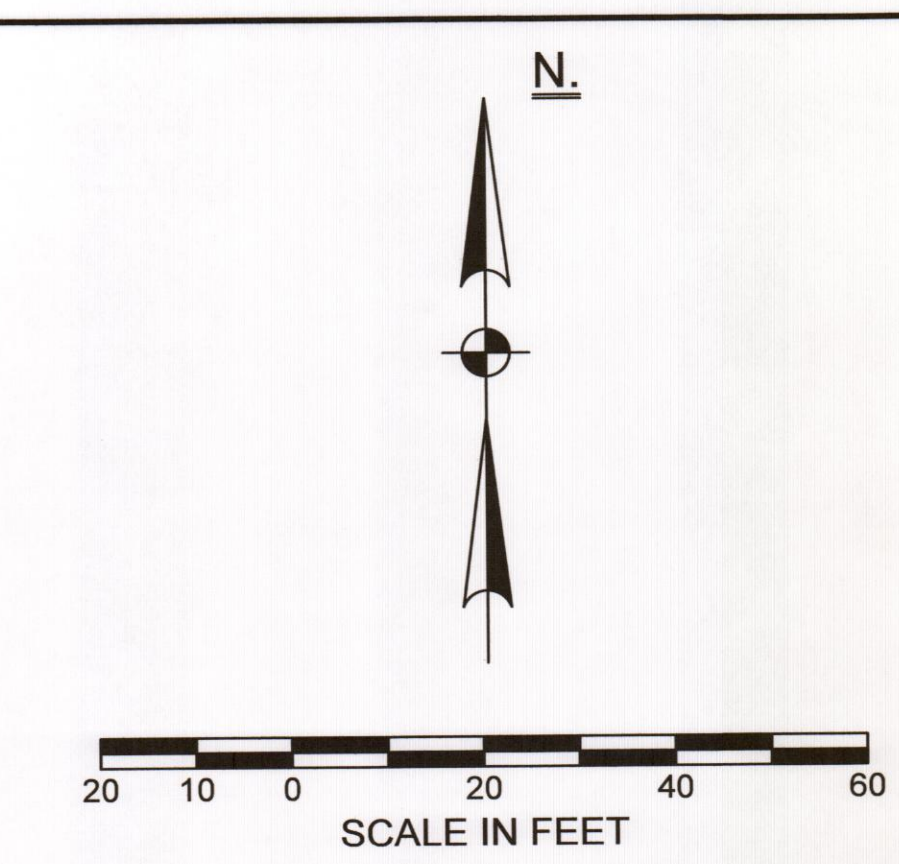
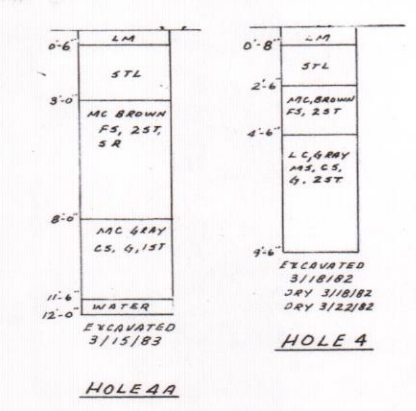
Enclosure(s)

cc: Joseph L. Warner Jr., Charlestown Building Official

TH-5A - GROUND ELEV: 69.2 - AUGUST 18, 2021											
HORIZON	DEPTH	DIST	TOPO	SOIL	COLORS	RE-DOX	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 10"	C	S	2.5YR 6/3				La	2gld	Wf	3
Bw	10" - 30"	C	S	10YR 5/6				La	2gld	Ff	3
Bw2	30" - 32"	C	S	2.5YR 7/3	5YR 4/4	M M P		La	2gld	Ff	3
C	32" - 120"	C	S	2.5YR 7/3				La	2gld	Ff	3

TH-5B - GROUND ELEV: 60.4 - AUGUST 18, 2021											
HORIZON	DEPTH	DIST	TOPO	SOIL	COLORS	RE-DOX	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 8"	C	S	2.5YR 6/3				La	2gld	Wf	3
Bw	8" - 30"	C	S	10YR 5/6				La	2gld	Ff	3
C	30" - 120"	C	S	2.5YR 7/3	5YR 4/4	M M P		La	2gld	Ff	3

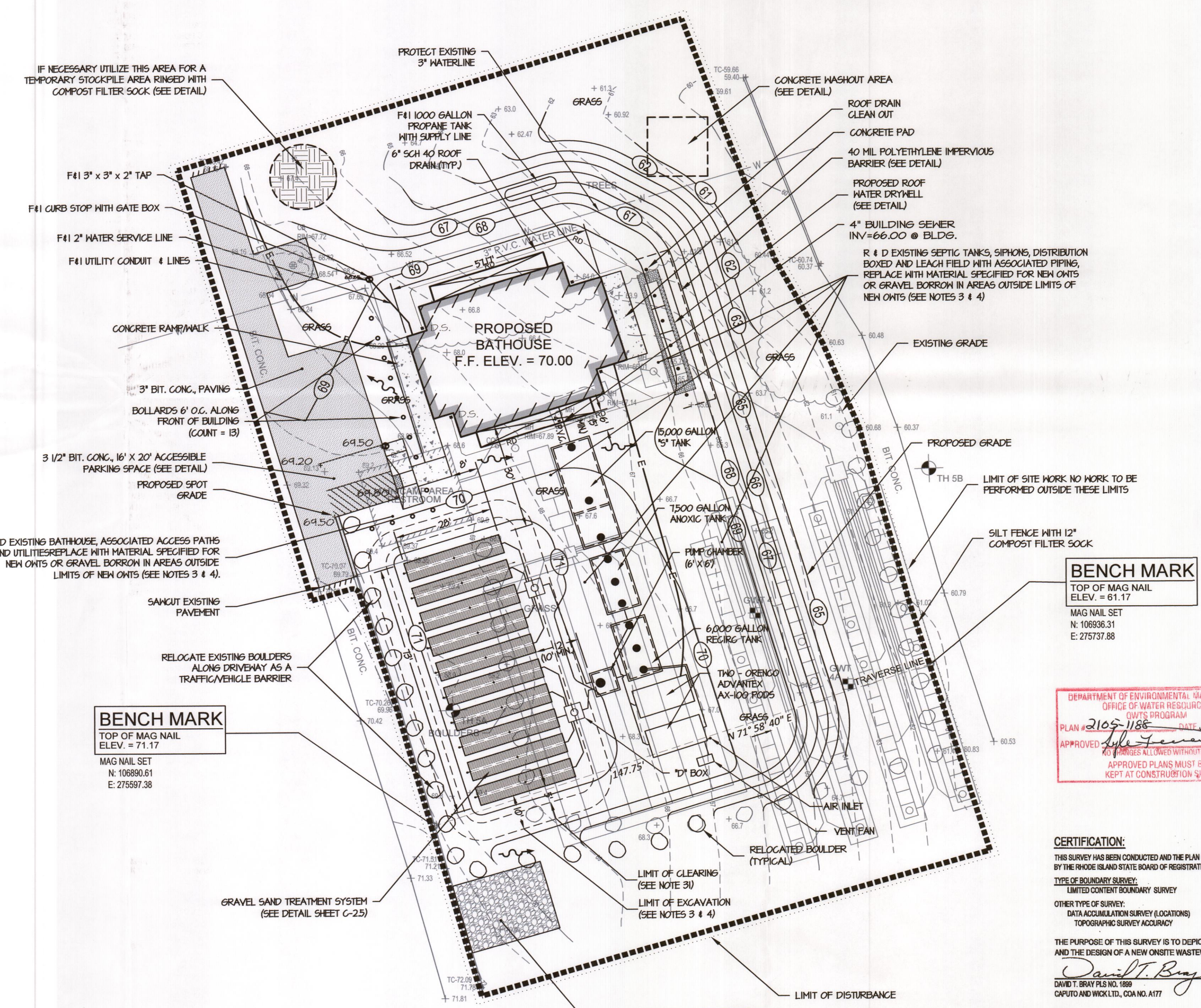
SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA OBSERVED WEEPING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 30" (ELEV: 66.7) PERFORMED BY: KAMAL HINGORARY



LOCUS MAP

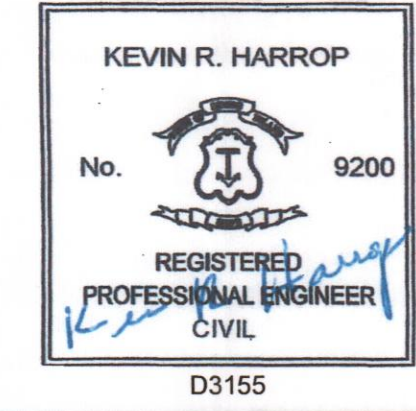
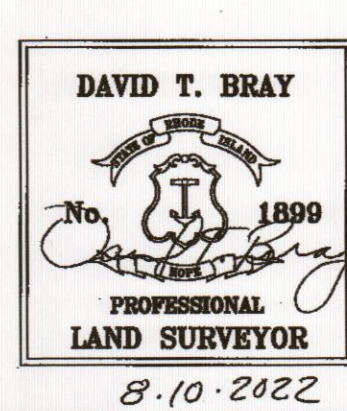
NOTES:

- ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, OFFICE OF WATER RESOURCES "RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION AND MAINTENANCE OF ON-SITE WASTEWATER TREATMENT SYSTEMS", LATEST EDITION.
- THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL OF ALL PROPOSED CONSTRUCTION MATERIALS AND EQUIPMENT PRIOR TO ANY CONSTRUCTION.
- EXISTING ON-SITE WASTEWATER TREATMENT SYSTEM (OWTS) PRECAST STRUCTURES ARE TO BE PUMPED OUT, RINSED WITH CLEAN WATER AND PUMPED OUT AGAIN. PUMPING MUST BE PERFORMED BY A STATE LICENSED SEPTIC HAULER AND THE CONTENTS OF THE TANK DISPOSED OF PROPERLY. AFTER PUMPING, THE EXISTING OWTS STRUCTURES MUST BE FILLED WITH FLOWABLE FILL OR REMOVED AND REPLACED WITH GRAVEL BORROW AND 4" LOAM AND SEED.
- REMOVE ALL PORTIONS OF THE EXISTING OWTS WITHIN 5' OF THE GRAVEL SAND TREATMENT SYSTEM AND ALL FILL. A HORIZON SOIL B HORIZON SOIL AND SCARIFY 3" OF THE C HORIZON SOIL BELOW THE GRAVEL SAND TREATMENT SYSTEM AND THOROUGHLY MIX WITH ASTM C-33 SAND (SEE NOTE 16) TO INTERFACE THE FILL WITH THE SOIL AND REPLACE ALL REMOVED SOIL WITH ASTM C-33 SAND. A AND B SOIL HORIZON LAYERS ARE TO BE REMOVED IN THIS APPLICATION DUE TO COMPACTION CAUSED BY PREVIOUS SYSTEM INSTALLATION AND FILL BEING PLACED ABOVE.
- UNSATURABLE MATERIAL USED TO BACKFILL THE TEST HOLES SHALL BE REMOVED AND REPLACED WITH WITH ASTM C-33 SAND (SEE NOTE 16).
- ASTM C-33 SAND (SEE NOTE 16) MUST BE PLACED ON SCARIFIED, RELATIVELY DRY NATURAL SOIL. THE CONTRACTOR SHALL PROVIDE FOR DEWATERING AS REQUIRED AND ALL WORK SHALL BE PERFORMED UNDER DRY CONDITIONS.
- BUILDING SEWER PIPE TO BE 4" P. V. C. SCH. 40 UNLESS OTHERWISE NOTED.
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- SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
- IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION. IF IN DOUBT, ASK.
- NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6-27.
- INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
- IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
- MINIMUM PERIMETER INVERT ELEVATION = 70.25. NO FINISHED GRADE BELOW 70.25 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM.
- THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL DELIVERED TO THE SITE IS REQUIRED.
- OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEX PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEX INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL, AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
- INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEX INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR-150-6. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEM LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE VENDORS TO INSTALL THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
- REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY AN INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEX TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
- THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-6.47 OF THE "REGULATIONS". FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE SYSTEM COMPONENTS FOR OBSERVATION.
- THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
- CONTRACTOR SHALL CONTACT "DIS-SAFE" PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
- THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
- NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
- I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
- ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO BE WATER TIGHT.
- PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR POCKETS.
- CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
- CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION, EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
- THE PUMP DOSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTORS RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
- ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
- THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STAKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
- NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
- MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.



DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
OWTS PROGRAM
PLAN # 2105-1158 DATE 3/15/23
APPROVED: [Signature]
NO CHANGES ALLOWED WITHOUT PRIOR APPROVAL
APPROVED PLANS MUST BE KEPT AT CONSTRUCTION SITE

CERTIFICATION:
THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 8 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2016, AS FOLLOWS:
TYPE OF BOUNDARY SURVEY: LIMITED CONTENT BOUNDARY SURVEY
OTHER TYPE OF SURVEY: DATA ACCUMULATION SURVEY (LOCATIONS)
MEASUREMENT SPECIFICATION: CLASS III T-2 (IMMEDIATE AREA AROUND BATHHOUSE AND OWTS)
THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ON-SITE WASTEWATER TREATMENT SYSTEM.
DAVID T. BRAY PLS NO. 1889 CAPUTO AND WICK LTD., COA NO. A177 DATE 8/10/2022



DESIGN DATA
DAILY SEWAGE FLOW: 50 GPD/CAMPSITE x 150 CAMPSITES = 7500 GALLONS PER DAY (G.P.D.)
GROUND WATER TABLE: 120"
DEPTH TO IMPERVIOUS: NOT ENCOUNTERED
SOIL CLASS: B, SOIL CATEGORY: 3, LOADING RATE: 0.70 GALS./S.F./DAY
SEPTIC TANK REQUIREMENTS VOLUME = 2 X 7,500 G.P.D. = 15,000 GALLONS
LEACHING AREA REQUIREMENTS:
GRAVEL SAND TREATMENT (GST) SYSTEM WITH CATEGORY 1 TREATMENT (ORENCO ADVANTEX TREATMENT AX100)
ASSIGNED EFFLUENT LOADING RATE = 3.5 GPD PER S.F.
SQUARE FOOTAGE OF GST REQUIRED = 7500 GPD / 3.5 GPD PER S.F. = 2,143 S.F.
LENGTH OF GST 6212 REQUIRED = 2,143 S.F. / 17.5 S.F./L.F. = 123 L.F.
LENGTH OF GST 6212 SPECIFIED: 280 L.F.
TOTAL GST SYSTEM CAPACITY = 280 L.F. X 17.5 S.F./L.F. X 3.5 G.P.D./S.F. = 17,150 GPD
17,150 GPD > 7,500 GPD - CAPACITY = 229% OF ANTICIPATED DESIGN FLOW

LEGEND

100	EXISTING CONTOUR	+ 100.00	FINISHED SPOT GRADE
100	PROPOSED CONTOUR	+ 100.00	EXISTING SPOT GRADE
RI. STD.	RHODE ISLAND STANDARD		SPLIT RAIL FENCE
INV.	INVERT OF PIPE		DEEP OBSERVATION HOLE
P. V. C.	POLYVINYL CHLORIDE PIPE		OUT CROP OR SURFACE ROCK
S. D. R.	STANDARD DIMENSION RATIO		EXIST. UNDERGROUND ELECTRIC
CONC.	CONCRETE		EXIST. WATER
BIT.	BITUMINOUS		EXIST. UNDERGROUND TELEPHONE
TYP.	TYPICAL		FINISH GRADE SURFACE FLOW DIRECTION

CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

BURLINGAME STATE PARK AND CAMPGROUND

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

MAIN CAMP BATHHOUSE - SITE PLAN

Dwg: Scale: 1" = 20'
Contract No. x Date: FEBRUARY, 2023

C-1.5

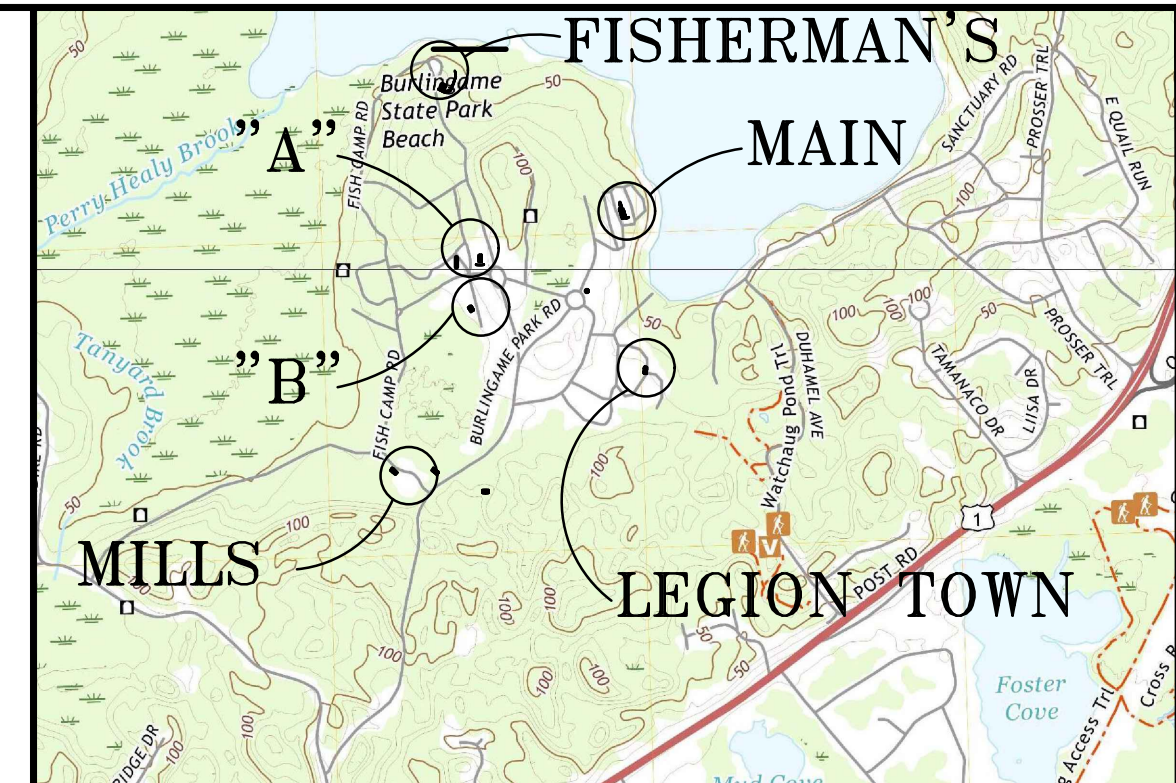
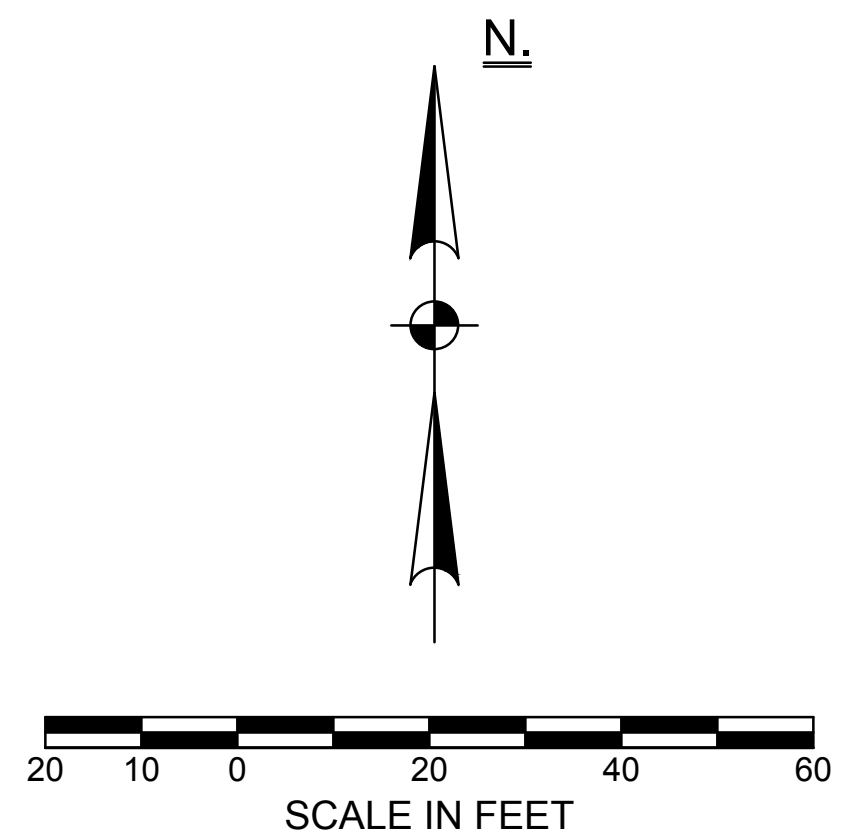
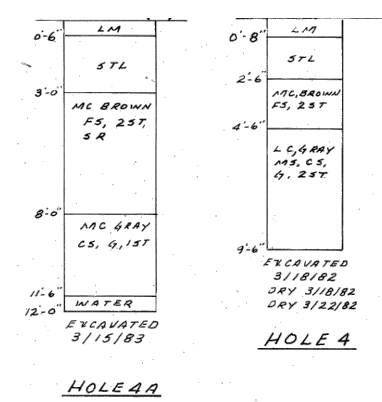
J:\RhodeIsland\Charlestown\DEM - Burlingame\09 - 025 and S-4 Site Design\2023.02.10.dwg

TH-5A - GROUND ELEV: 69.2 - AUGUST 18, 2021										
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 10"	C	S	2.5YR 6/3			Lo	2gd	Vfr	3
Bw	10" - 30"	C	S	10YR 5/6			Lo	2gd	Fr	3
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SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 30" (ELEV: 66.7)
OBSERVED WEeping GROUNDWATER - NA
PERFORMED BY: KAMAL HINCORANY

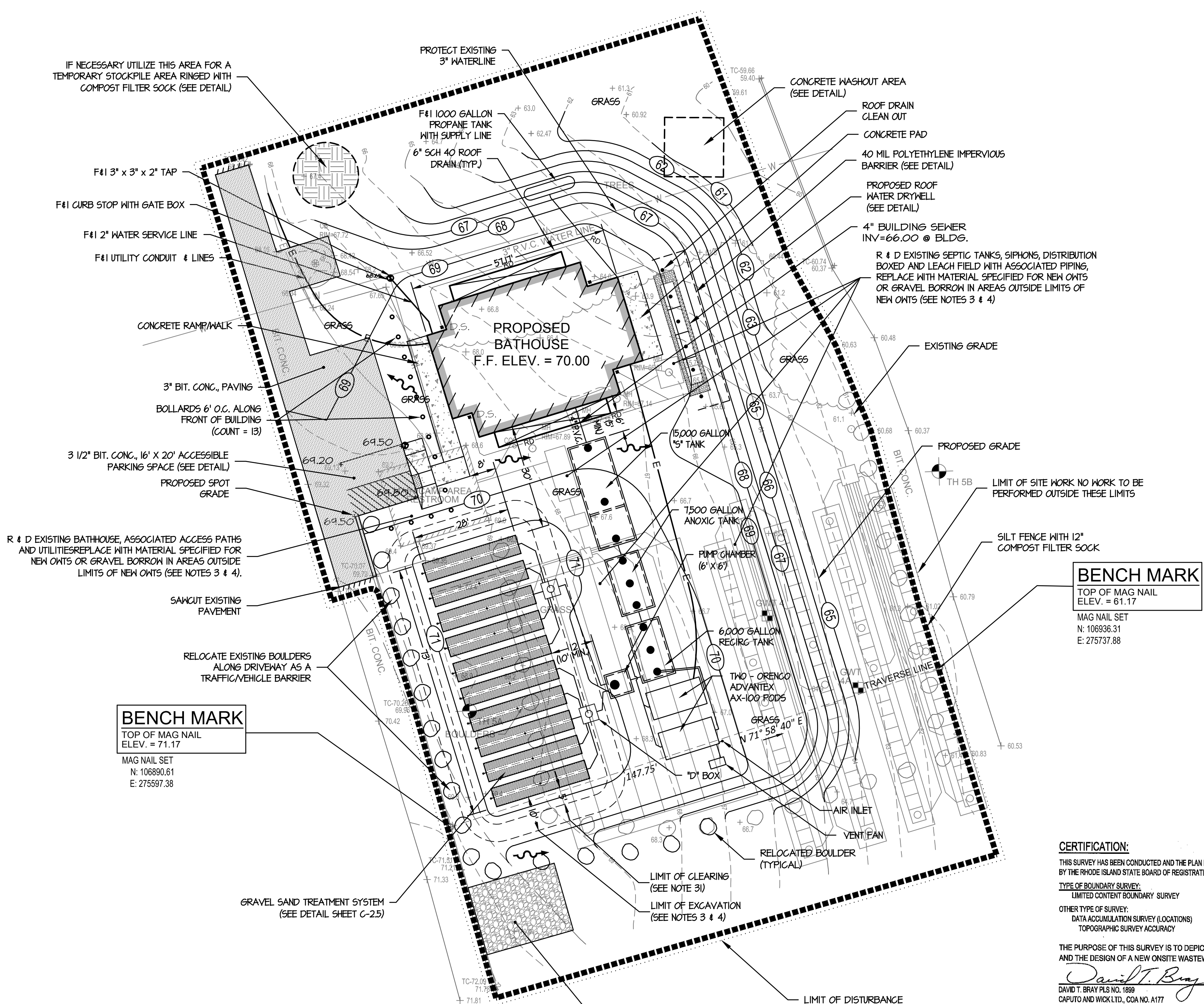
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SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 30" (ELEV: 57.9)
OBSERVED WEeping GROUNDWATER - NA
PERFORMED BY: KAMAL HINCORANY



LOCUS MAP

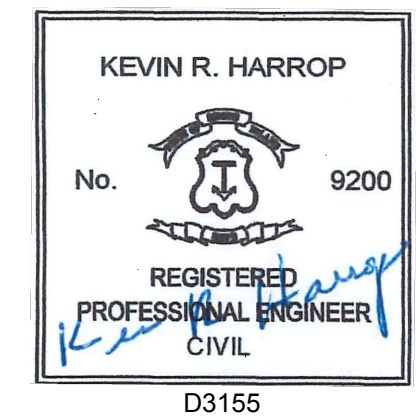
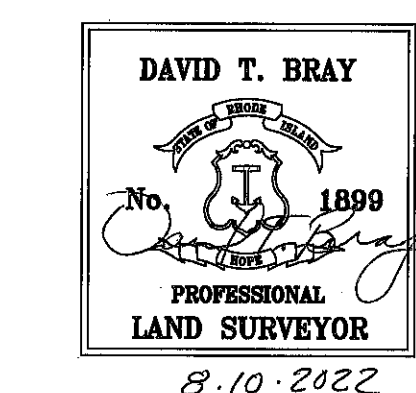
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 - CONTRACTOR SHALL CONTACT "DIG-SAFE" PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
 - THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
 - NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
 - I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
 - ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO BE WATER TIGHT.
 - PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR LOCKS.
 - CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
 - CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION. EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
 - THE PUMP DOSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
 - ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
 - THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STAKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
 - NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
 - MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.



LEGEND

— 100 —	EXISTING CONTOUR	+ 100.00	FINISHED SPOT GRADE
— 100 —	PROPOSED CONTOUR	+ 100.00	EXISTING SPOT GRADE
RI. STD.	RHODE ISLAND STANDARD		SPLIT RAIL FENCE
INV.	INVERT OF PIPE		DEEP OBSERVATION HOLE
P. V. C.	POLYVINYL CHLORIDE PIPE		OUT CROP OR SURFACE ROCK
S. D. R.	STANDARD DIMENSION RATIO		EXIST. UNDERGROUND ELECTRIC
CONC.	CONCRETE		EXIST. WATER
BIT.	BITUMINOUS		EXIST. UNDERGROUND TELEPHONE
TYP.	TYPICAL		FINISH GRADE SURFACE FLOW DIRECTION

CERTIFICATION:
THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 6 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2015, AS FOLLOWS:
TYPE OF BOUNDARY SURVEY: LIMITED CONTENT BOUNDARY SURVEY
MEASUREMENT SPECIFICATION: NOT A BOUNDARY SURVEY
OTHER TYPE OF SURVEY: DATA/REGULATION SURVEY (LOCATIONS)
CLASS II: T2 (IMMEDIATE AREA AROUND BATHHOUSE AND OWTS)
TOPOGRAPHIC SURVEY ACCURACY:
THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ONSITE WASTEWATER TREATMENT SYSTEM.
David T. Bray 8/10/2022
DAVID T. BRAY PLS NO. 1989
CAPUTO AND WICK LTD., COA NO. A177



CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

DESIGN DATA

DAILY SEWAGE FLOW:
50 GPD/CAMPSITE x 150 CAMPSITES = 7500 GALLONS PER DAY (G.P.D.)

GROUND WATER TABLE: 120"

DEPTH TO IMPERVIOUS: NOT ENCOUNTERED

SOIL CLASS: B, SOIL CATEGORY: 3, LOADING RATE: 0.70 GAL/S.F./DAY

SEPTIC TANK REQUIREMENTS VOLUME = 2 X 7,500 G.P.D. = 15,000 GALLONS

LEACHING AREA REQUIREMENTS:
GRAVEL SAND TREATMENT (GST) SYSTEM WITH CATEGORY 1 TREATMENT (ORENCO ADVANTEK TREATMENT AX100)
ASSIGNED EFFLUENT LOADING RATE = 3.5 GPD PER S. F.
SQUARE FOOTAGE OF GST REQUIRED = 7500 GPD / 3.5 GPD PER S.F. = 2,143 S.F.
LENGTH OF GST 6212 REQUIRED = 2,143 S.F. / 17.5 S.F./L.F. = 123 L.F.
LENGTH OF GST 6212 SPECIFIED: 280 L.F.
TOTAL GST SYSTEM CAPACITY = 280 L.F. X 17.5 S.F./L.F. X 3.5 G.P.D./S.F. = 17,150 GPD
17,150 GPD > 7,500 GPD - CAPACITY = 229% OF ANTICIPATED DESIGN FLOW

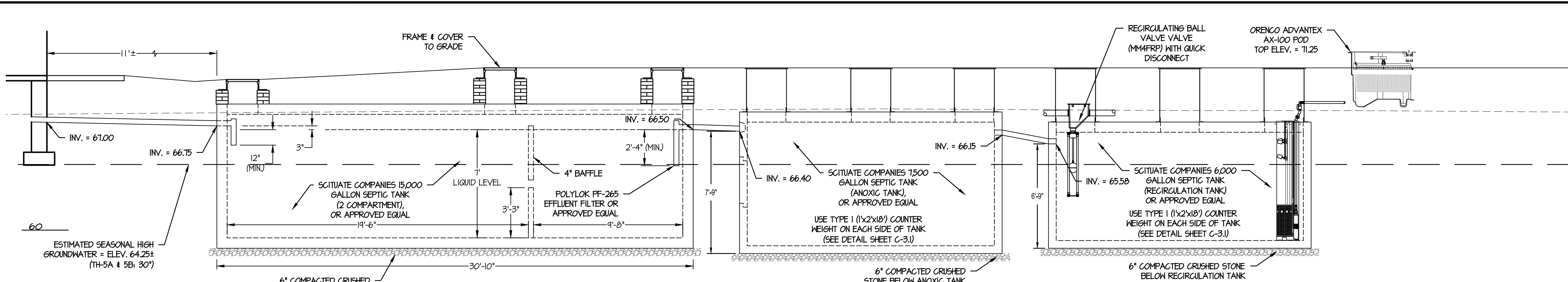
STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

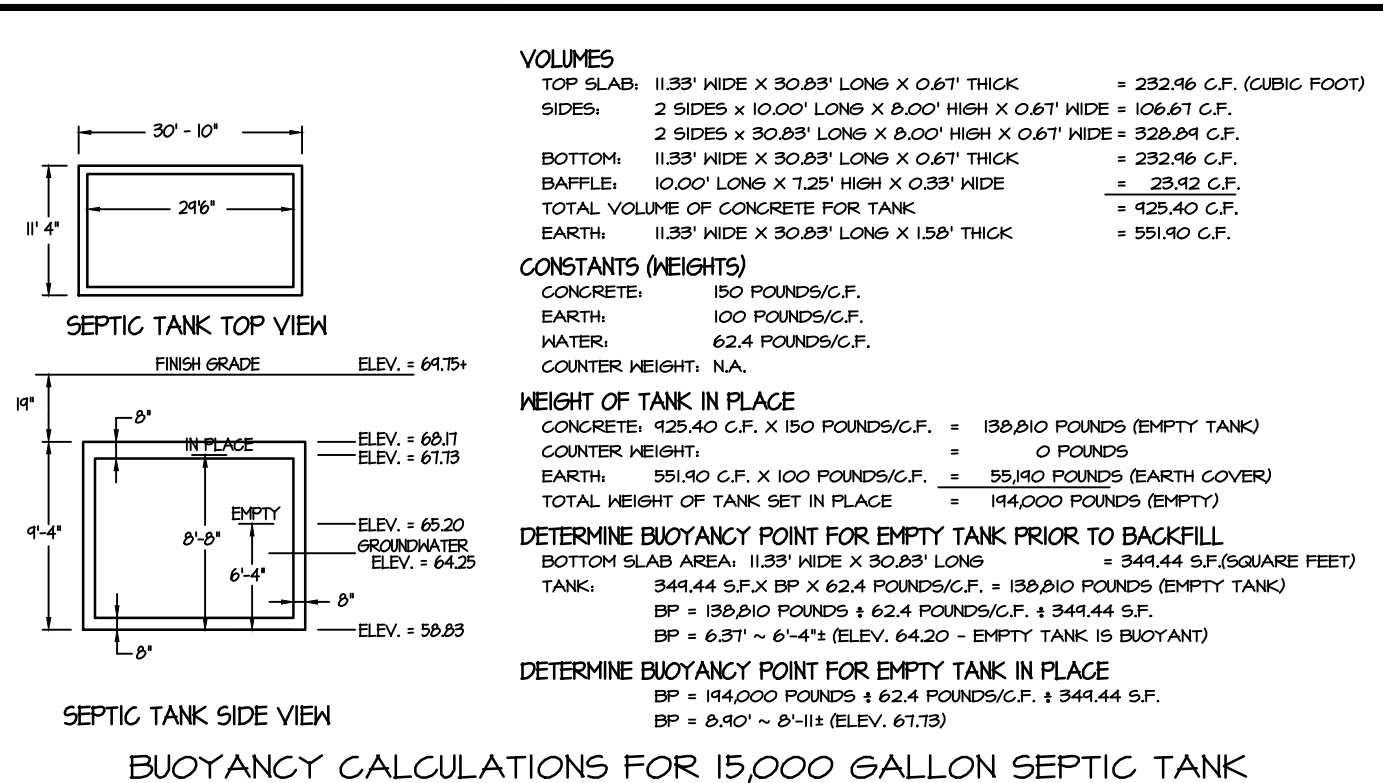
MAIN CAMP BATHHOUSE - SITE PLAN

Dwg: Scale: 1" = 20'
Contract No. x Date: FEBRUARY, 2023
C-1.5 13

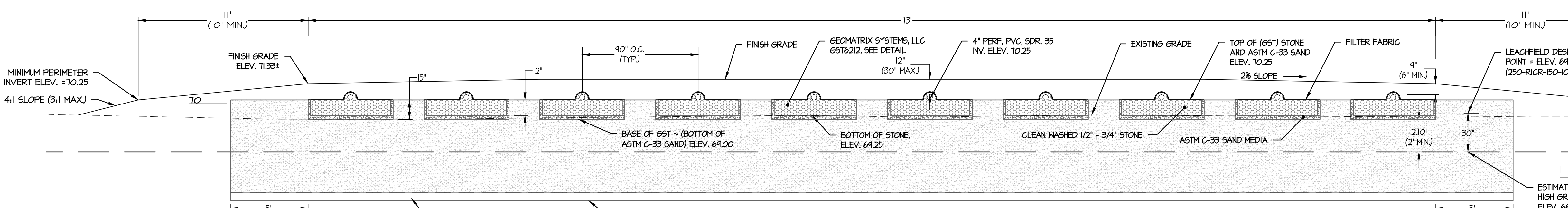
BURLINGAME STATE PARK AND CAMPGROUND



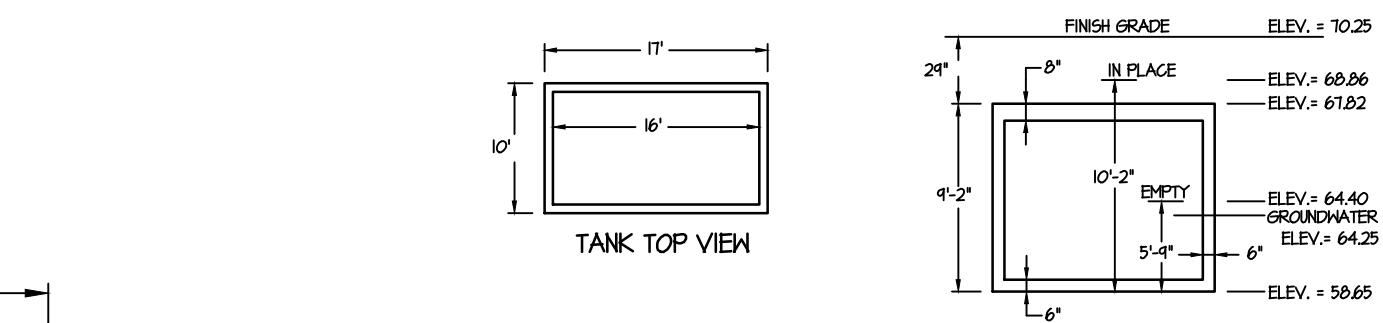
PROFILE
SCALE 1" = 4'



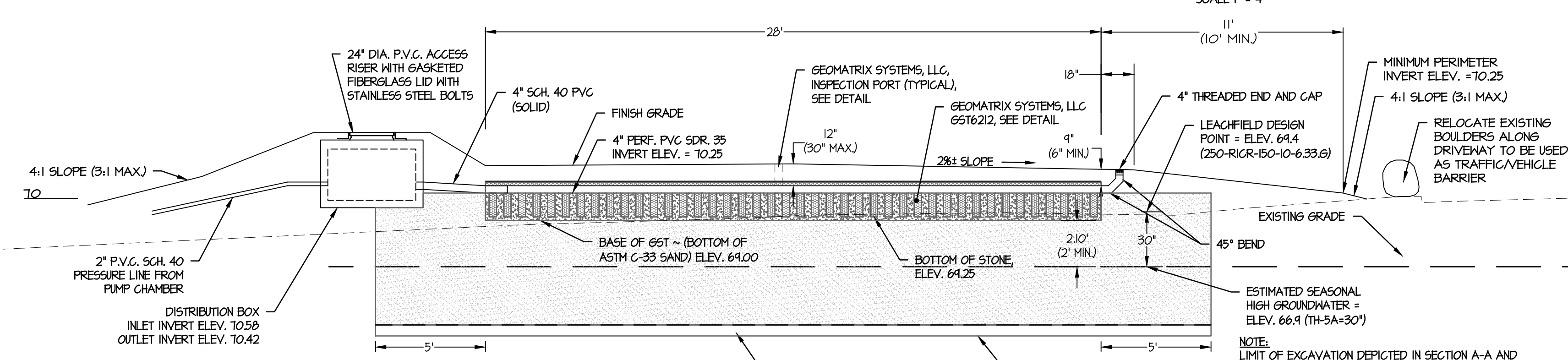
BUOYANCY CALCULATIONS FOR 15,000 GALLON SEPTIC TANK
MUST SET IN DRY CONDITIONS



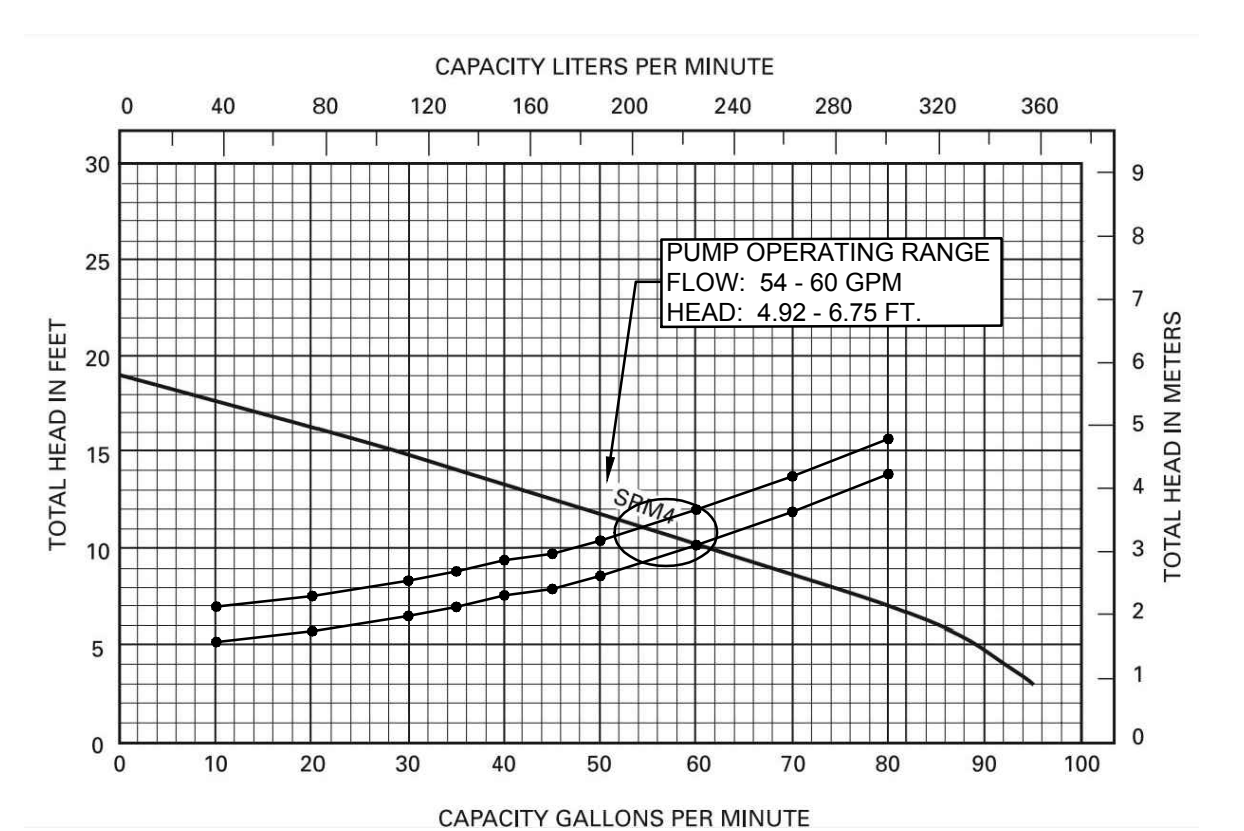
GRAVEL TREATMENT SYSTEM (GST) SECTION B-B
SCALE 1" = 4'



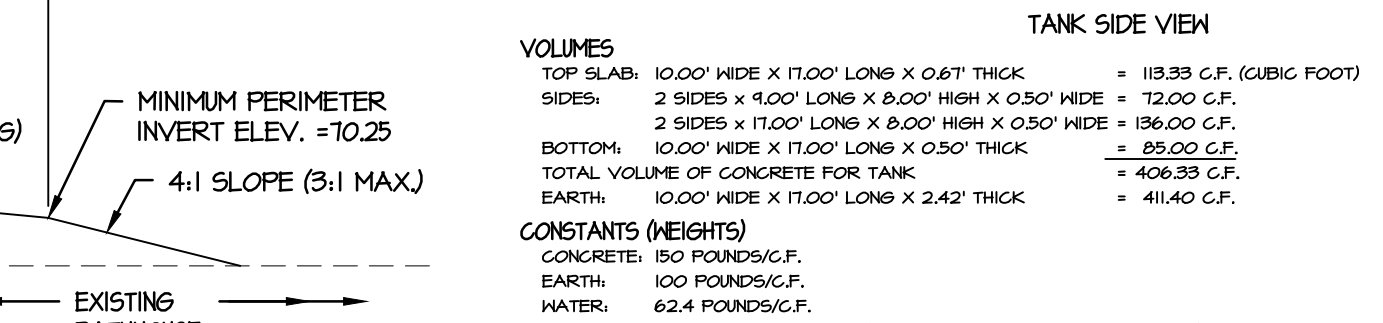
BUOYANCY CALCULATIONS FOR 1,500 ANOXIC TANK
MUST SET IN DRY CONDITIONS



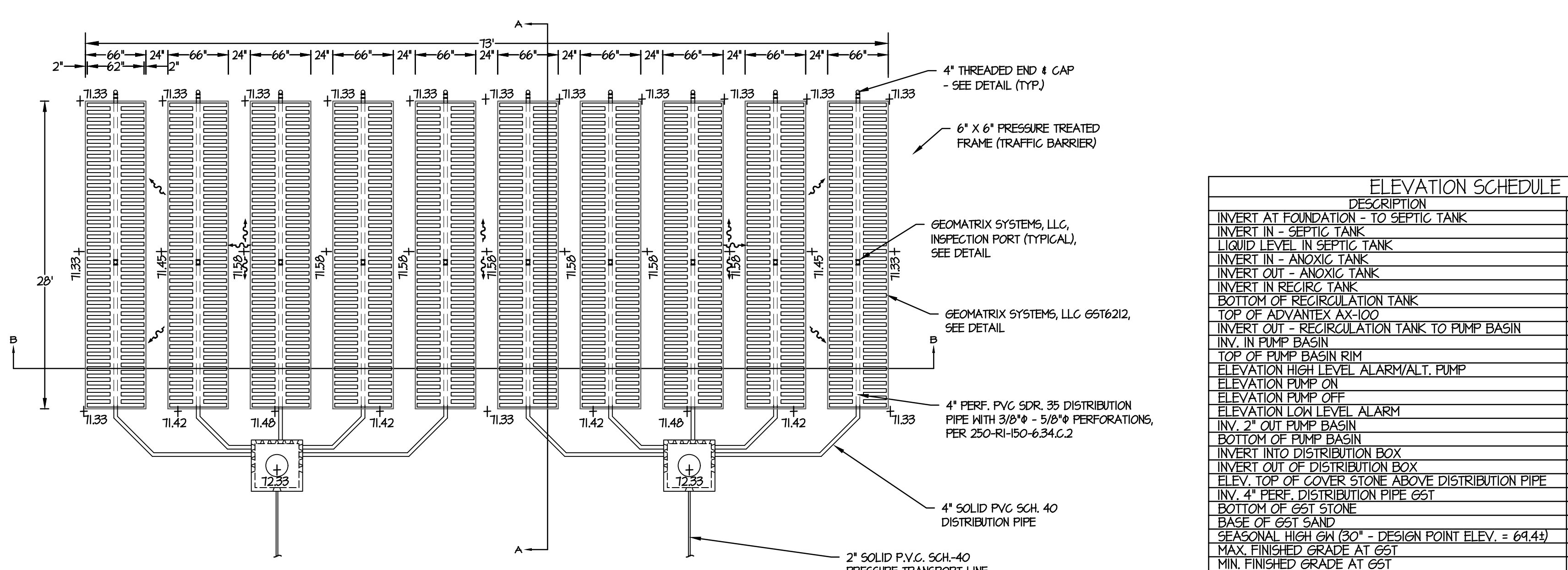
GRAVEL TREATMENT SYSTEM (GST) SECTION A-A
SCALE 1" = 4'



PUMP CURVE: MYERS SRM4



BUOYANCY CALCULATIONS FOR 6,000 RECIRCULATION TANK
MUST SET IN DRY CONDITIONS



GRAVEL SAND TREATMENT SYSTEM (GST) PLAN VIEW
SCALE 1" = 8'

CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

DESCRIPTION	ELEVATION
INVERT AT FOUNDATION - TO SEPTIC TANK	61.00
INVERT IN - SEPTIC TANK	66.15
LIQUID LEVEL IN SEPTIC TANK	66.50
INVERT IN - ANOXIC TANK	66.40
INVERT OUT - ANOXIC TANK	66.15
INVERT IN RECIRC. TANK	65.50
BOTTOM OF RECIRCULATION TANK	58.83
TOP OF ADVANTEK AX-100	71.25
INVERT OUT - RECIRCULATION TANK TO PUMP BASIN	61.50
INV. IN PUMP BASIN	61.25
TOP OF PUMP BASIN RIM	71.00
ELEVATION HIGH LEVEL ALARM/ALT. PUMP	65.83
ELEVATION PUMP ON	65.61
ELEVATION PUMP OFF	63.83
ELEVATION LOW LEVEL ALARM	63.61
INV. 2" OUT PUMP BASIN	61.00
BOTTOM OF PUMP BASIN	60.50
INVERT INTO DISTRIBUTION BOX	70.50
INVERT OUT OF DISTRIBUTION BOX	70.42
ELEV. TOP OF COVER STONE ABOVE DISTRIBUTION PIPE	70.15
INV. 4" PERF. DISTRIBUTION PIPE GST	70.25
BOTTOM OF GST STONE	64.25
BASE OF GST SAND	64.00
SEASONAL HIGH GW (30" - DESIGN POINT ELEV. = 64.44)	66.9 (TH-5A)
MAX FINISHED GRADE AT GST	73.00
MIN. FINISHED GRADE AT GST	71.00

PUMPING AND SYSTEM SPECIFICATIONS/DATA:

PUMP CHAMBER PUMP MODEL:
MYERS SRM4 SUBMERSIBLE SEWAGE PUMP
HORSEPOWER - 0.4; SINGLE PHASE
2" INCH DISCHARGE; 230 VOLTS; 60 HZ 6 AMPS
LIFT OUT (2)
MYERS SRA 200 WITH STAINLESS STEEL BRACKETS
CONTROL PANEL MODEL
MYERS CE-210W ALTERNATING
ENCLOSURE - NEMA 1 (NEMA 4X IF EXPOSED TO WEATHER)
VOLTAGE - 230
HIGH LEVEL ALARM - VISUAL AND AUDIO
FLOATS MODEL
MYERS MODEL 20VM S/E OR EQUAL

PUMP CHAMBER DISCHARGE VOLUME PER CYCLE:
6' X 6' INTERIOR @ 1' - 10" = 66 CUBIC FEET X 7.48 GALLONS/CF = 494 GAL./CYCLE
2" PIPE DRAIN BACK: APPROXIMATELY 8 GAL.
494 GALLONS/CYCLE - 8 GALLONS = 486 GAL./CYCLE
7500 GPD/2 GST SYSTEMS = 3750 GPD/486 GAL./CYCLE = 7.7 - 8 CYCLES/DAY/GST

FLOATS - ON, OFF, HIGH AND LOW WATER:
HIGH WATER - ELEVATION 65.83
PUMP ON - ELEVATION 65.67
PUMP OFF - ELEVATION 63.83
LOW WATER - ELEVATION 63.67

ORENCO AX-100 TREATMENT SYSTEM DATA REVIEWED AND PROVIDED BY ATLANTIC SOLUTIONS (CONTROL PANEL - TIME DOSED)
GRAVEL SAND TREATMENT (GST) SYSTEM DATA REVIEWED BY GEOMATRIX SYSTEMS LLC.

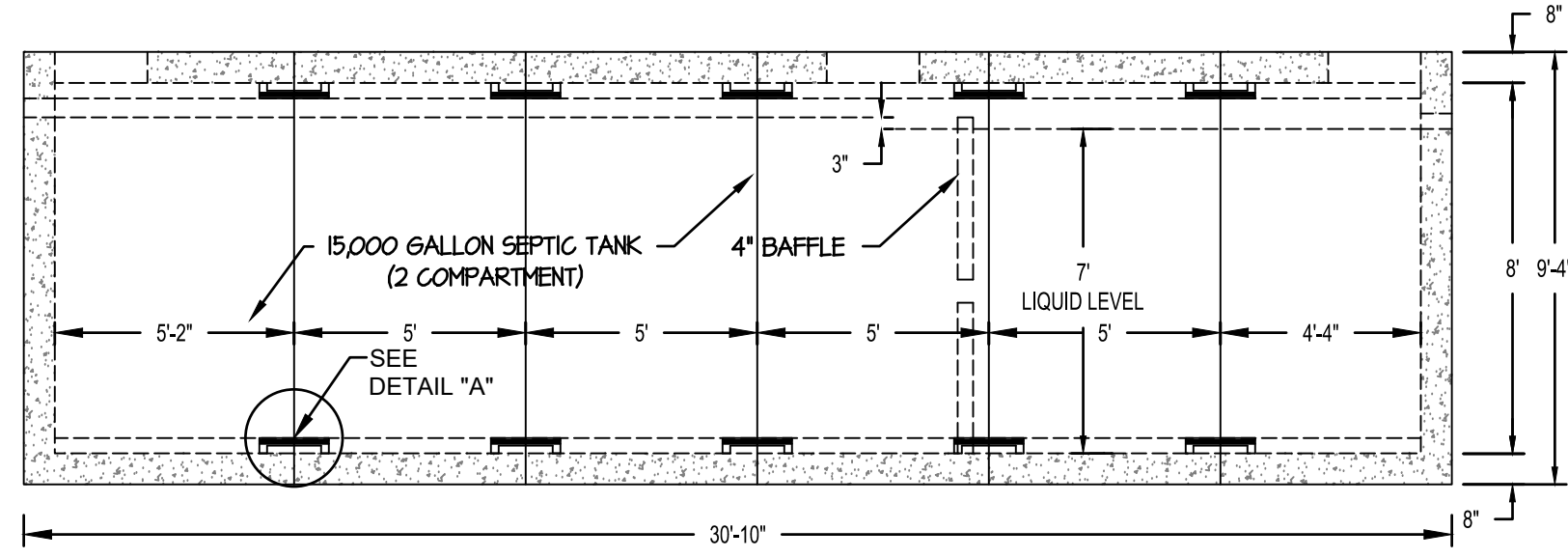
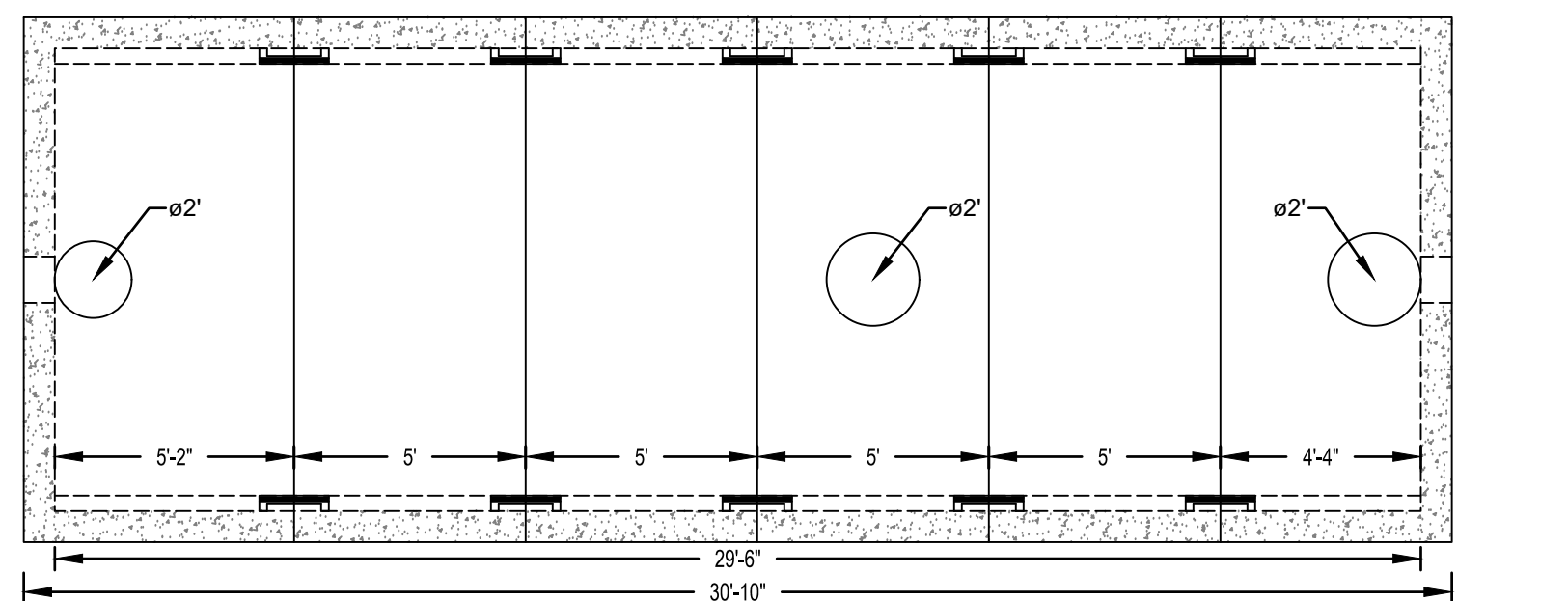
STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

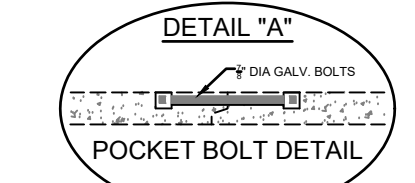
MAIN CAMP BATHHOUSE - OWTS DETAILS

Dwg: Scale: 1" = 20'
Contract No. x Date: FEBRUARY, 2023
C-2.5 19

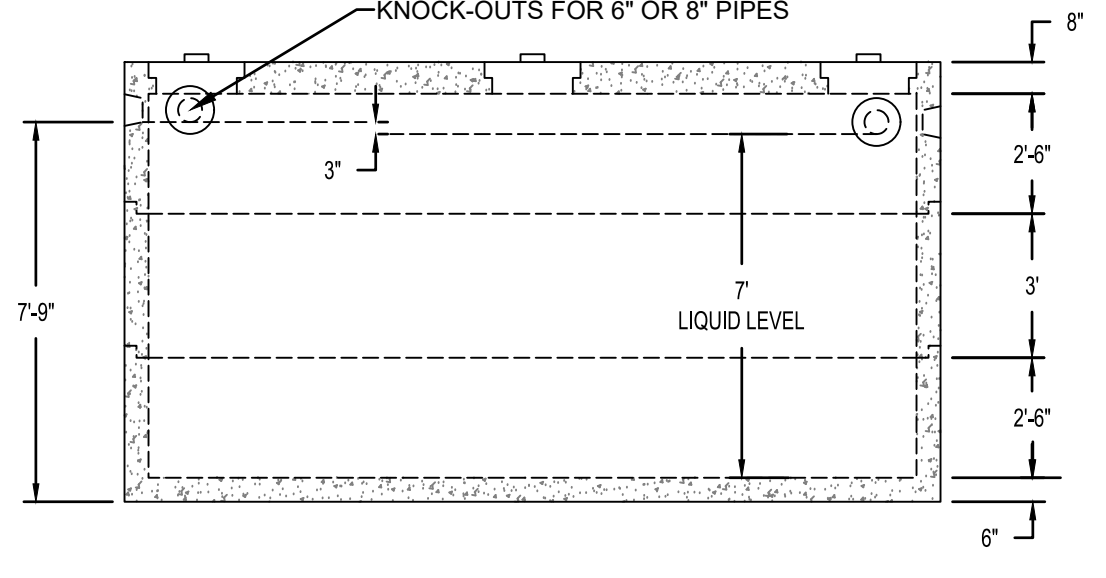
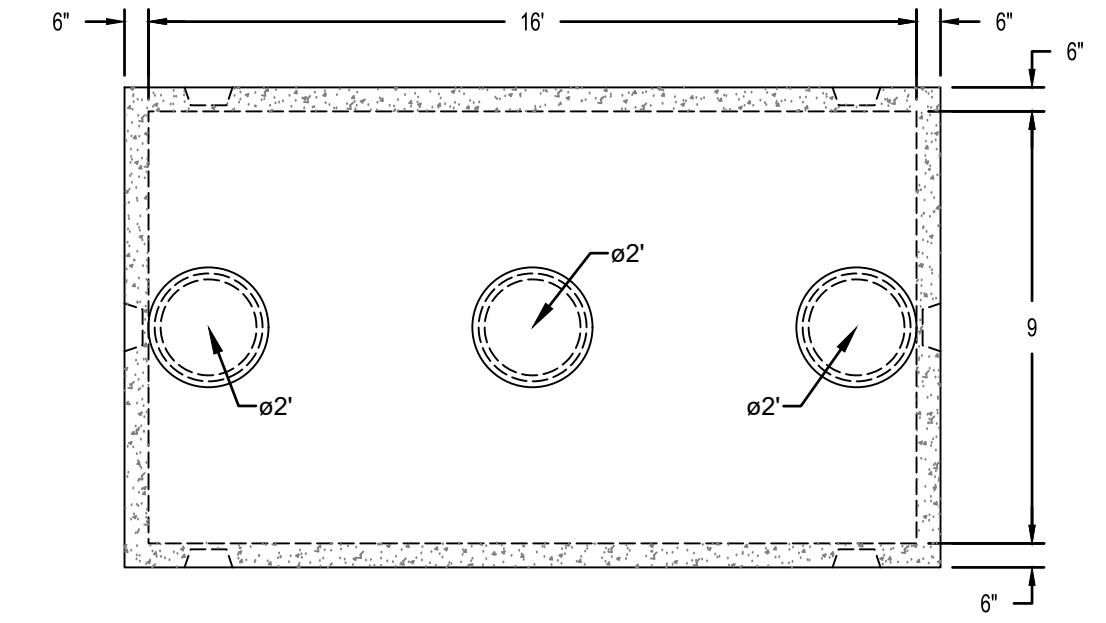
J:\RhodeIsland\CharlestownRIDEM - Burlingame\009 - 025 - and S-6 Site Design\2023.02.10.dwg



15,000 GALLON TWO COMPARTMENT SEPTIC TANK
SCALE 1" = 4"

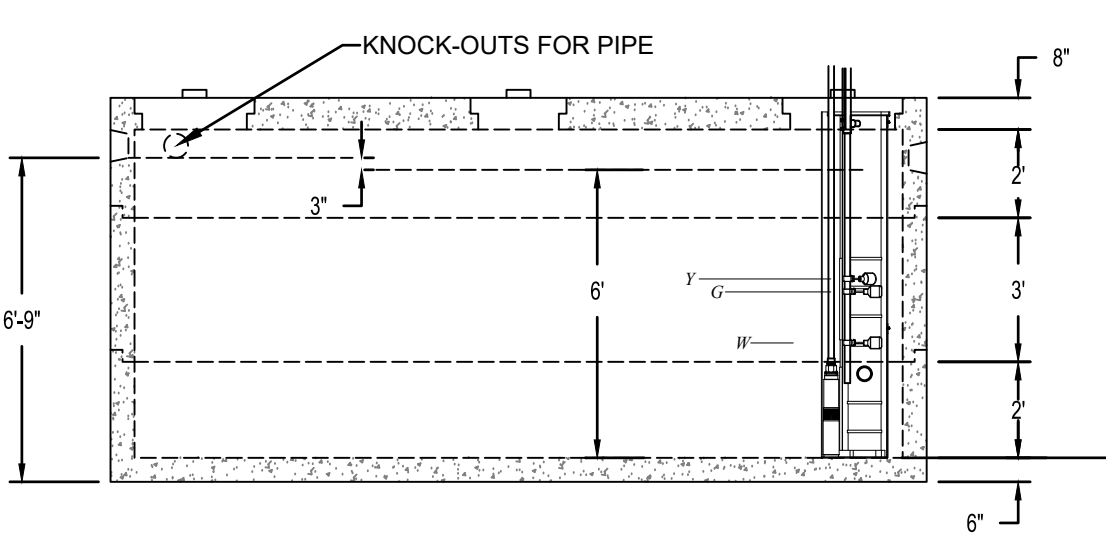
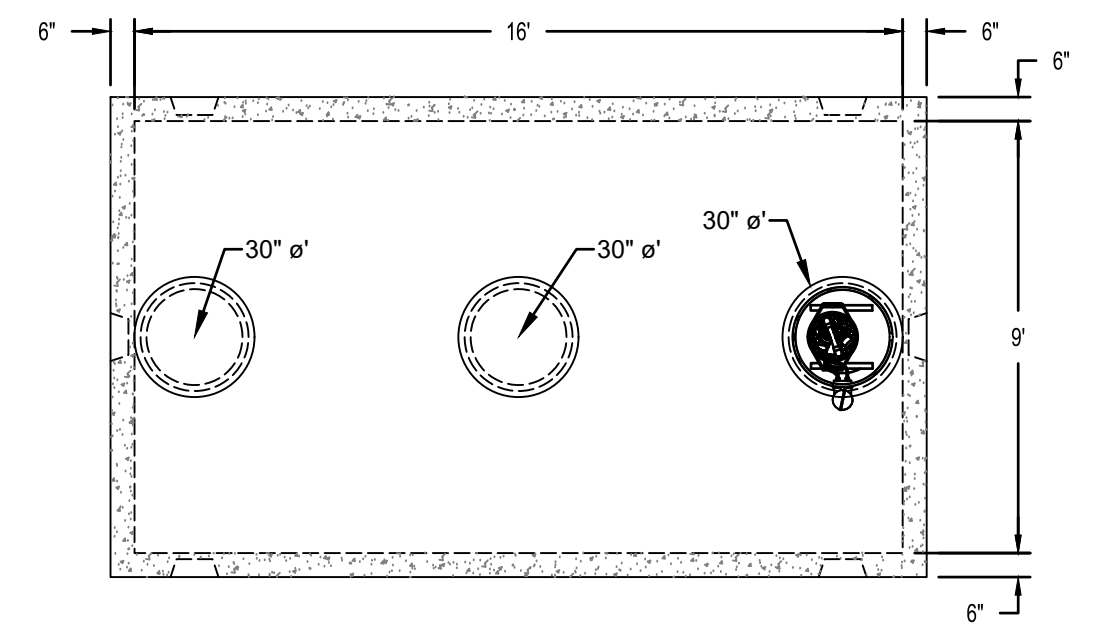


- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.



7,500 GALLON ANOXIC TANK
SCALE 1" = 4"

- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

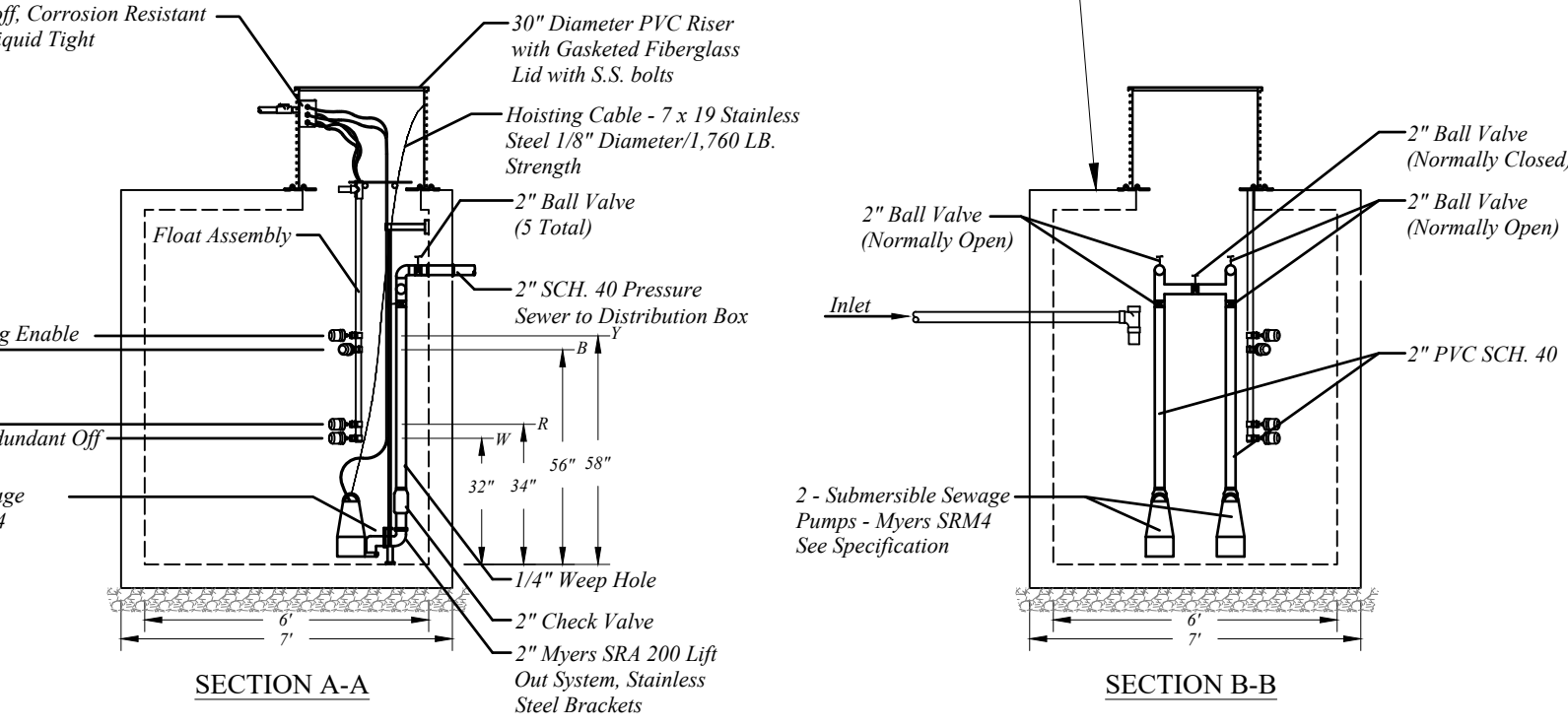
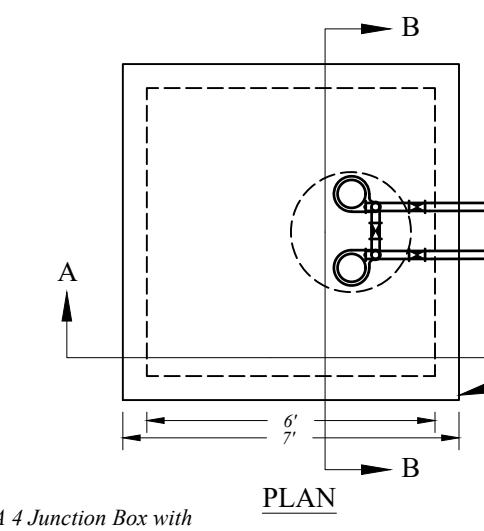


6,000 GALLON RECIRCULATION TANK
SCALE 1" = 4"

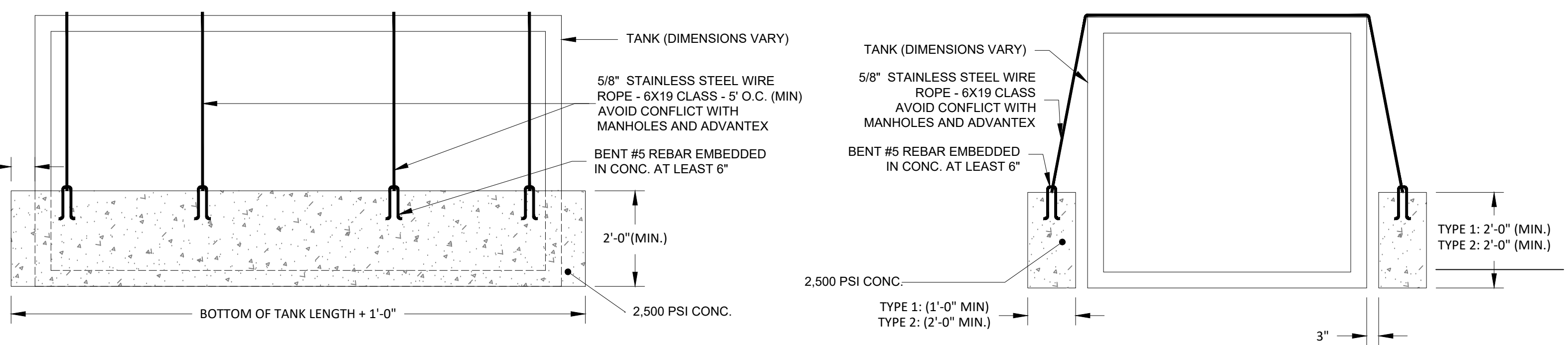
Float Functions	
Y	High Level Alarm & Alternate Pump On
Z	Overload Timer ON/OFF
W	LL/RR

- DESIGN NOTES:**
1. CONCRETE 5,000 PSI @ 28 DAYS
 2. REINFORCING ASTM A-615 GRADE #5 REBAR 12" O.C.B.W. OR EQUAL
 3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
 4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
 5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

- PUMPING NOTES:**
1. EQUIPMENT FROM OTHER MANUFACTURERS MAY BE USED IF EQUAL APPROVAL FOR ALTERNATE EQUIPMENT REQUIRED FROM ENGINEER PRIOR TO CONSTRUCTION. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY CONTRACTOR.
 2. CONTROL PANEL AND ALARM TO BE MOUNTED IN A CONSPICUOUS LOCATION.
 3. JUNCTION BOX IN PUMP CHAMBER TO HAVE SHUT-OFF SWITCH.
 4. FLOATS ARE TO BE SET TO SPECIFIED ELEVATIONS AND FIELD VERIFIED.
 5. THE PUMP CHAMBER DOSING CONTROLS SHALL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
 6. ELECTRICAL CONNECTIONS MAY BE INSTALLED OUTSIDE PUMP CHAMBER IN SEPARATE HAND HOLE WITH ACCESS FRAME AND COVER TO GRADE MEETING H-20-44 LOADING REQUIREMENTS.



PUMP CHAMBER DETAIL
SCALE 1" = 4"



COUNTER WEIGHT: TANK ANTI-FLOATATION SECTIONS
SCALE 1" = 2"

ANTI-FLOATATION AREA

16,000 GALLON TANK (TYPE 1) - 2 SIDES x 32.83' LONG x 1.00' WIDE	= 66.66 S.F.
15,000 GALLON TANK (TYPE 2) - 2 SIDES x 31.83' LONG x 1.00' WIDE	= 63.66 S.F.
15,000 GALLON TANK (TYPE 2) - 2 SIDES x 31.83' LONG x 2.00' WIDE	= 127.32 S.F.
8,000 GALLON TANK (TYPE 1) - 2 SIDES x 19.00' LONG x 1.00' WIDE	= 38 S.F.
8,000 GALLON TANK (TYPE 2) - 2 SIDES x 19.00' LONG x 2.00' WIDE	= 76 S.F.
7,500 GALLON TANK (TYPE 1) - 2 SIDES x 18.00' LONG x 1.00' WIDE	= 36 S.F.
7,500 GALLON TANK (TYPE 2) - 2 SIDES x 18.00' LONG x 2.00' WIDE	= 72 S.F.
6,000 GALLON TANK (TYPE 1) - 2 SIDES x 15.00' LONG x 1.00' WIDE	= 30 S.F.
6,000 GALLON TANK (TYPE 2) - 2 SIDES x 15.00' LONG x 2.00' WIDE	= 60 S.F.
PUMP CHAMBER (TYPE 2) - 2 SIDES x 6.00' LONG x 1.00' WIDE	= 12 S.F.

ANTI-FLOATATION VOLUMES

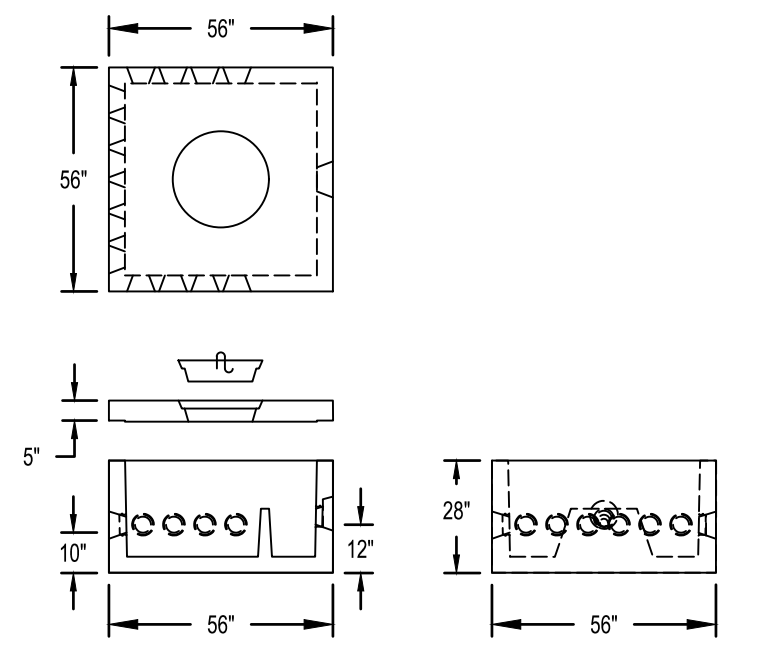
16,000 GALLON TANK (TYPE 1) - 66.66 S.F. x 2.00' HIGH	= 133.32 G.F.
16,000 GALLON TANK (TYPE 1) - 63.66 S.F. x 2.00' HIGH	= 127.32 G.F.
16,000 GALLON TANK (TYPE 2) - 127.32 S.F. x 2.00' HIGH	= 254.64 G.F.
8,000 GALLON TANK (TYPE 1) - 38 S.F. x 2.00' HIGH	= 76 G.F.
8,000 GALLON TANK (TYPE 2) - 76 S.F. x 2.00' HIGH	= 152 G.F.
7,500 GALLON TANK (TYPE 1) - 36 S.F. x 2.00' HIGH	= 72 G.F.
7,500 GALLON TANK (TYPE 2) - 72 S.F. x 2.00' HIGH	= 144 G.F.
6,000 GALLON TANK (TYPE 1) - 30 S.F. x 2.00' HIGH	= 60 G.F.
6,000 GALLON TANK (TYPE 2) - 60 S.F. x 2.00' HIGH	= 120 G.F.
PUMP CHAMBER (TYPE 1) - 12 S.F. x 2.00' HIGH	= 24 G.F.
PUMP CHAMBER (TYPE 2) - 24 S.F. x 2.00' HIGH	= 48 G.F.

CONSTANTS (WEIGHTS)

CONCRETE	150 POUNDS/C.F.
WATER	62.4 POUNDS/C.F.
SUBMERGED CONCRETE	87.6 POUNDS/C.F.

WEIGHT OF ANTI-FLOATATION IN PLACE

16,000 GALLON TANK (TYPE 1) - 133.32 G.F. x 87.6 POUNDS/G.F.	= 11,680 POUNDS
16,000 GALLON TANK (TYPE 1) - 127.32 G.F. x 87.6 POUNDS/G.F.	= 11,100 POUNDS
16,000 GALLON TANK (TYPE 2) - 254.64 G.F. x 87.6 POUNDS/G.F.	= 22,300 POUNDS
8,000 GALLON TANK (TYPE 1) - 76 G.F. x 87.6 POUNDS/G.F.	= 6,660 POUNDS
8,000 GALLON TANK (TYPE 2) - 152 G.F. x 87.6 POUNDS/G.F.	= 13,320 POUNDS
7,500 GALLON TANK (TYPE 1) - 72 G.F. x 87.6 POUNDS/G.F.	= 6,307.2 POUNDS
7,500 GALLON TANK (TYPE 2) - 144 G.F. x 87.6 POUNDS/G.F.	= 12,614.4 POUNDS
6,000 GALLON TANK (TYPE 1) - 60 G.F. x 87.6 POUNDS/G.F.	= 5,256 POUNDS
6,000 GALLON TANK (TYPE 2) - 120 G.F. x 87.6 POUNDS/G.F.	= 10,512 POUNDS
PUMP CHAMBER (TYPE 1) - 24 G.F. x 87.6 POUNDS/G.F.	= 2,098 POUNDS
PUMP CHAMBER (TYPE 2) - 48 G.F. x 87.6 POUNDS/G.F.	= 4,196 POUNDS



DISTRIBUTION BOX WITH 14 OUTLETS
SCALE 1" = 4"

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DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS PRECAST STRUCTURES DETAILS

Dwg: _____ Scale: 1" = 20'
Contract No. x _____ Date: FEBRUARY, 2023

C-3.1
21

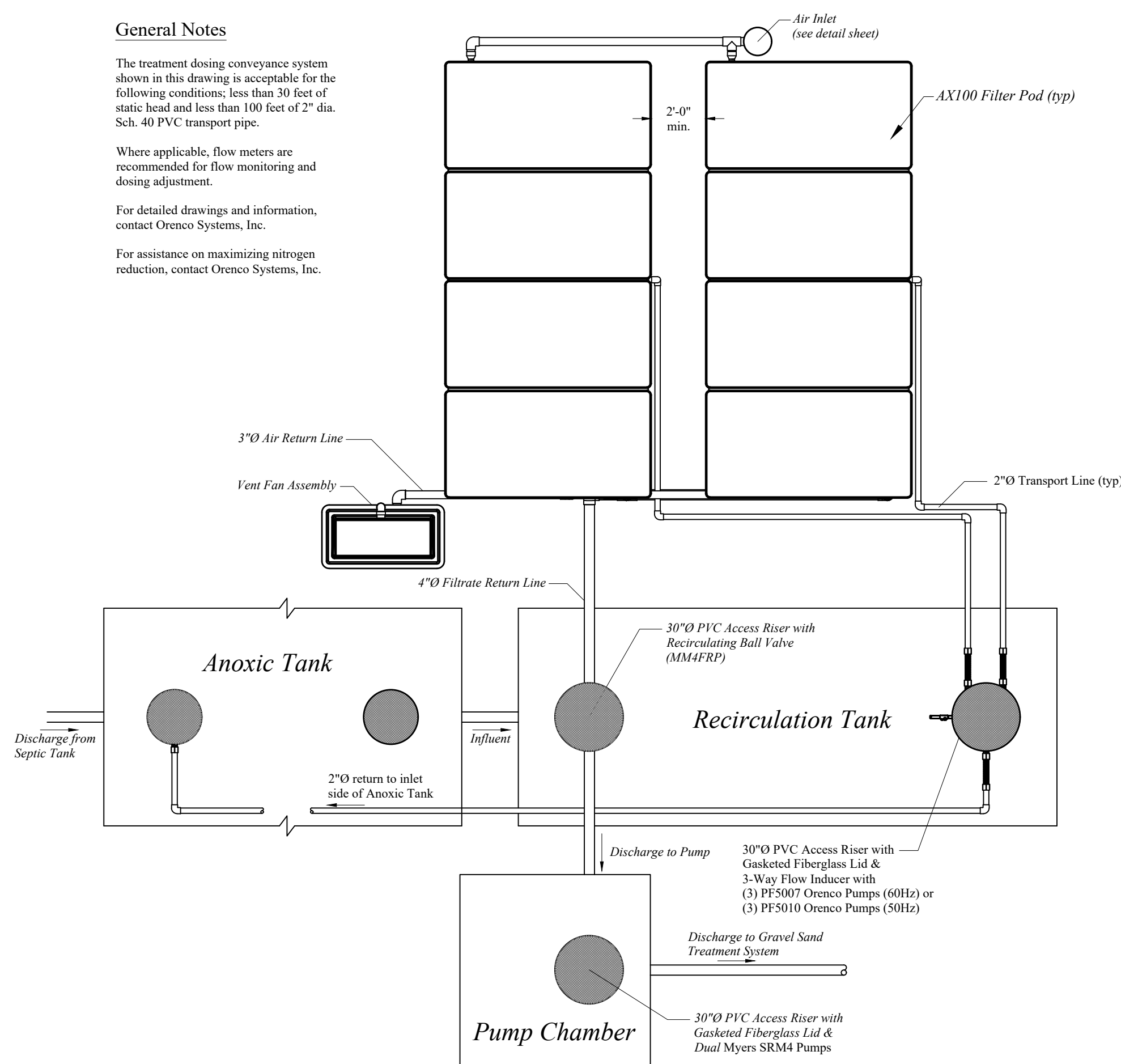
General Notes

The treatment dosing conveyance system shown in this drawing is acceptable for the following conditions: less than 30 feet of static head and less than 100 feet of 2" dia. Sch. 40 PVC transport pipe.

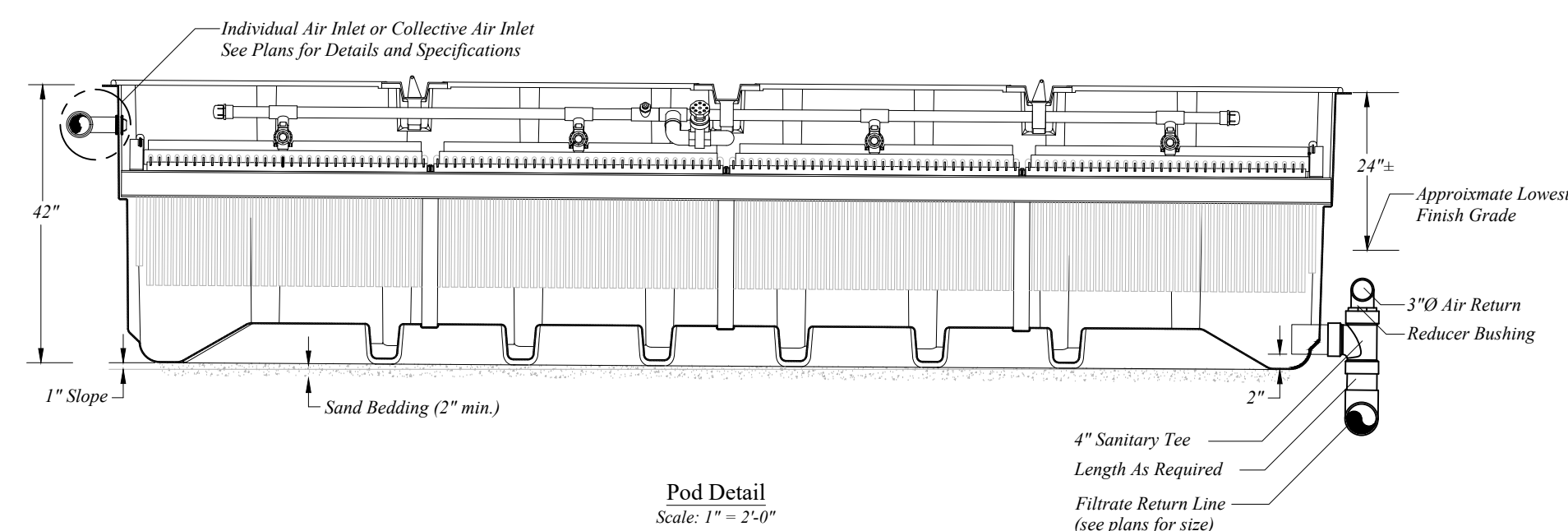
Where applicable, flow meters are recommended for flow monitoring and dosing adjustment.

For detailed drawings and information, contact Orenco Systems, Inc.

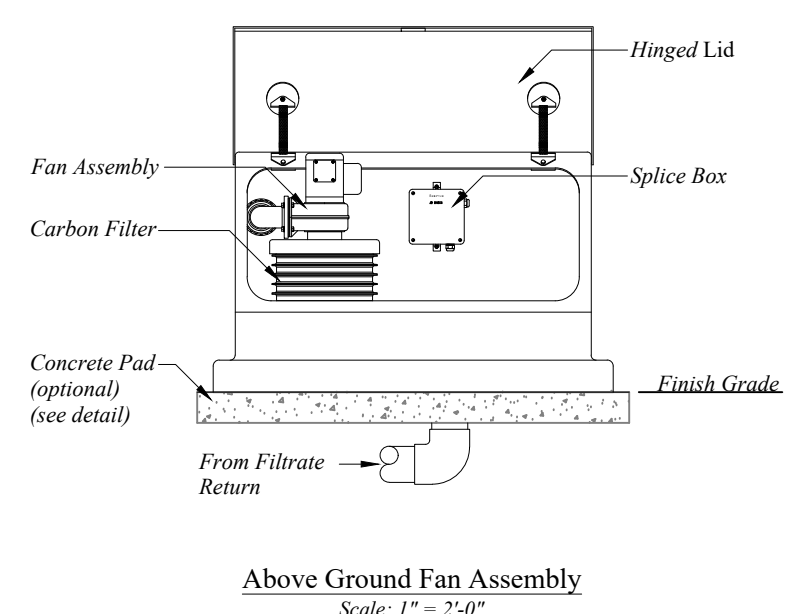
For assistance on maximizing nitrogen reduction, contact Orenco Systems, Inc.



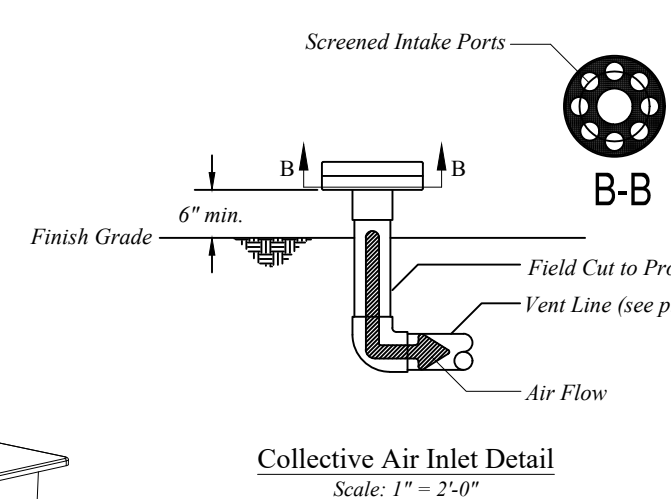
**AdvanTex AX100 SYSTEM - MANIFOLDED VENT INLET
2 POD CONFIGURATION**
SCALE 1" = 4'



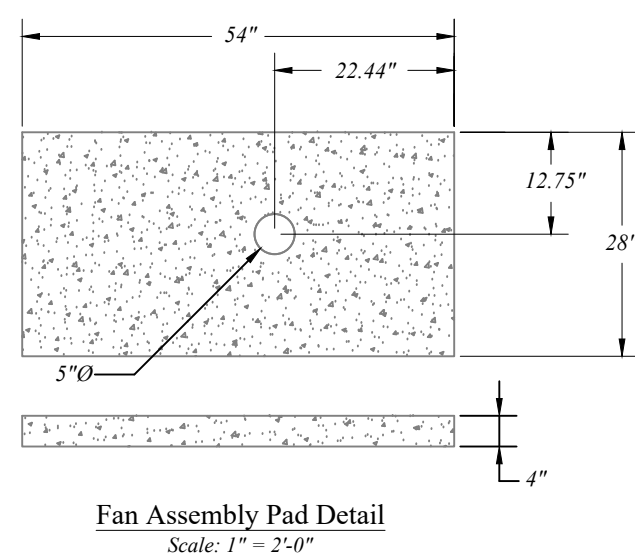
Pod Detail
Scale: 1" = 2'-0"



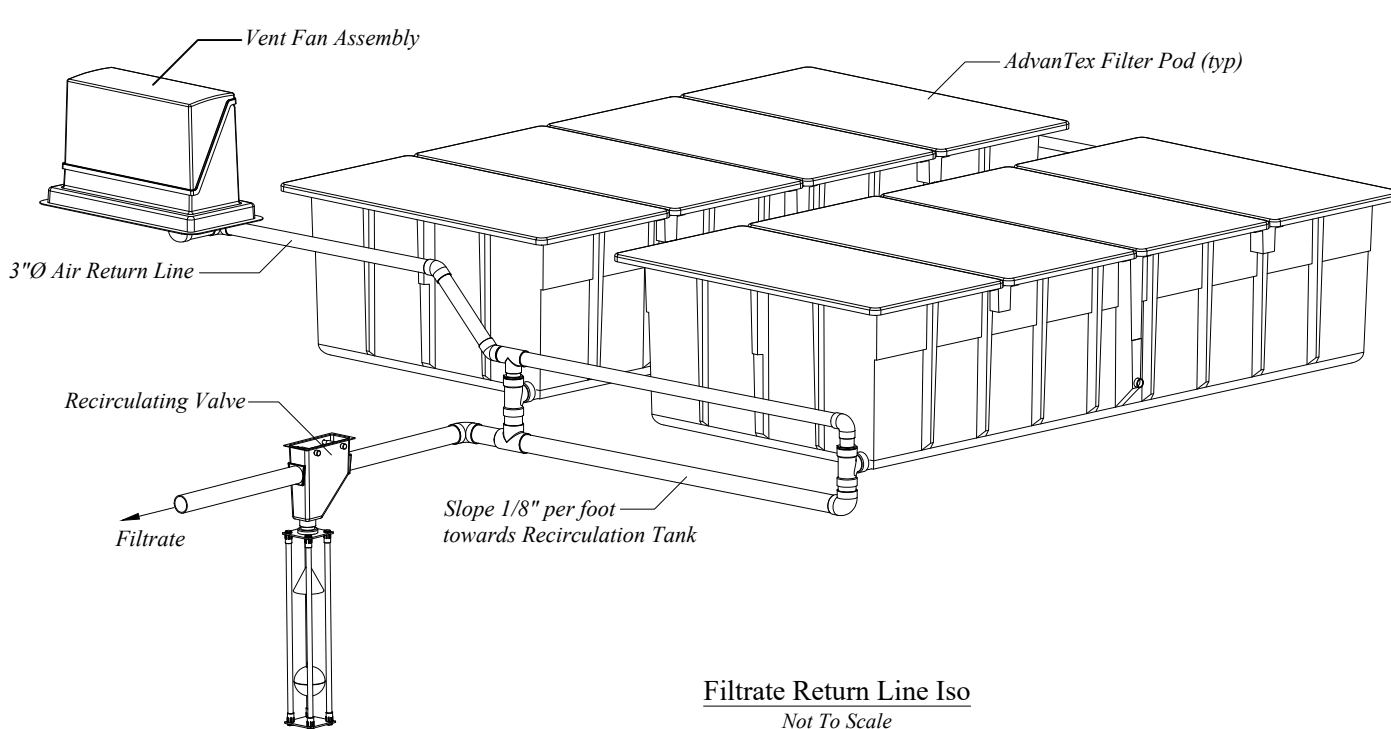
Above Ground Fan Assembly
Scale: 1" = 2'-0"



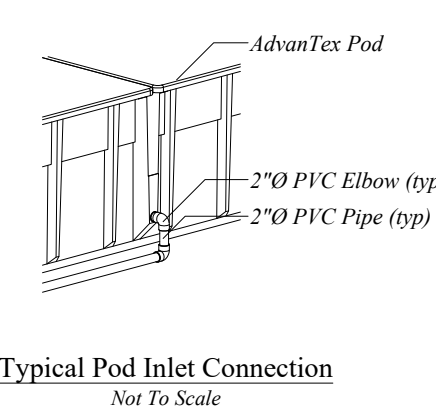
Collective Air Inlet Detail
Scale: 1" = 2'-0"



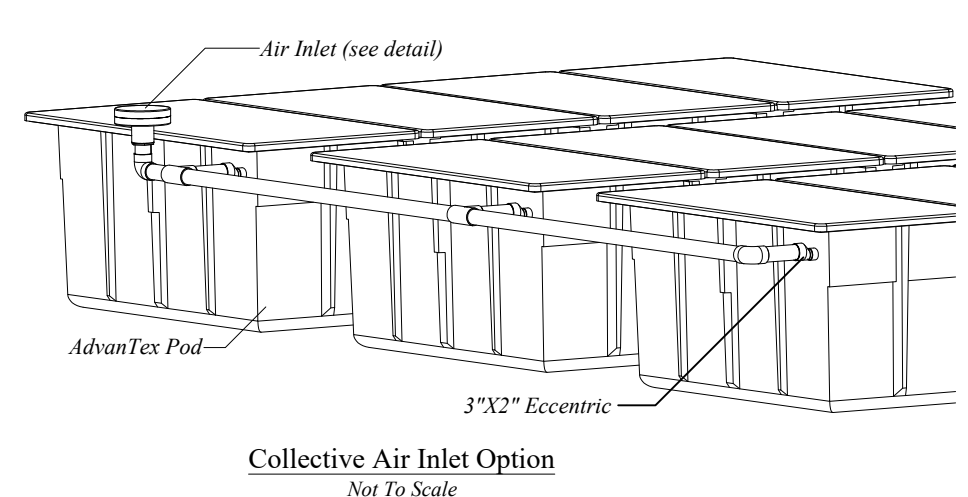
Fan Assembly Pad Detail
Scale: 1" = 2'-0"



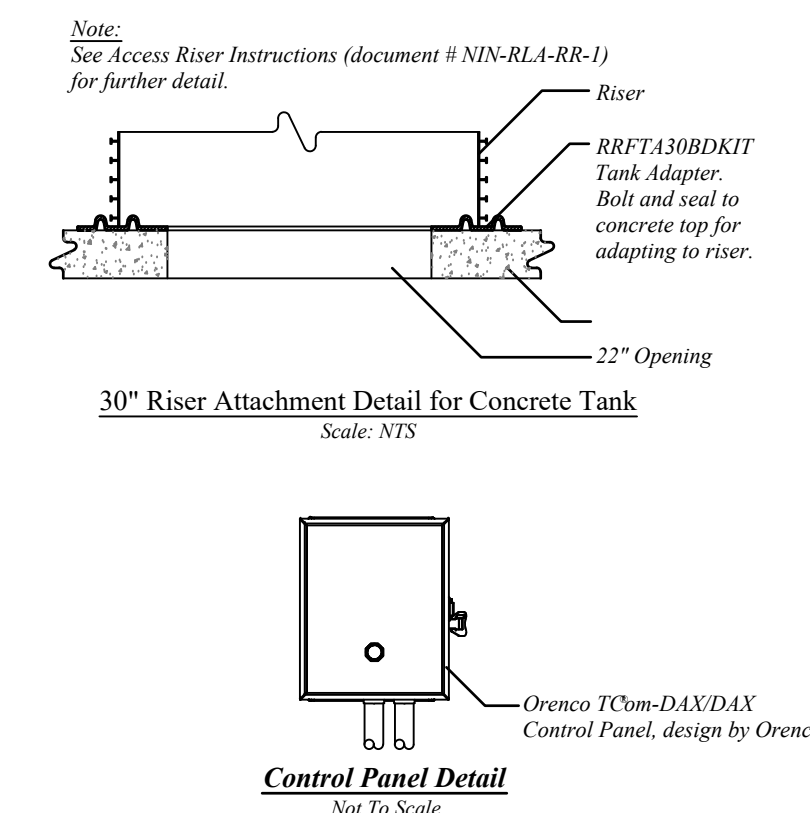
Filtrate Return Line Iso
Not To Scale



Typical Pod Inlet Connection
Not To Scale

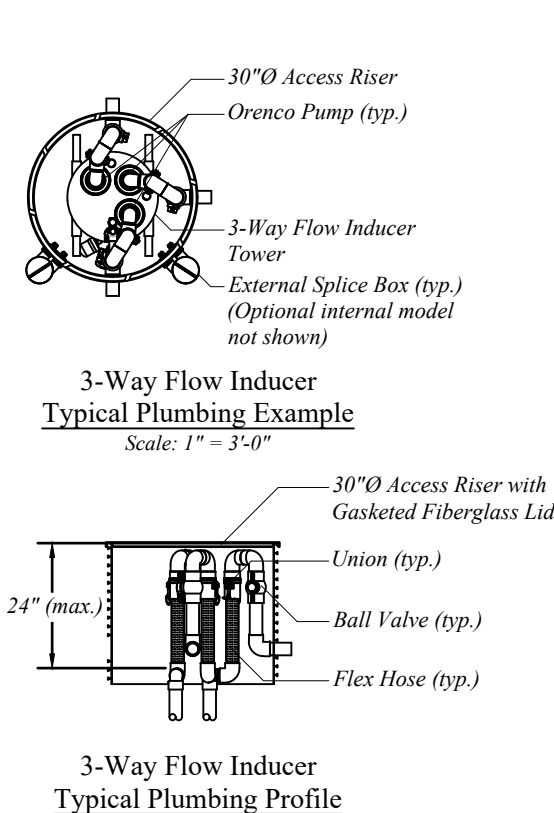


Collective Air Inlet Option
Not To Scale



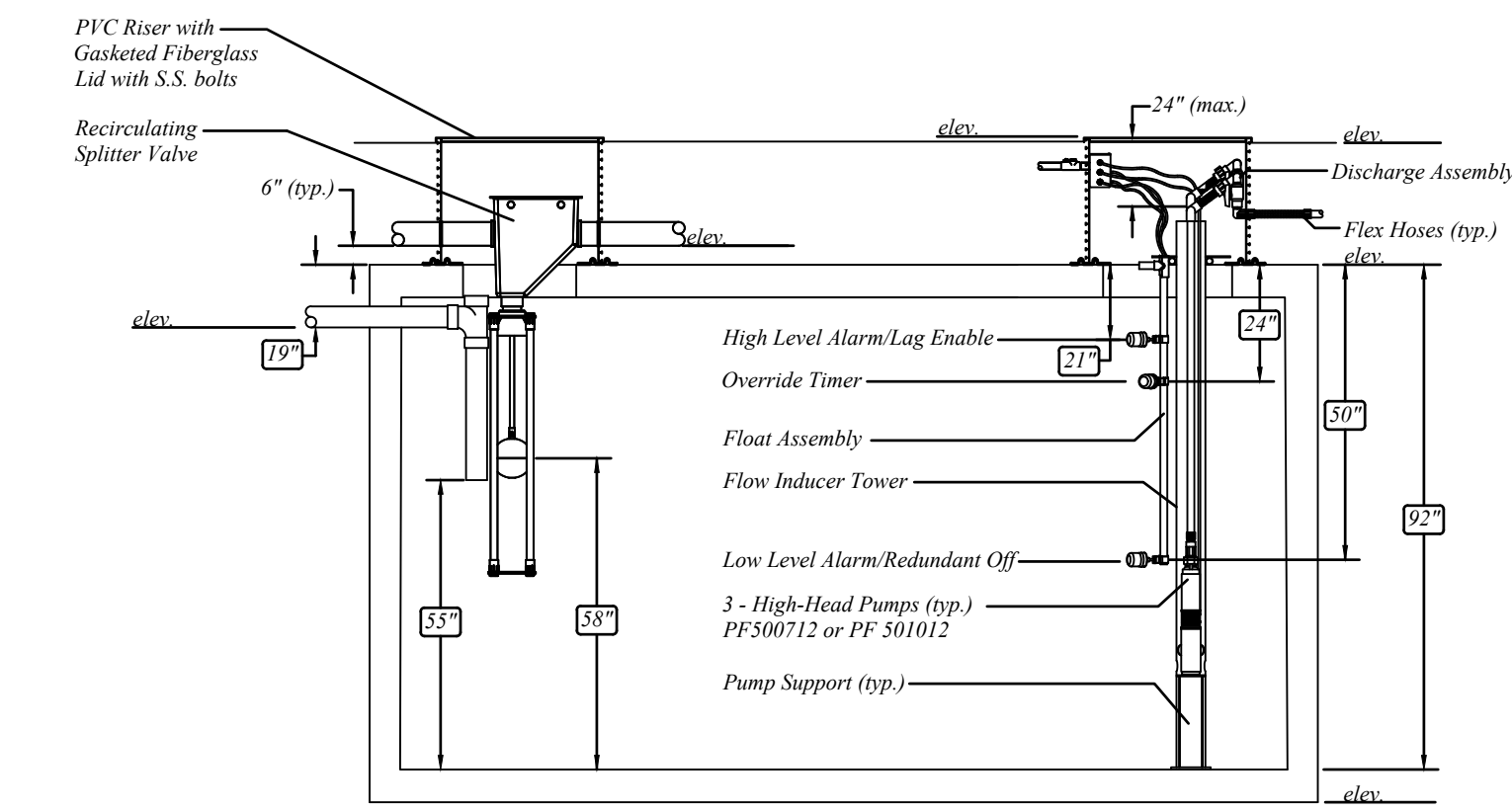
30" Riser Attachment Detail for Concrete Tank
Scale: NTS

Control Panel Detail
Not To Scale



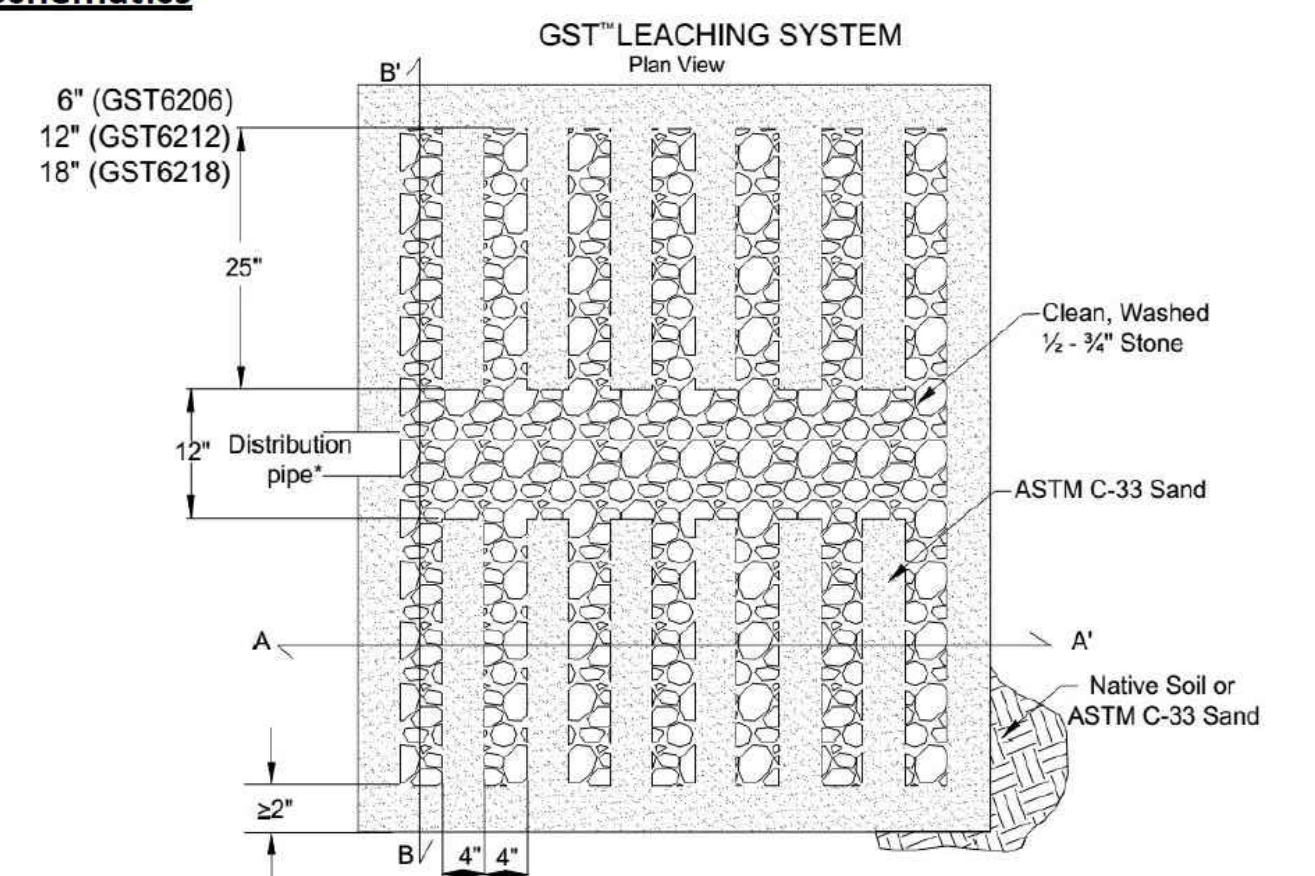
Typical Plumbing Example
Scale: 1" = 3'-0"

Typical Plumbing Profile
Scale: 1" = 3'-0"

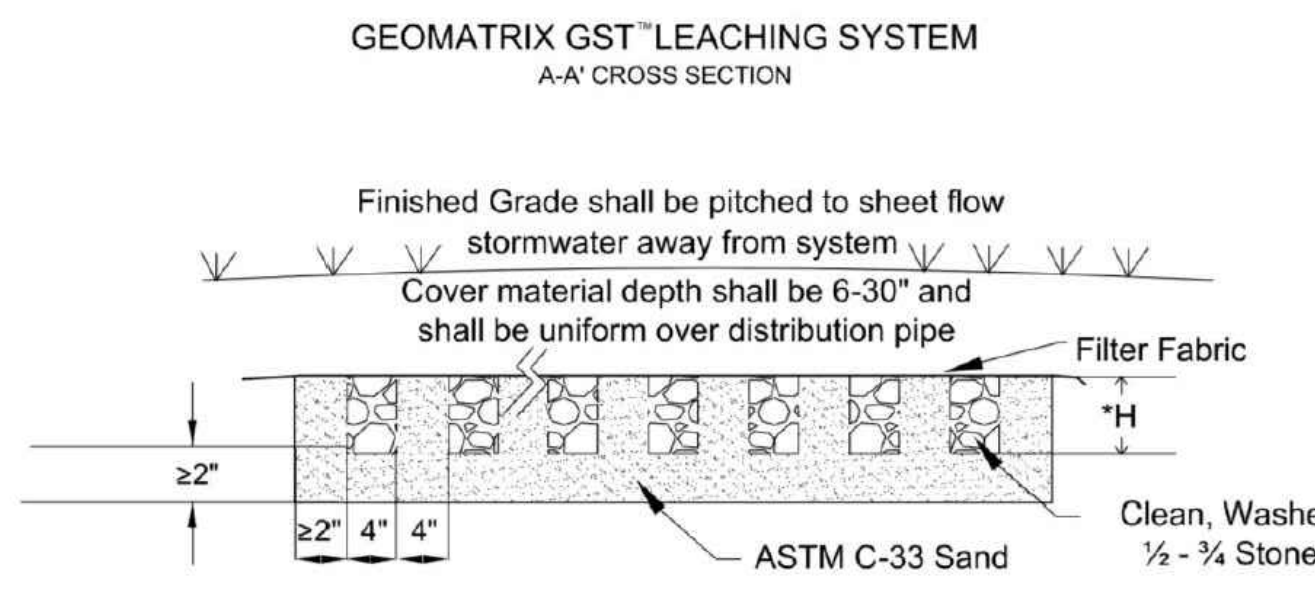


RECIRCULATION TANK FLOAT AND RSV SETTINGS
NOT TO SCALE

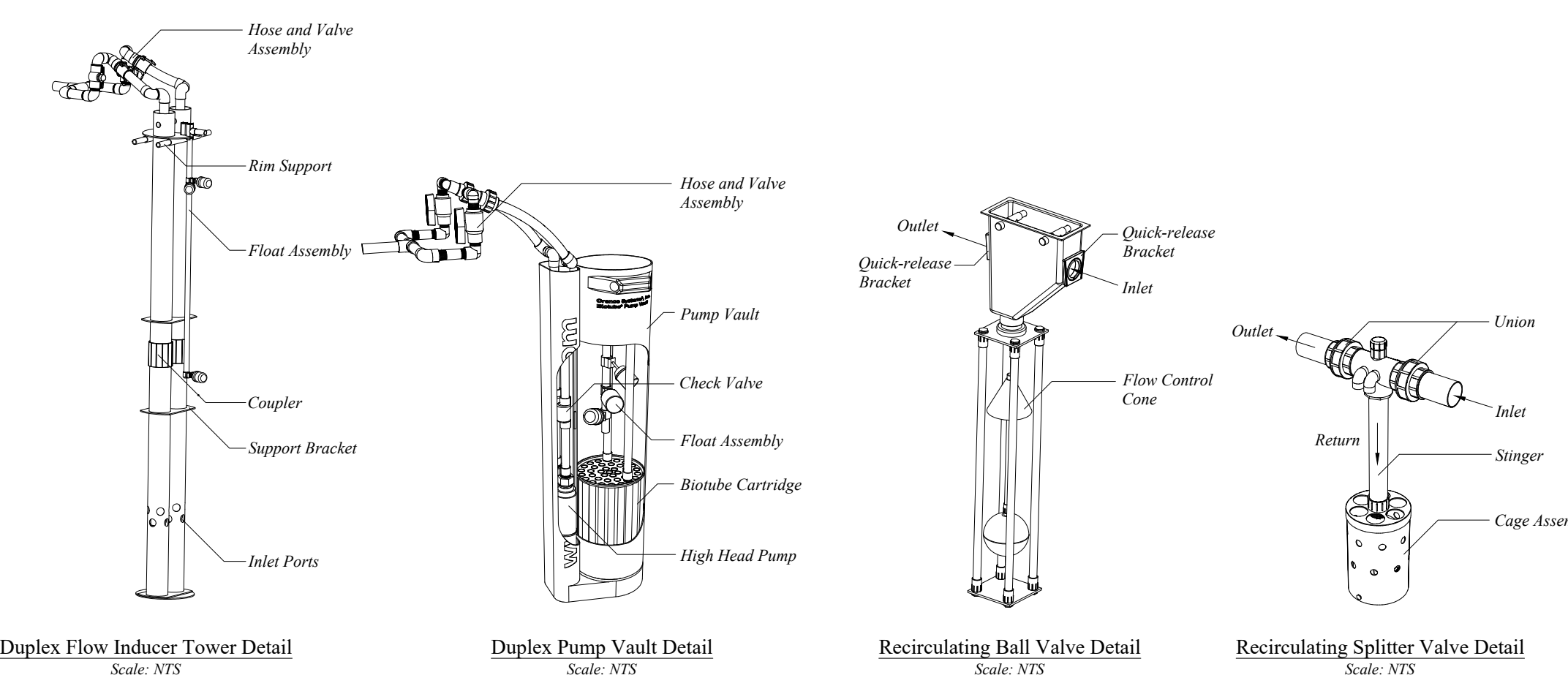
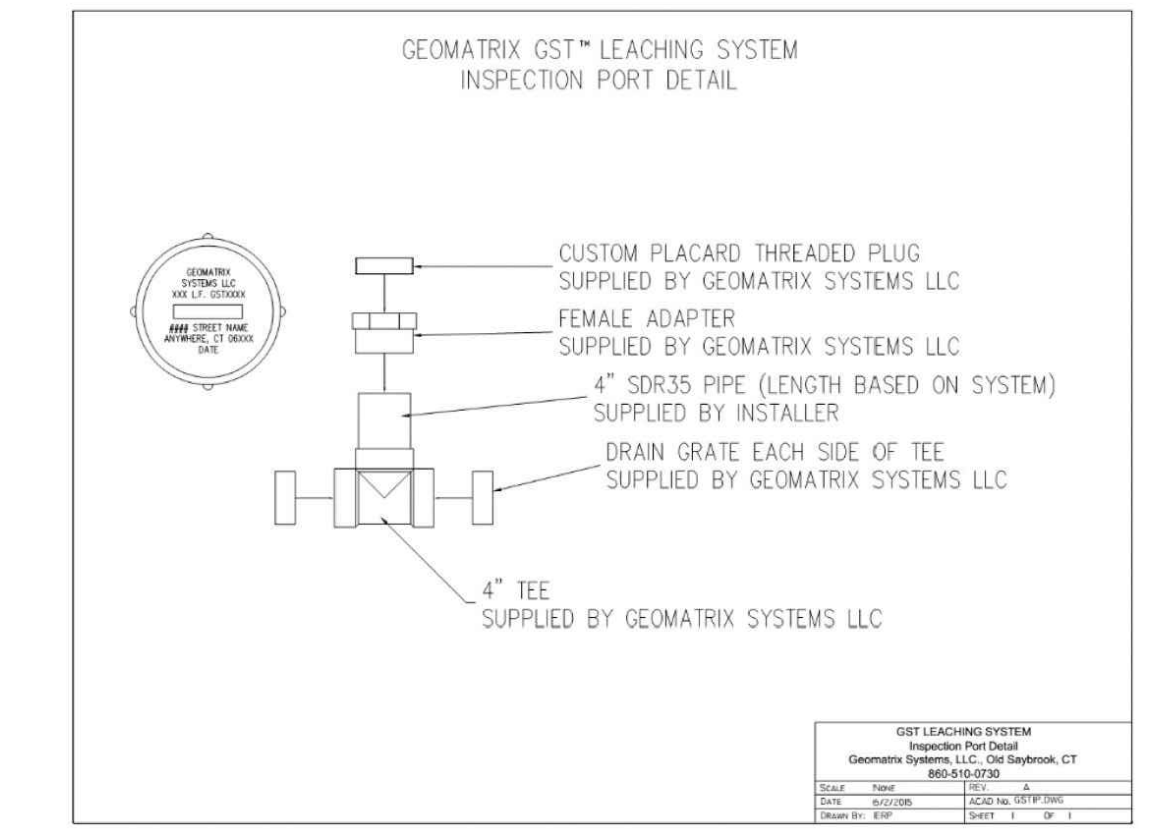
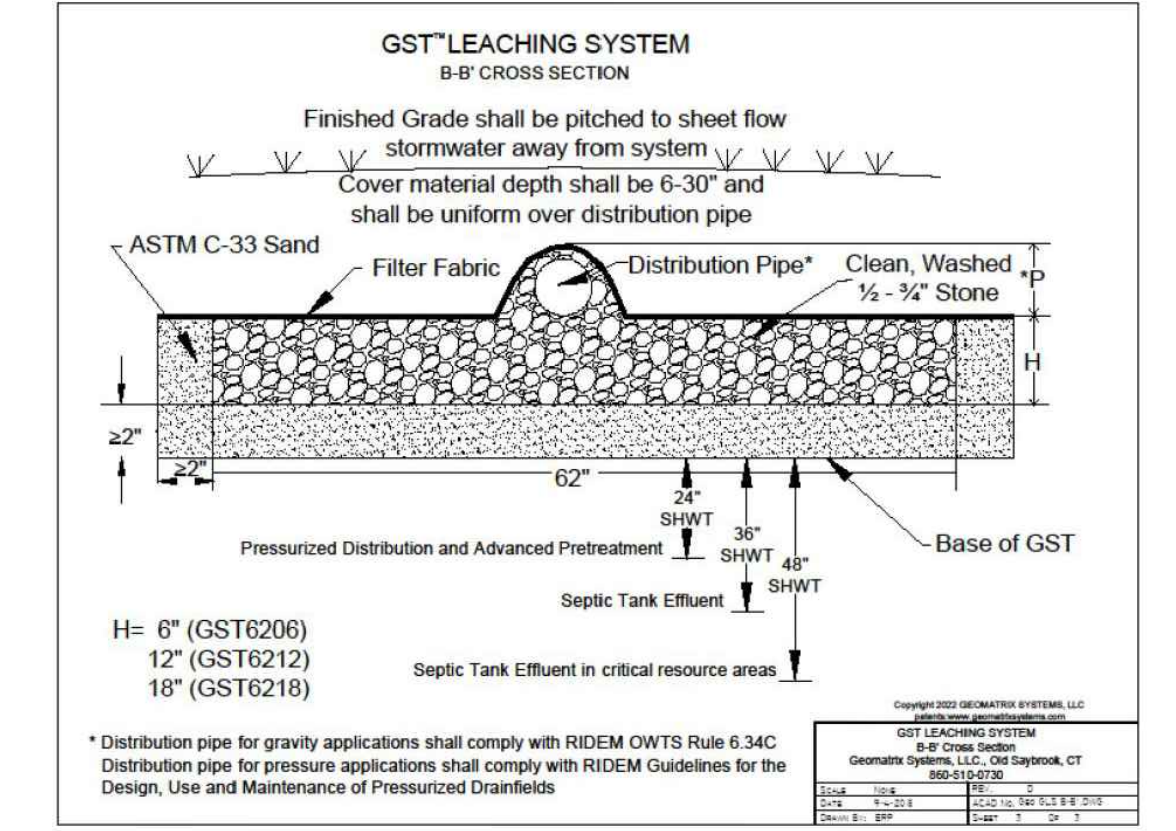
GST Schematics



* Distribution pipe for gravity systems shall comply with RIDEM DWTS Rule 6.34C. Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.



*H= 6" (GST6206)
12" (GST6212)
18" (GST6218)



Advantex AX100 SYSTEM - MISCELLANEOUS DETAILS
SCALE: VARIES

BURLINGAME STATE PARK AND CAMPGROUND

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS DETAILS

Dwg: C-3.2
Contract No. x
Scale: 1" = 20'
Date: FEBRUARY, 2023

J:\RhodeIsland\Charlestown\RIDEM - Burlingame\009 - 025 - and S-6 Site Design\2023\02.10.dwg

OWTS SUBMISSION - FEBRUARY 16, 2023



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

20.0179 6A, 6B
SHEET 1-2



Site Evaluation Form
Part A - Soil Profile Description

Application Number

Property Owner: RHODE ISLAND STATE OF (DEM) DIVISION OF PARKS

Property Location: 1-100 BURLINGAME PARK RD, CHARLESTOWN, RI PLAT 15 LOT 10

Date of Test Hole: 8/18/21

Soil Evaluator: KAMAL HINGORANY License Number: D4005

Weather: CLOUDY Shaded: Yes No Time: 9:30

Table with 11 columns: TH Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Contains two sections for TH 6A and TH 6B horizons.

TH 6A Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 40" (og)

TH 6B Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 42" (og)

Comments:

Part B

Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer





20.0179 6A, 6B
SHEET 2-2

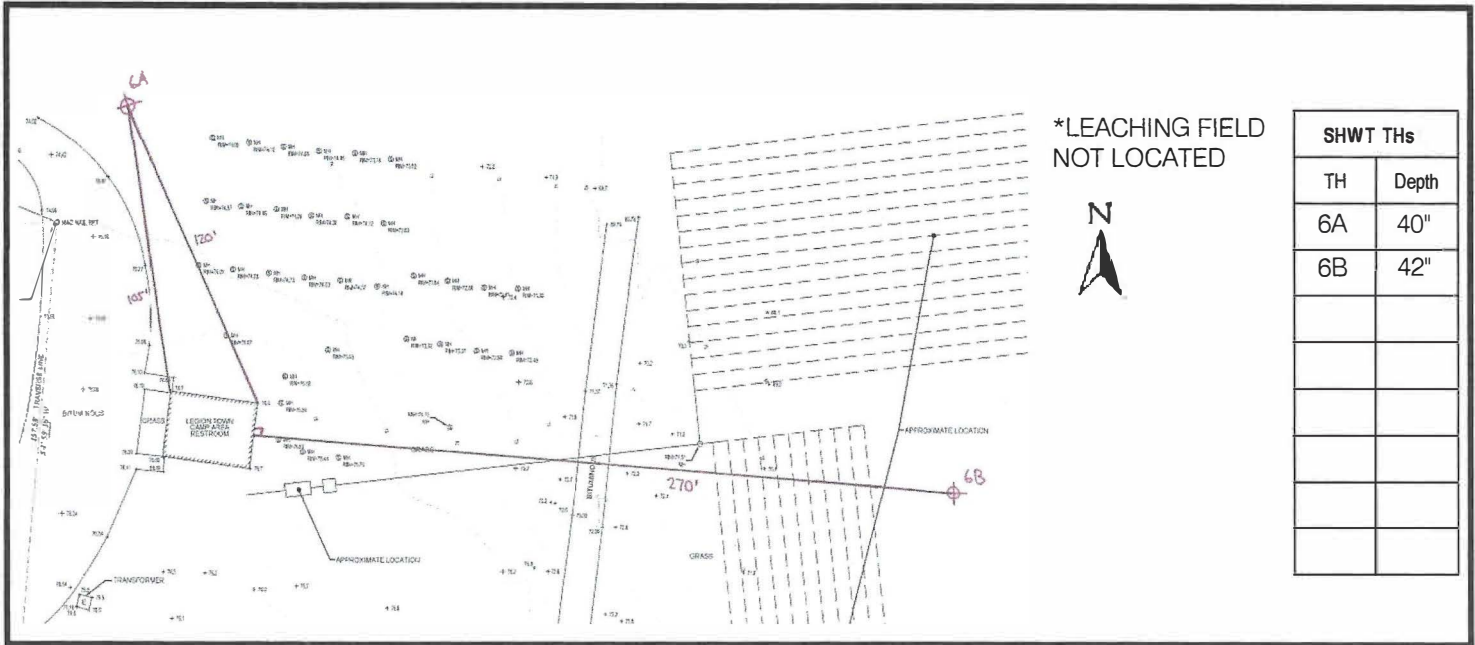
Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*

***OFFSETS MUST BE SHOWN**

Key:

-  Approximate location of test holes
-  Approximate location of bedrock test holes
-  Estimated gradient and direction of slope
-  Approximate direction of due north



1. Relief and Slope: _____
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO YES
8. Site's potential for flooding or ponding: NONE SLIGHT MODERATE SEVERE
9. Landscape position: SHOULDER
10. Vegetation: GRASS
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site: _____

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: [Signature] D4005 License # _____ Part B prepared by: [Signature] D4005 License # _____

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur Inconclusive Disclaim

Unwitnessed Soil Evaluations Decision: Accept Inconclusive Disclaim

Wet Season Determination required Additional Field Review Required

Explanation: _____

Signature Authorized Agent

Date



Main Camp Bathhouse and System Replacement Project
Burlingame State Park and Campground
Charlestown, Rhode Island

DESIGN NARRATIVE

RIDEM is in the process of replacing the Bathhouse and Onsite Wastewater System (OWTS) at this location. Soil logs can be found on Sheet C-1.5 together with the proposed site layout and System Design Data and Notes. Details for the system are on Sheets C-2.5, C-3.1 and C-3.2.

Soil evaluations for this OWTS location were conducted on August 18, 2021, soils are Category 3 and the Estimated Seasonal High Water Table depth at the OWTS is 30" or at elevation 67.2±.

In total the six bathhouses for the overall campground accommodate approximately 720 campsites. Utilizing the RIDEM wastewater design flow for a campground with washroom and toilets of 50 gallons per day we determine a daily flow for the entire campground to be approximately 36,000 gallons per day (GPD). The average daily flow per acre of the campground is (36,000 GPD / 847 Acres) 42.5 GPD/Acre. The average daily flow for each bathhouse is approximately 6,000 GPD. In calculating an estimated daily flow for the Main Camp Bathhouse OWTS we took a conservative approach utilizing 150 campsites at 50 GPD/campsite to determine a design flow for the Main Camp Bathhouse to be 7,500 GPD which is greater than the 6,000 GPD average. Please see the attached campsite map which depicts the campsites (a total of 146 as highlighted) chosen to be included within the 150 sites utilized for sizing the OWTS. Please note that sites throughout the campground overlap to agree with the conservative estimate. The system as sized is oversized and is considered a large system. The system is used on a seasonal basis between the months of April and October.

The OWTS will utilize Two (2) Orenco AdvanTEX AX100 Pods for advanced treatment. This system is a Category 1 advanced treatment technology. The system will treat the wastewater and reduce the biochemical oxygen demand (BOD) and comply with the latest Orenco system design criteria and thus the RIDEM OWTS criteria. See attached Final Design Review Letter from Orenco.

The systems drainfield is designed as a Geomatrix Gravel Sand Treatment (GST) System. The Loading Rate for Category 1 Technology for the GST is 3.5 GPD/square feet (SF). The minimum size drainfield is 7,500 GPD/3.5 GPD/SF which equals 2,143 SF. We propose to use the GST 6212 and the minimum size drainfield requirement for this application is 123 lineal feet (LF). We propose to use the 280 lineal feet (LF) of GST 6212 which provides 17.5 S.F. per LF, which equals 4,900 SF. and is greater than 2,143 SF (minimum size). The GST system has been divided into two equal drainfields and the GST are spaced 7'6" on center. The two drainfields consist of 5 rows each 28 feet long and 62" wide with a stone depth of 12" below the 4" perforated distribution pipe. See pump selection and system specifications on Sheet C-2.5 for additional information. Please see the attached review letter from Geomatrix.

WATCHAUG POND



FISH CAMP AREA

150

400 AREA

MAIN CAMP AREA

146

150

B
150

LEGIONTOWN
CAMP AREA

156

500 AREA

MILLS CAMP AREA

150

- CHECK STATION
- PERMITS
- COMFORT STATION

TO WESTERLY

TO WAKEFIELD & PROVIDENCE



BURLINGAME STATE PARK
RHODE ISLAND DEPT. OF
ENVIRONMENTAL MANAGEMENT

DEVELOPED BY:
PARE
PARE CORPORATION
825 BIRCH - SCHWETS - HANNA
8 BLAIRSTOWN VALLEY PLACE
LUDLOW, MASSACHUSETTS
01546-1100

LEGEND

- A TENTS ONLY
- B SMALL TRAILERS
- C LARGE TRAILERS AND MOTORHOMES
- M MOTORHOMES
- P PORTAJONS
- ⊙ WATER
- ▨ RESTROOMS WITH SHOWERS
- ★ DUMPING STATIONS
- ▢ CABIN
- D DUMPSTERS

01/19/2023

Kevin Harrop
Caputo & Wick
1150 Pawtucket Ave
Rumford, RI 02916

Subject: Final Design Review of Burlingame Park/Main Camp

Kevin,

Orenco Systems, Inc. (“Orenco”) has received the Plans with all required fields completed (attached to this letter), a copy of the plan set showing the designed site layout and configuration plans, and other documents that comprise the Final Design for the Burlingame Park project. Orenco staff reviews the Final Design of all wastewater collection and treatment systems for commercial applications to ensure that the design is compliant with the most current version of the system’s applicable design criteria published by Orenco for the specified parameters provided by the system’s designer in the Plans. The findings and conclusions of my review of this Final Design are as follows:

Design Basis

The system has been designed for a Type 2, Park application. Influent flow and constituent concentrations and effluent constituent concentration requirements have been provided by the system’s designer on the attached Plans and were used in my review of the Final Design.

The influent flow on the Plans were not extrapolated from the metered flows from the subject site, but in our experience, they are consistent with influent flows from other, similar Type 2, Park systems that Orenco has previously observed. As such, I have no reason to doubt the accuracy of the designer’s findings and assumptions as to the influent flow, and find that it was reasonable for the designer to use them as the design basis for the system.

System Design

The proposed Final Design of the system consists of a park. Influent will enter a 15,000 gallon Primary Tank, which will then flow into a 7,500 gallon Pre-Anoxic Tank. From here, flow will gravity discharge into a 6,000 gallon Recirculation Tank. The recirc-filtrate blend in this tank will pump into (2) AX100 pods and the filtrate will enter a splitter valve in the front of the Recirculation Tank where it will either be recirculated again or siphon to a drain field.

Design Criteria

The applicable design criteria for this system, which I used to conduct the review of its Final Design, is revision 8.0 of document NDA-ATX-1, titled *Orenco[®] AdvanTex[®] Design Criteria, Commercial Treatment Systems*, which was published by Orenco in October, 2020. A copy of the design criteria can be downloaded from Orenco’s online document library at www.orenco.com/corporate/doclibrary.cfm.

Findings

The findings of my review as to whether the Final Design complies with Orenco’s design criteria for treating wastewater to the effluent constituent concentration requirements provided in the Plans are as follows:

Primary Treatment

The Final Design specifies the use of 1 - 15,000 U.S. Gallon Primary concrete and 1 - 7,500 U.S. Gallon Primary concrete tanks in series for primary treatment. Using the flow data specified on the Plans the hydraulic retention times for grease capture and primary treatment calculate as follows:

Primary Tank(s) Hydraulic Retention Time (HRT)¹				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Effective Combined Primary Tankage (gpd)	Avg HRT (days)	Max Day HRT (days)
3,500	7,500	22,500	6.4	3.0

¹ Design Max Day Flow is the maximum daily flow a facility is expected to receive no more than one day within any week’s time.

The Primary Tank Sizing Recommendations states that the recommended primary tankage for a Park treatment system should be sized to at a minimum of 3 days of hydraulic retention time at the Design Max Day Flow. Therefore, the configuration and specifications of the primary treatment tanks in the Final Design satisfy Orenco’s recommendation for primary tankage for this Park application. This pre-anoxic tank should be sized equal to one day at maximum day design flow and is considered part of the overall primary tank volume.

Recirculation Tank — Standard Stage

The Final Design further specifies the use of 1 - 6,000 U.S. Gallon concrete tank for recirculation and blending of the AdvanTex-treated effluent with primary tank effluent. Using the flow data specified on the Plans the tank is sized to be equal to 80% of the Maximum Day Design Flow. The recirculation tank for the standard stage should be sized at a minimum of 75% of the Maximum Day Design Flow. Therefore, the specification of the recirculation-blend tank in the Final Design satisfies Orenco’s design criteria.

Hydraulic Load — Standard Stage

The Final Design specifies the use of 2 - AX100 pods, which contain a nominal surface area of 200 square feet of treatment media. Using the flow data specified on the Plans the hydraulic loading rate for the system calculates as follows:

Hydraulic Loading Rate (HLR) — Standard Stage				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Nominal Textile Area (sq. ft.)	Average HLR (gal. per day/sq. ft.)	Peak HLR (gal. per day/sq. ft.)
3,500	7,500	200	17.5	37.5

According to the AdvanTex System Loading Chart in the applicable design criteria, the standard AdvanTex treatment system (Stage 1) should not be hydraulically loaded more than 25 gpd/square foot at Design Average Flow or 50 gpd/square foot at Design Max Day Flow. Therefore, the specified type and number of AdvanTex pods in the Final Design satisfy Orenco’s design criteria to achieve the effluent quality listed in the design criteria at a 95% confidence level for this Type 2, Park application.

Organic Load — Standard Stage

The following influent characteristics provided on the Plans were estimated and not derived from direct sampling. Even though the influent characteristics were not derived from direct sampling, the values provided are consistent with values we have seen in other, similar Type 2, Park applications.

Influent (Primary Tank Effluent) Characteristics — Loading to Textile	
Average BOD ₅ (mg/L)	Average TSS (mg/L)
250	200

Based on the average influent biochemical oxygen demand (BOD₅) concentration and flow data specified on the Plans, the system will receive approximately 7.3 pounds of BOD₅ per day at Design Average Flow, and 15.6 pounds of BOD₅ per day at Maximum Day Design Flow. Using this information, the organic loading rate of the system calculates as:

Organic Loading Rate (OLR) — Standard Stage				
Average Organic Load (lbs/day)	Maximum Organic Load (lbs/day)	Nominal Treatment Area (sq. ft.)	Average OLR (lbs BOD/sq. ft./day)	Maximum OLR (lbs BOD/sq. ft./day)
7.3	15.6	200	0.04	0.08

Conclusions

I have reviewed the Final Design of the Burlingame Park wastewater treatment system, and have found that the design is compliant with the most current version of the system's applicable design criteria published by Orenco for the specified parameters provided by the system's designer in the Plans. In addition, I noted no anomalies in the site layout or configuration of the system during my review.

Compliance Table — Meets Minimum Design Standards	
	Standard Stage
Recirc Tank Size	Yes
Hydraulic Load	Yes
Organic Load	Yes

As such, the system as designed satisfactorily complies with Orenco's design criteria to meet the following effluent limits specified in the Plans at a 95% confidence level, provided that all influent flows and constituent concentrations specified in the Plans are not exceeded:

Expected Effluent Quality	
Constituent	Average (mg/L)
BOD ₅	20
TSS	20

It is important to note that even though the AdvanTex Treatment System has the capability to meet or exceed the required treatment parameters, there is no way that Orenco can guarantee that a particular system will be operated or maintained in a manner consistent with the Final Design reviewed. Once the facility is placed into operation, the influent flows and constituent concentrations to the facility should be monitored, and if flow or any of the influent constituent concentrations exceed those listed in the Plans, measures should be taken to reduce the flow or constituent concentration to those listed. However, if additional treatment capacity becomes necessary, the system is designed to have the capability to expand to account for the new flow or constituent concentration.

Proper air ventilation is a critical feature of all commercial AdvanTex Treatment Systems, and as such, adequate active ventilation is required for all systems. In addition, please note that disposing of toxics or chemicals into the system is strictly prohibited. Examples of toxics include restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo, waste products, or any other toxins. Furthermore, water softener brine discharge is prohibited from being discharged into the AdvanTex Treatment System. Failure to adhere to these policies will void Orenco's limited product warranties.

If you have any questions about my review process, findings, or conclusions, please feel free to call or e-mail me.

Sincerely,



Caleb Castleman
Systems Engineering
Orenco Systems Inc.
(800) 348-9843 ext. 548
ccastleman@orenco.com

Project: Burlingame State Park and Camp Ground
 Location: Main Camp

Description	Input values	Units
Finish Grade	69.75	Elevation
Water Table Elevation	64.25	Elevation
Bottom of Tank Elevation	58.83	Elevation
Lowest Pipe Invert	66.50	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	19.00	Inches
Length of Tank	30.83	Feet
Width of Tank	11.33	Feet
Depth of Tank	9.33	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	8.00	Inches
Sides Concrete Thickness	8.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	4.00	Inches
Compartment Wall Height	87.00	Inches
Computed Value		
Submerged Depth	5.42	Feet
Top/Bottom Surface Area of Tank	349.43	SF
Displaced Volume	1,893.93	CF
Volume of Tank Top	232.96	CF
Volume of Tank Sides	435.53	CF
Volume of Tank Bottom	232.96	CF
Volume of Baffle	24.17	CF
Weight of Tank Top	34,943.38	lbs
Weight of Tank Sides	65,330.02	lbs
Weight of Tank Bottom	34,943.38	lbs
Weight of Baffle	3,624.88	lbs
Total Weight of Tank	138,841.66	lbs
Volume of Soil	553.27	CF
Weight of Soil Above Tank	55,327.02	lbs
Uplift Created by Submerged Tank	118,181.30	lbs
Total Weight of Tank, Counter Weight and Soil	194,168.68	lbs
Exceeds Displaced Volume by	75,987.38	lbs
Buoyance Point for Empty Tank	6.37	Feet (above bottom)
Buoyance Point for Empty Tank	65.20	Elev
Buoyance Point for Tank in Place	8.90	Feet (above bottom)
Buoyance Point for Tank in Place	67.73	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Main Camp

Description	Input values	Units
Finish Grade	70.25	Elevation
Water Table Elevation	64.25	Elevation
Bottom of Tank Elevation	58.65	Elevation
Lowest Pipe Invert	66.15	Elevation
Counter Weight	6,307.20	lbs
Soil Above Tank	29.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	9.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
Computed Value		
Submerged Depth	5.60	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	952.00	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	208.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	31,199.74	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	60,949.74	lbs
Volume of Soil	410.83	CF
Weight of Soil Above Tank	41,083.33	lbs
Uplift Created by Submerged Tank	59,404.80	lbs
Total Weight of Tank, Counter Weight and Soil	108,340.27	lbs
Exceeds Displaced Volume by	48,935.47	lbs
Buoyance Point for Empty Tank	5.75	Feet (above bottom)
Buoyance Point for Empty Tank	64.40	Elev
Buoyance Point for Tank in Place	10.21	Feet (above bottom)
Buoyance Point for Tank in Place	68.86	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
Location: Main Camp

Description	Input values	Units
Finish Grade	70.25	Elevation
Water Table Elevation	64.25	Elevation
Bottom of Tank Elevation	58.83	Elevation
Lowest Pipe Invert	65.58	Elevation
Counter Weight	6,307.20	lbs
Soil Above Tank	39.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	8.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
Computed Value		
Submerged Depth	5.42	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	921.40	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	182.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	27,300.13	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	57,050.13	lbs
Volume of Soil	552.50	CF
Weight of Soil Above Tank	55,250.00	lbs
Uplift Created by Submerged Tank	57,495.36	lbs
Total Weight of Tank, Counter Weight and Soil	118,607.33	lbs
Exceeds Displaced Volume by	61,111.97	lbs
Buoyance Point for Empty Tank	5.38	Feet (above bottom)
Buoyance Point for Empty Tank	64.21	Elev
Buoyance Point for Tank in Place	11.18	Feet (above bottom)
Buoyance Point for Tank in Place	70.01	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Main Camp

Description	Input values	Units
Finish Grade	70.75	Elevation
Water Table Elevation	64.25	Elevation
Bottom of Chamber Elevation	60.50	Elevation
Lowest Pipe Invert	67.00	Elevation
Counter Weight	0.00	lbs
Soil Above Chamber	27.00	Inches
Chamber Length	7.00	Feet
Chamber Width	7.00	Feet
Diameter of Opening	2.50	Feet
Chamber Interior Height	7.00	Feet
Top of Concrete Thickness	6.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Concrete Wall Thickness	6.00	Inches
	Computed Value	
Submerged Depth	3.75	Feet
Top Surface Area of Chamber	44.09	SF
Surface Area of Chamber Sides	182.00	SF
Bottom Surface Area of Chamber	49.00	SF
Displaced Volume	183.75	CF
Volume of Chamber Top	22.05	CF
Volume of Chamber Sides	91.00	CF
Volume of Chamber Bottom	24.50	CF
Weight of Chamber Top	3,306.84	lbs
Weight of Tank Side	13,650.00	lbs
Weight of Chamber Bottom	3,675.00	lbs
Total Weight of Chamber	20,631.84	lbs
Volume of Soil	99.21	CF
Weight of Soil Above Chamber	9,920.53	lbs
Uplift Created by Submerged Chamber	11,466.00	lbs
Total: Chamber, Counter Weight and Soil	30,552.38	lbs
Exceeds Displaced Volume by	19,086.38	lbs
Buoyance Point for Empty Chamber	6.75	Feet (above bottom)
Buoyance Point for Empty Chamber	67.25	Elev
Buoyance Point for Chamber in Place	9.99	Feet (above bottom)
Buoyance Point for Chamber in Place	70.49	Elev

(Soil friction has not been taken into account)

Duplex Control Panels

Applications

Orenco Duplex Control Panels are used to control dual pumps, alarms, and other equipment as specified in pressure sewers and onsite septic systems.



Orenco[®] DAX2 Control Panel



General

Orenco Duplex Control Panels are specifically engineered for pressure sewer (STEP) systems and onsite septic treatment systems that require the use of two alternating pumps. Standard features include circuit breakers, an automatic/manual/off motor control toggle for each pump, an audio/visual high level alarm, an alarm reset, and a duplex alternator. Other standard features and options are listed on page 2. Orenco panels are designed for use with mechanical and/or mercury float switches. Listed per UL 508 in the US and Canada.

Standard Models

DAX1, DAX2

Product Code Diagram



Standard options (list in order):
 PT = programmable timer
 RO = redundant off relay
 CS = current sensor
 ETM = elapsed time meter
 CT = event counter
 HT = heater
 SA = surge arrester
 PRL = pump run light
 PL = power light

Intrinsically safe relays:
 Blank = standard, no IR relays
 IR = intrinsically safe relays

Pump voltage:
 1 = 120 VAC
 2 = 120 VAC or 240 VAC

DAX series duplex control panel

Materials of Construction

Enclosure	UV-resistant fiberglass, UL Type 4X
Hinges	Stainless steel

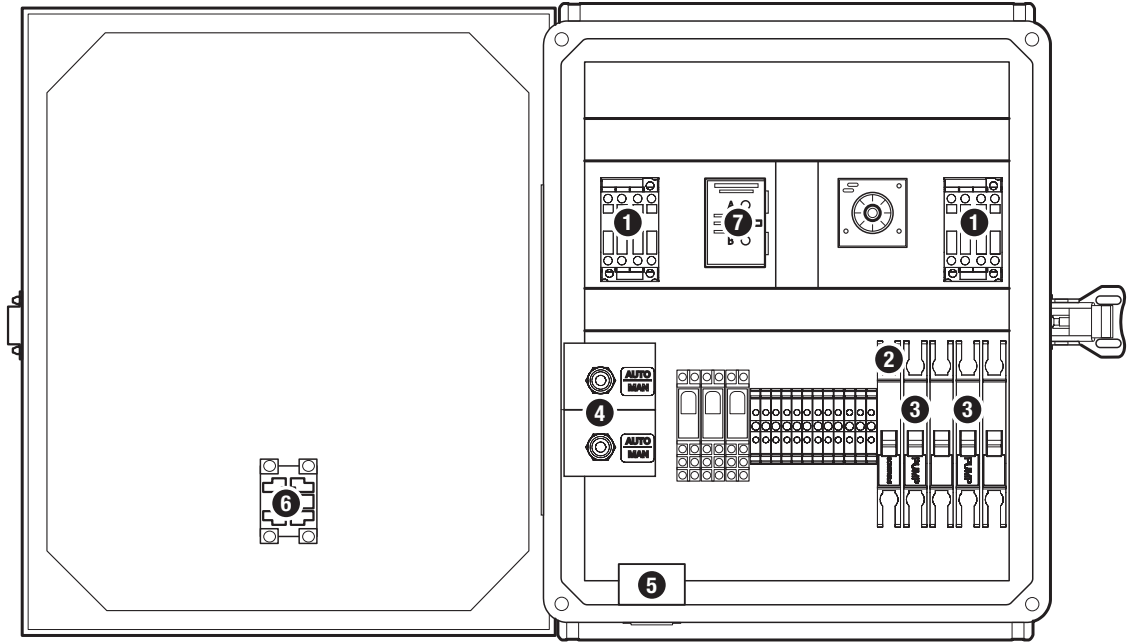
Specifications

Panel Ratings

DAX1:	120 V, 1 hp, 16 amps, single phase, 60 Hz.
DAX2:	240 V, 3 hp, 16 amps, single phase, 60 Hz.

Dimensions

Height, in. (mm)	15.5 (394)
Width, in. (mm)	13.5 (343)
Depth, in. (mm)	6.7 (170)



Orenco® DAX2PTR0 240 V panel

Standard Components

Feature	Specification(s)
1. Motor-Start Contactor	120 V, 16 FLA, 1 hp (0.75 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA). 240 V, 16 FLA, 3 hp (2.24 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).
2. Controls Circuit Breaker	10 A, OFF/ON switch. Single-pole 120 V. DIN rail mounting with thermal magnetic tripping characteristics.
3. Pump Circuit Breakers	20 A, OFF/ON switch. Single-pole 120 V or double-pole 240 V. DIN rail mounting with thermal magnetic tripping characteristics.
4. Toggle Switches	20 A, 1hp (0.75 kW). Single-pole, double-throw HOA switch,
5. Audible Alarm	95 dB at 24 in. (610 mm), warble-tone sound.
6. Visual Alarm	7/8-in. (22-mm) diameter red lens, "Push-to-silence." UL Type 4X rated, 1 W LED light, 120 V.
7. Duplex Alternator	120 V. Cross-wired style for independent lag pump function. Selector switch for locking one pump into lead position.
Audible Alarm Silence Relay (Not shown)	120 V. Automatic reset. DIN rail mount.

Optional Features

Feature	Specification(s)	Code Adder
Intrinsically Safe Control Relays	Listed per UL 698A, for Class 1 Div. 1, groups A, B, C, D hazardous locations (requires larger enclosure).	IR
Programmable Timer	120 V. Repeat cycle from 0.05 seconds to 30 hours. Separate variable controls for OFF & ON time periods.	PT
Redundant Off Relay	120 V. Provides a secondary off. Sounds alarm on low level condition. DIN rail mount.	RO
Elapsed Time Meter	120 V, 7-digit, non-resettable. Limit of 99,999 hours; accurate to 0.01 hours.	ETM
Event Counter	120 V, 6-digit, non-resettable.	CT
Heater	Anti-condensation heater. Self-adjusting: radiates additional wattage as temperature drops.	HT
Surge Arrestor	Status light on unit; protects incoming power supply from electrical surges.	SA
Pump Run Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PRL
Power Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PL

PF-Series Submersible Effluent Pumps: 1-Phase, 60-Hz, 4-inch (100-mm)

Applications

Our PF-Series 4-inch (100-mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or dosing tanks. These pumps are constructed of light-weight, corrosion-resistant stainless steel and engineered plastics, and are field-serviceable and repairable with common tools. They're also CSA- and UL-certified to U.S. and Canadian safety standards for effluent pumps.

PF-Series pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.



Features/Specifications

To specify this pump for your installation, require the following:

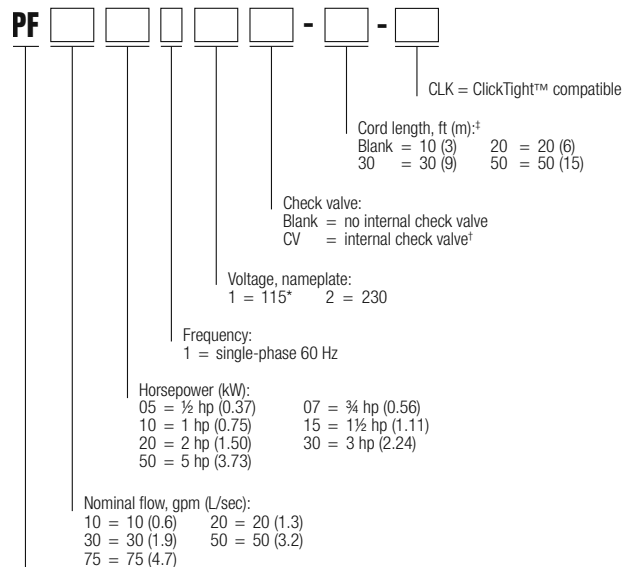
- Minimum 24-hour run-dry capability (liquid end) with no deterioration in pump life or performance*
- 1/8-inch (3-mm) bypass orifice to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid-end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10, 20, and 30 gpm (0.6, 1.3, and 1.9 L/sec) models; floating stack design on 50 and 75 gpm (3.2 and 4.7 L/sec) models
- Franklin Electric Super Stainless motor, rated for continuous use and frequent cycling
- Type SOOW 600-V motor cable (model PF751512 uses 14 AWG, SJ00W, 300-V cord)

* Not applicable for 5-hp (3.73 kW) models

Standard Models

See specifications chart on page 2 for a list of standard pumps. For a complete list of available pumps, call Orenco.

Product Code Diagram



Pump, PF Series

* ½-hp (0.37 kW) only

[†] Available for 10 gpm (0.6 L/sec), 1/2 hp (0.37 kW)

[‡] Note: 20-ft cords are available only for pumps through 1½ hp



C US
LR80980
LR2053896



Powered by
Franklin Electric

Specifications

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Discharge size and material ¹	Length in. (mm)	Min. liquid level in. (mm)	Weight lb (kg)	Rated cycles per day
PF100511 ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100511CV ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512 ⁹	10 (0.6)	0.50 (0.37)	1	230	240	6.3	6.3	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712 ^{4,5,9}	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	1 ¼ in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF101012 ^{5,6,9}	10 (0.6)	1.00 (0.75)	1	230	240	9.6	9.6	1 ¼ in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF200511 ⁹	20 (1.3)	0.50 (0.37)	1	115	120	12.3	12.5	1 ¼ in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512 ⁹	20 (1.3)	0.50 (0.37)	1	230	240	6.4	6.5	1 ¼ in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF201012 ^{4,5,9}	20 (1.3)	1.00 (0.75)	1	230	240	10.5	10.5	1 ¼ in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF201512 ^{4,5}	20 (1.3)	1.50 (1.11)	1	230	240	12.4	12.6	1 ¼ in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF300511 ⁹	30 (1.9)	0.50 (0.37)	1	115	120	11.8	11.8	1 ¼ in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512 ⁹	30 (1.9)	0.50 (0.37)	1	230	240	6.2	6.2	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712 ⁹	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	1 ¼ in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF301012 ^{4,9}	30 (1.9)	1.00 (0.75)	1	230	240	10.4	10.4	1 ¼ in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF301512 ^{4,5}	30 (1.9)	1.50 (1.11)	1	230	240	12.6	12.6	1 ¼ in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF302012 ^{5,6,7}	30 (1.9)	2.00 (1.49)	1	230	240	11.0	11.0	1 ¼ in. SS	35.5 (902)	26 (660)	44 (20)	100
PF303012 ^{5,6,7,8}	30 (1.9)	3.00 (2.23)	1	230	240	16.8	16.8	1 ¼ in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF305012 ^{5,6,7,8}	30 (1.9)	5.00 (3.73)	1	230	240	25.6	25.8	1 ¼ in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF500511 ⁹	50 (3.2)	0.50 (0.37)	1	115	120	12.1	12.1	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512 ⁹	50 (3.2)	0.50 (0.37)	1	230	240	6.2	6.2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500712 ⁹	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501012 ⁹	50 (3.2)	1.00 (0.75)	1	230	240	10.1	10.1	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF501512 ⁴	50 (3.2)	1.50 (1.11)	1	230	240	12.5	12.6	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF503012 ^{4,5,7,8}	50 (3.2)	3.00 (2.23)	1	230	240	17.7	17.7	2 in. SS	43.0 (1092)	37 (940)	55 (25)	100
PF505012 ^{5,6,7,8}	50 (3.2)	5.00 (3.73)	1	230	240	26.2	26.4	2 in. SS	65.4 (1661)	55 (1397)	64 (29)	100
PF751012 ⁹	75 (4.7)	1.00 (0.75)	1	230	240	9.9	10.0	2 in. SS	27.0 (686)	27 (686)	34 (15)	100
PF751512	75 (4.7)	1.50 (1.11)	1	230	240	12.1	12.3	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

1 GFP = glass-filled polypropylene; SS = stainless steel. The 1 ¼-in. NPT GFP discharge is 2 7/8 in. octagonal across flats; the 1 ¼-in. NPT SS discharge is 2 1/8 in. octagonal across flats; and the 2-in. NPT SS discharge is 2 7/8 in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

2 Minimum liquid level is for single pumps when installed in an Orenco Biotube® Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

3 Weight includes carton and 10-ft (3-m) cord.

4 High-pressure discharge assembly required.

5 Do not use cam-lock option (Q) on discharge assembly.

6 Custom discharge assembly required for these pumps. Contact Orenco.

7 Capacitor pack (sold separately or installed in a custom control panel) required for this pump. Contact Orenco.

8 Torque locks are available for all pumps and are supplied with 3-hp and 5-hp pumps.

9 ClickTight™ compatible.

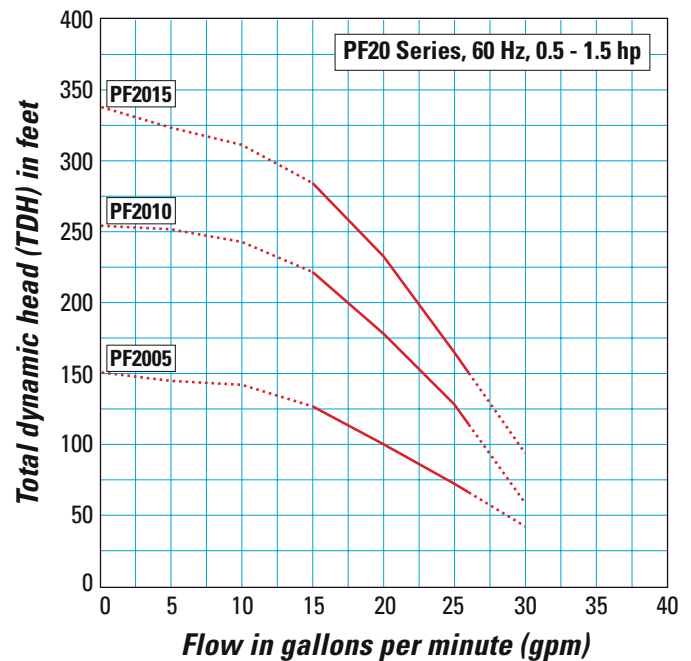
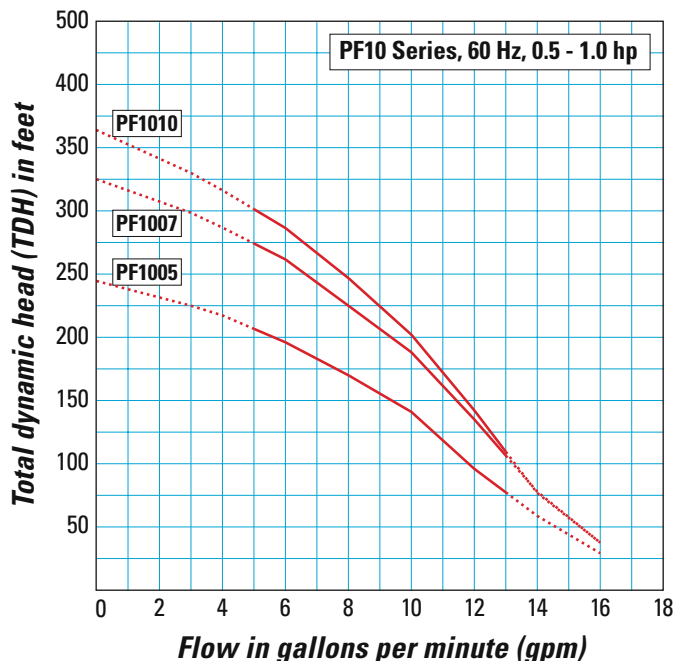
Materials of Construction

Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (Noryl GFN3)
Impellers	Celcon® acetal copolymer on 10-, 20-, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	7/16-in. hexagonal stainless steel, 300 series
Coupling	Sintered stainless steel, 300 series
Shell	Stainless steel, 300 series
Motor	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing ensures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Single-phase motors are equipped with surge arrestors for added security. Single-phase motors through 1.5 hp (1.11 kW) have built-in thermal overload protection, which trips at 203-221° F (95-105° C).

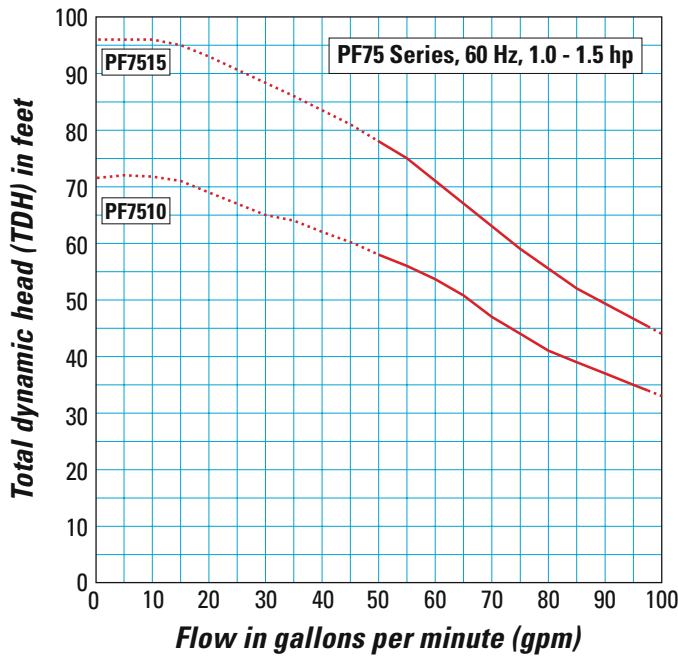
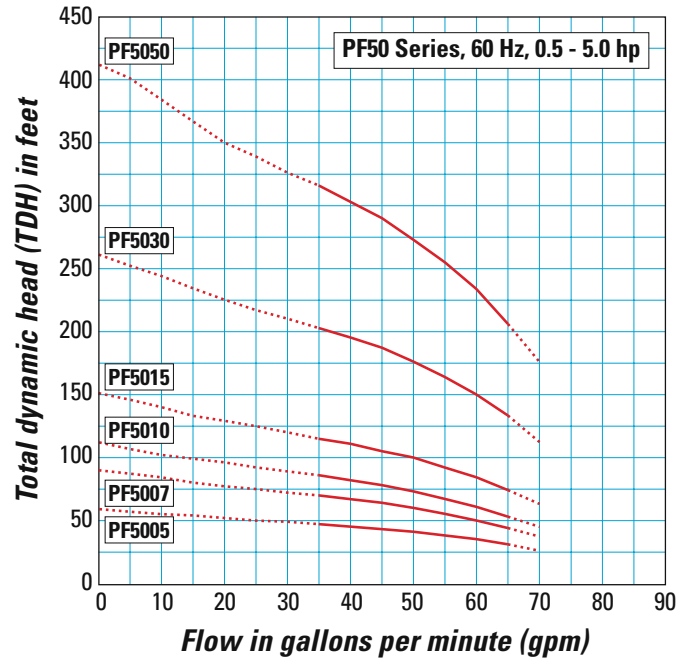
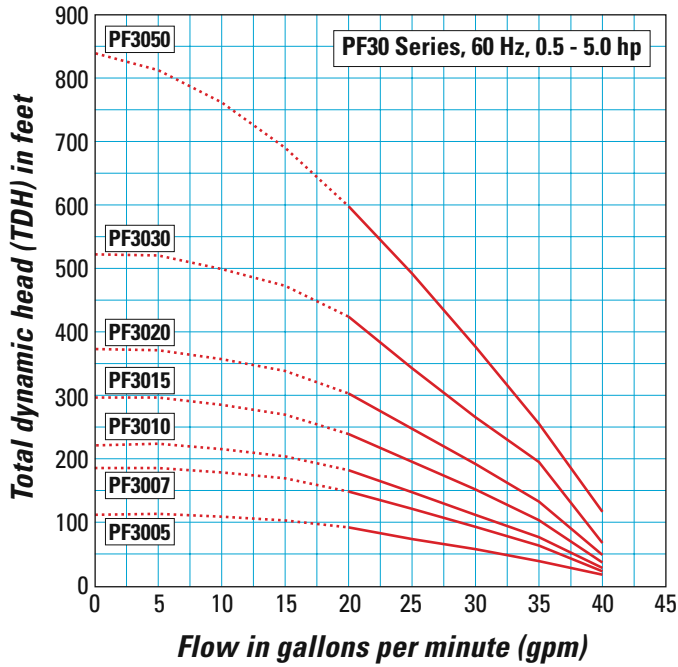
Using a Pump Curve

A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow and pressure (total dynamic head or “TDH”), providing a graphical representation of a pump’s optimal performance range. Pumps perform best at their nominal flow rate. These graphs show optimal pump operation ranges with a solid line and show flow rates outside of these ranges with a dashed line. For the most accurate pump specification, use Orenco’s PumpSelect™ software.

Pump Curves



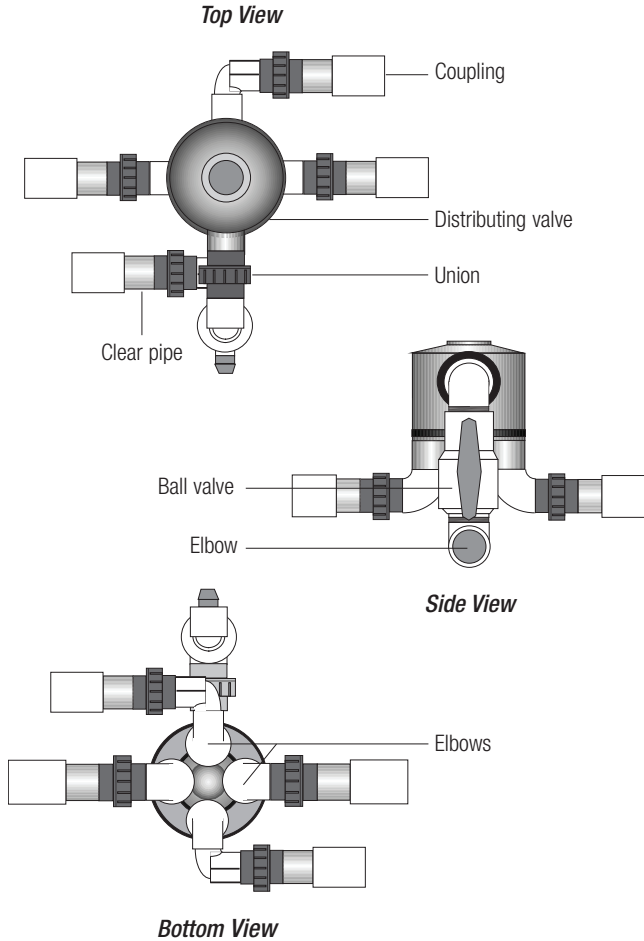
Pump Curves, cont.



Distributing Valves

Applications

Automatic Distributing Valve Assemblies are used to pressurize multiple zone distribution systems including textile filters, sand filters and drainfields.



General

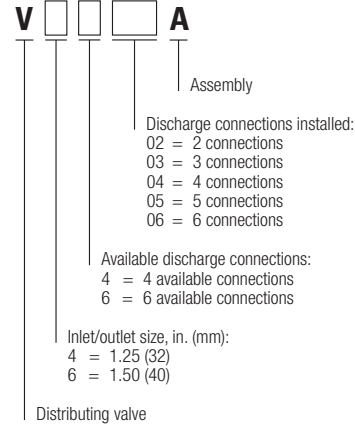
Orenco's Automatic Distributing Valve Assemblies are mechanically operated and sequentially redirect the pump's flow to multiple zones or cells in a distribution field. Valve actuation is accomplished by a combination of pressure and flow. They allow the use of smaller horsepower pumps on large sand filters and drainfields. For example, a large community drainfield requiring 300 gpm (18.90L/sec) can use a six-line valve assembly to reduce the pump flow rate requirement to only 50 gpm (3.14L/sec).

Orenco only warrants Automatic Distributing Valves when used in conjunction with High-Head Effluent Pumps with Biotube[®] pump vaults to provide pressure and flow requirements, and to prevent debris from fouling valve operation. An inlet ball valve, a section of clear pipe, and a union for each outlet are provided for a complete assembly that is easy to maintain and monitor. Ideal valve location is at the high point in the system. Refer to Automatic Distributing Valve Assemblies (NTP-VA-1) for more information.

Standard Models

V4402A, V4403A, V4404A, V4605A, V4606A, V6402A, V6403A, V6404A, V6605A, V6606A.

Product Code Diagram



Materials of Construction

All Fittings	Sch. 40 PVC per ASTM specification
Unions	Sch. 80 PVC per ASTM specification
Ball Valve	Sch. 40 PVC per ASTM specification
Clear Pipe	Sch. 40 PVC per ASTM specification

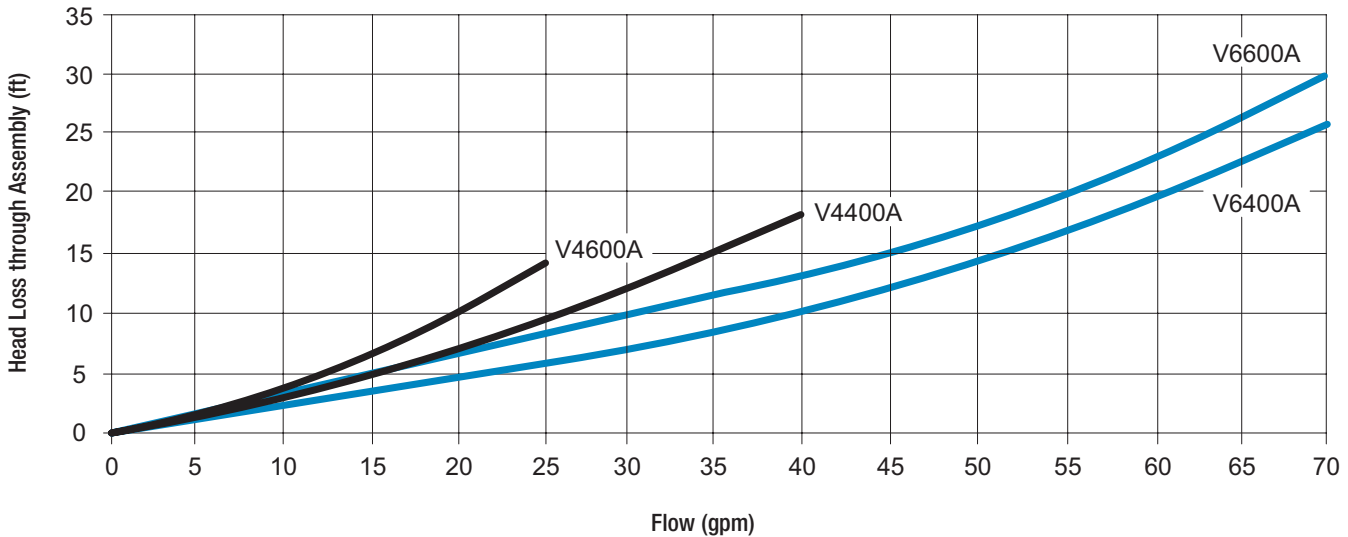
Specifications

Model	Inlet Size, in. (mm)	Outlets Size, in. (mm)	Flow Range, gpm (L/sec)	Max Head, ft (m)	Min. Enclosure*
V4402A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4403A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4404A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4605A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V4606A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V6402A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6403A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6404A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6605A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6606A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418

* When using an enclosed basin, choose the next larger-sized diameter.

Table 1. Automatic Distributing Valve Assembly Headloss Equations

Model Series	Equation	Operating Range, gpm (L/sec)
V4400A	$H_L = 0.085 \times Q^{1.45}$	10 - 40 (0.63 – 2.52)
V4600A	$H_L = 0.085 \times Q^{1.58}$	10 - 25 (0.63 – 1.57)
V6400A	$H_L = 0.0045 \times Q^2 + 3.5 \times (1 - e^{-0.06Q})$	15 - 70 (0.95 – 4.42)
V6600A	$H_L = 0.0049 \times Q^2 + 5.5 \times (1 - e^{-0.1Q})$	15 - 70 (0.95 – 4.42)



AdvanTex® AX100 Textile Filter

Applications

Orenco's AdvanTex® AX100 Treatment System is an innovative technology for onsite treatment of domestic-strength wastewater. The heart of the system is the AdvanTex Filter, a sturdy, watertight fiberglass basin filled with an engineered textile material. This lightweight, highly absorbent textile material treats a tremendous amount of wastewater in a small space. AX100 Treatment Systems are ideal for:

- New construction
- System upgrades and repairs
- Small sites
- Poor soils
- Pretreatment
- Nitrogen reduction
- Price-sensitive markets

For sizing, see AdvanTex® Design Criteria (NDA-ATX-COMM-1-PKG).



The heart of the AdvanTex® AX100 Treatment System is this sturdy, watertight fiberglass basin filled with an engineered textile material.

Features/Specifications

To specify this product, require the following:

- Wastewater treatment to better than secondary treatment standards
- Consistent treatment, even during peak flows
- Timer operation for flow monitoring, flow modulation, and surge control
- Fixed-film, engineered textile media, operated in an unsaturated condition
- Consistent media quality
- Low energy consumption
- Low maintenance requirements
- Complete pre-manufactured package, ready to install
- Watertight construction, corrosion-proof materials, and components
- Foam-core lid provides insulation value of R-6 (RSI-1.1)
- Quiet operation

Standard Model

AX100

Specifications**

Length, in. (mm)	191 (4851)
Width, in. (mm)	94 (2388)
Height, in. (mm)	42 (1067)
Area (footprint), ft ² (m ²)	128 (11.9)
Dry Weight, lb (kg)	1616 (733)

* Covered by U.S. patent numbers 6,540,920; 6,372,137; 5,531,894; 5,480,561; 5,360,556

** Nominal values provided. See AdvanTex® Treatment System drawings for exact dimensions.

AdvanTex[®] Vent Fan Assembly

Applications

Oreco's AdvanTex[®] Vent Fan Assembly consists of a water-proof fiberglass enclosure with equipment for venting onsite wastewater treatment systems. One enclosure can hold a vent fan with carbon filter and an optional heater.

The vent fan is used in commercial-sized AdvanTex Treatment Systems to gently pull air through the textile media, ensuring that adequate oxygen is available for biological treatment. The carbon filter scrubs the air that the system exhausts. An optional heater can be added where climate requires heating of the air that enters the AdvanTex textile filter pods.



Standard Models

AXVFACF — AX above ground Vent Fan Assembly with LMF-3 Fan

AXVFACF-HT — AX above ground Vent Fan Assembly with LMF-3 Fan and HT10 Heater

Enclosure

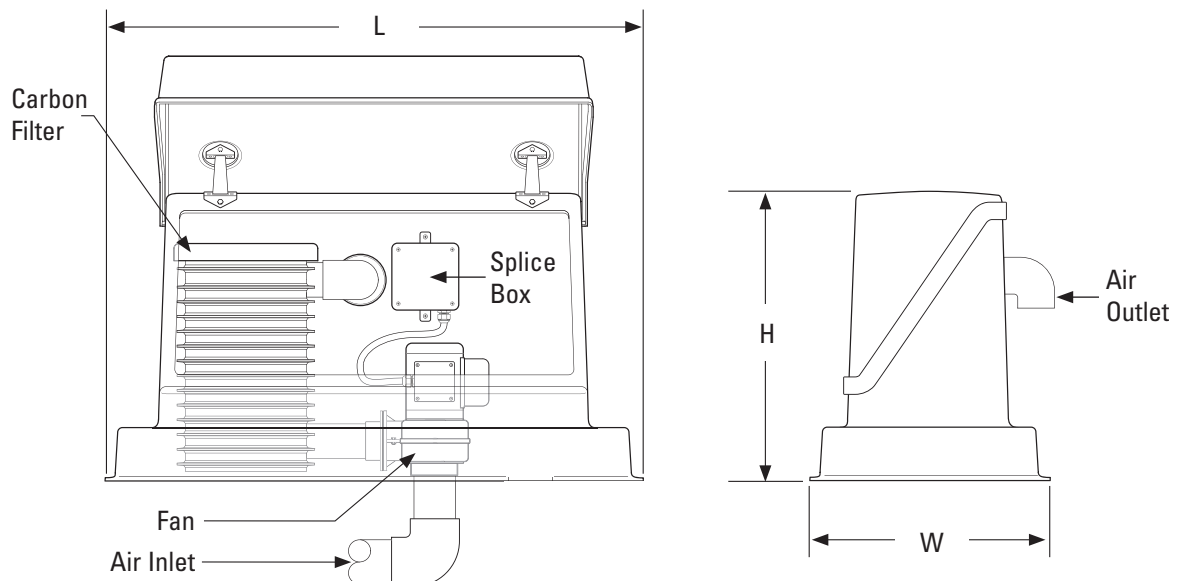
Physical Specifications

Materials of Construction

Shell	Fiberglass-reinforced polyester (FRP)
Hardware	Stainless steel
Exterior finish	Green, textured, UV resistant
Straps	Nylon

Dimensions

Length (L)	50 in. (1270 mm)
Width (W)	24 in. (610 mm)
Height (H)	30 in. (762 mm)
Volume	15.1 ft ³ (0.43 m ³)
Area (footprint)	8.3 ft ² (0.77 m ²)



AdvanTex[®] Vent Fan Assembly (continued)

Fan

Physical Specifications

Dimensions

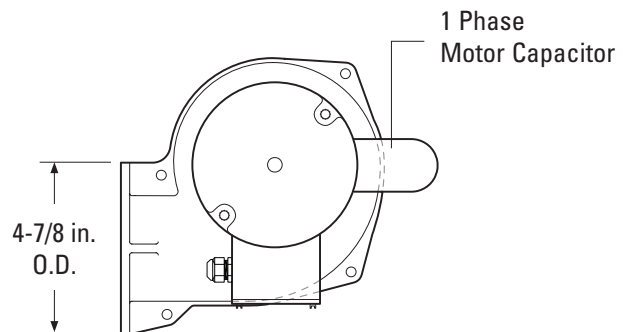
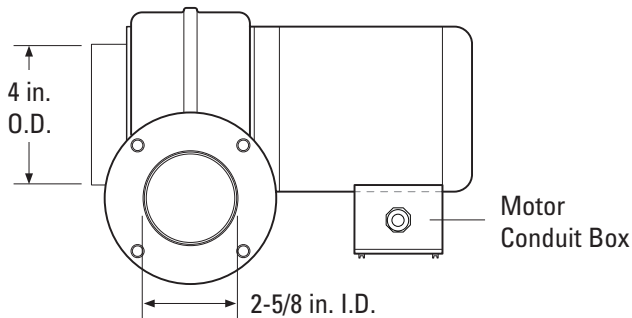
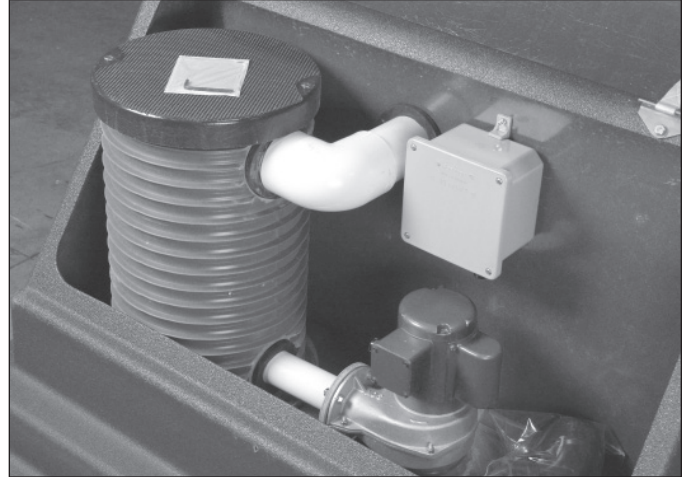
Inlet O.D.	4 in. (100 mm)
Inlet nominal pipe size	4 in. (100 mm)
Outlet I.D.	2-5/8 in. (67 mm)
Outlet Flange O.D.	4-7/8 in. (124 mm)

Materials of Construction

Housing	Aluminum
Wheel	Steel

Performance Data

	60 Hz	50 Hz
Horsepower (kW)	0.08 (0.06 kW)	0.08 (0.06 kW)
Phase	1 phase	1 phase
Volts	115/230	110/220
Amperage	1.4 A/0.7 A	1.8 A/0.9 A
RPM	3400	2900
CFM at 0" H ₂ O static pressure	245	205
CFM at 0.4" H ₂ O static pressure	220	170
CFM at 0.8" H ₂ O static pressure	190	130
CFM at 1.5" H ₂ O static pressure	120	N/A



AdvanTex® Vent Fan Assembly (continued)

Carbon Filter Basin

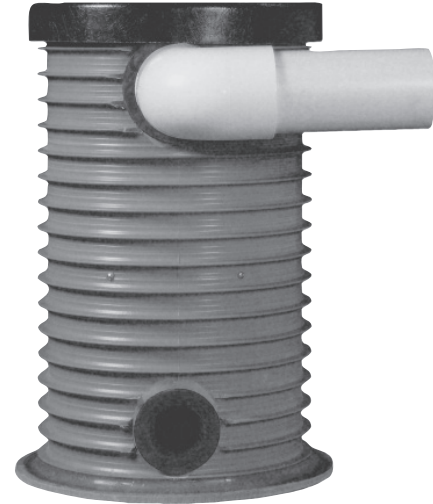
Physical Specifications

Dimensions

Outlet diameter	Accepts nominal 3-in. PVC pipe
Inlet diameter	Accepts nominal 2-in. PVC pipe
Height	21.5 in. (546 mm)
Diameter	12 in. (305 mm)

Materials of Construction

Housing	PVC
Bottom	Fiberglass-reinforced polyester (FRP)
Interior supports	Polypropylene grid and polyethylene screen
Support rings	PVC
Lid	Fiberglass
Fill material	Activated carbon



Heater (Optional)

Physical Specifications

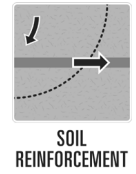
Dimensions

Outlet diameter	Fits nominal 3-in. Class 125 PVC pipe
Length (inlet to outlet)	11.75 in. (297 mm)
Width	11.25 in. (286 mm)
Depth	8.25 in. (210 mm)

Performance Data

Watts	1000
Volts	120
Amps	8.3





Miragrid® 22XT

Miragrid® 22XT geogrid is composed of high molecular weight, high tenacity polyester multifilament yarns woven in tension and finished with a PVC coating. Miragrid® 22XT geogrid is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Miragrid 22XT geogrid is used as soil reinforcement in MSE structures such as segmental retaining walls, precast modular block walls, wire faced walls, geosynthetic wrapped faced walls and steepened slopes. Miragrid 22XT is also used in MSE stabilized platforms for voids bridging, embankments on soft soils, landfill veneer stability, reducing differential settlement and for foundation seismic stability.

TenCate Geosynthetics Americas is accredited by Geosynthetic Accreditation Institute – Laboratory Accreditation Program ([GAI-LAP](#)).

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE
			MD
Tensile Strength @ Ultimate	ASTM D6637 (Method B)	lbs/ft (kN/m)	20559 (300.0)
Tensile Strength @ 5% strain	ASTM D6637 (Method B)	lbs/ft (kN/m)	6700 (97.8)
Mass/Unit Area ¹	(ASTM D5261)	oz/yd ² (g/m ²)	28.2 (956)
			MINIMUM ROLL VALUE
Creep Rupture Strength ²	ASTM D5262/D6992	lbs/ft (kN/m)	14277 (208.3)
Long Term Design Strength ³		lbs/ft (kN/m)	12361 (180.4)
PHYSICAL PROPERTIES		UNIT	ROLL CHARACTERISTIC
Roll Dimensions ⁴ (width x length)		ft (m)	12 x 200 (3.6 x 61)
Roll Area		yd ² (m ²)	267 (220)
Estimated Roll Weight		lbs (kg)	470 (213)
Label Roll Color			WHITE

¹ Typical Value

² 75-year design life based on NTPEP Report [REGEO-2016-01-069](#).

³ Long Term Design Strength for sand, silt, clay. $RF_{CR} = 1.44$; $RF_{ID} = 1.05$; $RF_D = 1.1$ (Installation damage reduction factor for other soils available upon request).

⁴ Special order roll lengths are available upon request

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FGS000105
ETQR19



MYERS[®]
MODEL SRM4
4/10 HORSEPOWER
RESIDENTIAL SEWAGE PUMP



MYERS® MODEL SRM4 Residential Sewage Pump

The Right Choice

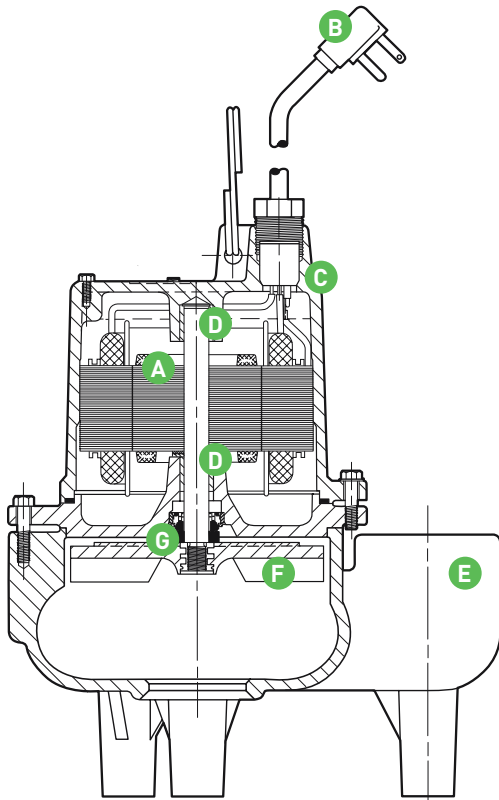
The SRM4 solids handling pump is the most reliable 4/10 horsepower residential sewage pump available today. The SRM4 is a plumbers/contractors dream! Its recessed impeller design allows 2" solids to pass freely through the volute without the chance of jamming the impeller. The SRM4 series pump has a national field-proven record of reliability. Look to your Myers distributor for the answer to your residential sewage handling needs ... and across the counter will be the Myers mini solids handling, the SRM4. It works for you! For more information, call your Myers distributor today, or the Myers Ohio sales office at 419-289-6898.



Product Capabilities		
Capacities To	95 gpm	360 lpm
Heads To	18 ft. 19 ft. shutoff	5.5 m 5.8 m
Pump Down Range Float Switch	7 to 14 in.	178 to 356 mm
Solids Handling Capacity	2 in.	50.8 mm
Liquids Handling	raw sewage, effluent, drain water	
Intermittent Liquid Temp.	up to 140°F	up to 60°C
Motor Electrical Data	4/10 HP shaded pole 1650 RPM	
Electrical	115V, 12A or 230V, 6A, 1Ø, 60 Hz.	
Acceptable pH Range	6 - 9	
Discharge, NPT	2 in.	50.8 mm
Min. Sump Diameter		
Simplex	18 in.	457 mm
Duplex	30 in.	762 mm

Note: Consult factory for applications outside these recommendations.

Pump Features and Applications



A. 4/10 HP Motor

Pressed in place and oil-filled for best alignment and heat transfer. Built-in overload protection.

B. Power Cord

Quick-disconnect watertight fitting.

C. Motor Housing

Heavy cast iron for efficient heat transfer.

D. Dual Thrust Washers, Sleeve Bearings

Oil lubricated, enhance smooth operation and extend pump life..

E. Cast Iron Volute

Passes 2" diameter solids.

F. Recessed Impeller

Operates out of volute passage, allowing maximum flow of liquids and solids.

G. Mechanical Shaft Seal

Carbon and ceramic faces, body is stationary, prevents string or trash from winding on seal..

Mechanical Float Switch

Mercury-free, 90° angle operation. (Piggyback models only).

Durable Motor Will Deliver Many Years Of Reliable Service.

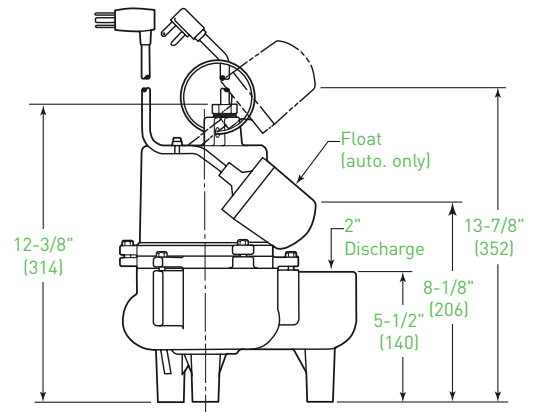
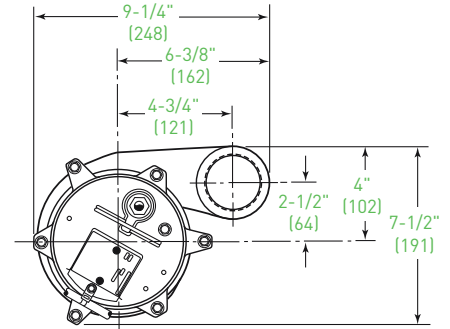
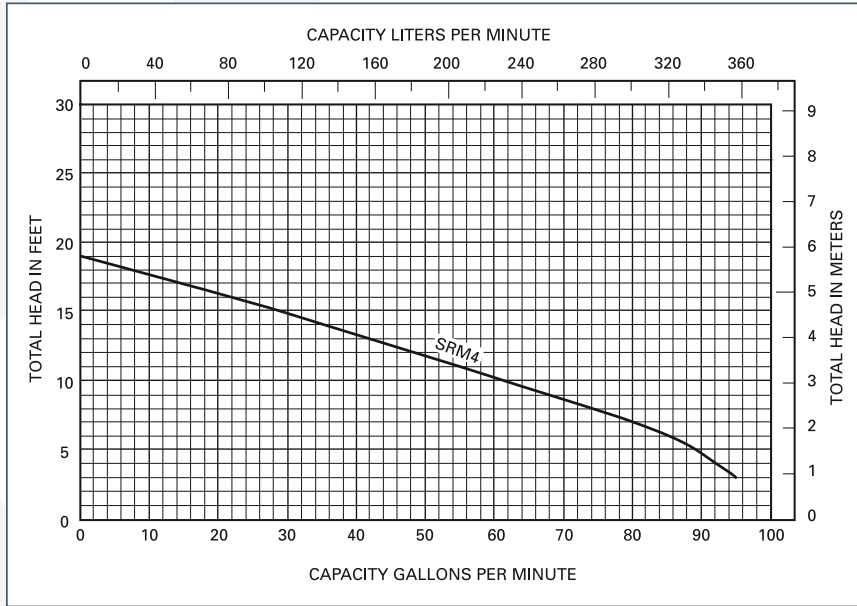
- Oil-filled motor for maximum heat dissipation and continuous bearing lubrication.
- Overload protected shaded pole motor eliminates starting switches.
- Recessed vortex impeller provides minimal radial loading for long bearing life.

The SRM4P Is Engineered For Many Years Of Maintenance-Free Operation.

- Wide-angle piggy-back float switch for maximum draw down. (Automatic models.)
- Pump can be operated manually by unplugging piggy-back switch and plugging pump directly into outlet (Automatic models).
- Recessed vortex impeller operates completely out of volute and provides free flow through passage for solids and liquids.

Performance Data and Dimensions [Dimensions in mm]

1650 RPM



740 EAST 9TH STREET,
ASHLAND, OHIO 44805
WWW.FEMYERS.COM

269 TRILLIUM DRIVE, KITCHENER,
ONTARIO, CANADA N2G 4W5
WWW.FEMYERS.COM

Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.
K3305 1/2/13 © 2013 Pentair Ltd. All Rights Reserved.



January 13, 2023

David T. Bray, PLS
President
Caputo & Wick LTD
1150 Pawtucket Ave.
Rumford, RI 02916-1897
Phone: (401) 434-8880

RE: Burlingame State Park and Camp Ground, Charlestown, RI

Dear Mr. Bray:

This letter will confirm that you have been trained and certified to design GST™ Leaching Systems by Geomatrix Systems, LLC ("Geomatrix") in the State of Rhode Island.

This letter also confirms that Geomatrix has reviewed the design of the GST Leaching System proposed for installation at Burlingame State Park and Camp Ground, Charlestown, RI and found the site and design to be suitable and in compliance with the approved design manuals for the aforementioned product.

If you have any questions, please contact me.

Sincerely,
GEOMATRIX SYSTEMS, LLC

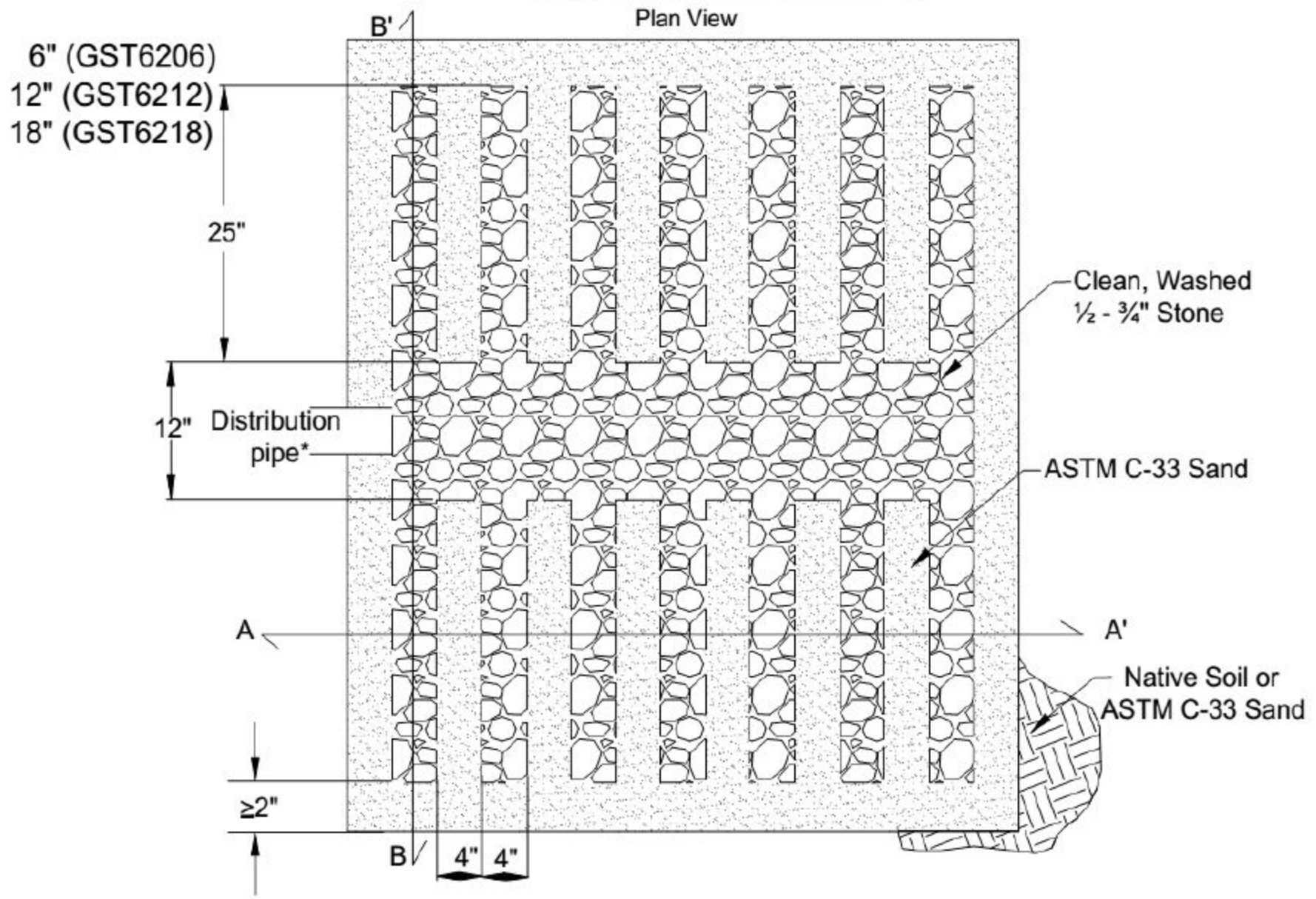
A handwritten signature in black ink that reads "David Jewett". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

David Jewett

Geomatrix Systems, LLC
114 Mill Rock Road East - Old Saybrook, CT 06475
Phone: 860-510-0730 – Fax: 860-510-0735

GST Schematics

GST™ LEACHING SYSTEM



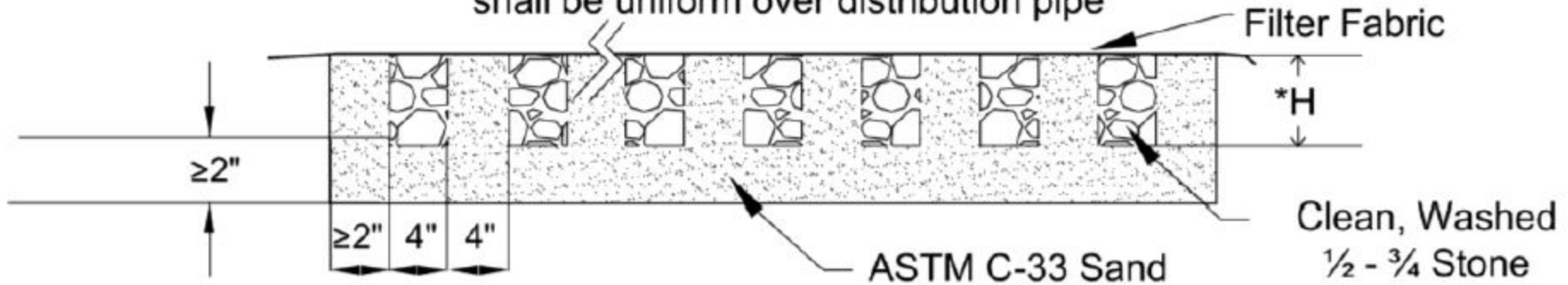
* Distribution pipe for gravity systems shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

GEOMATRIX GST™ LEACHING SYSTEM

A-A' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



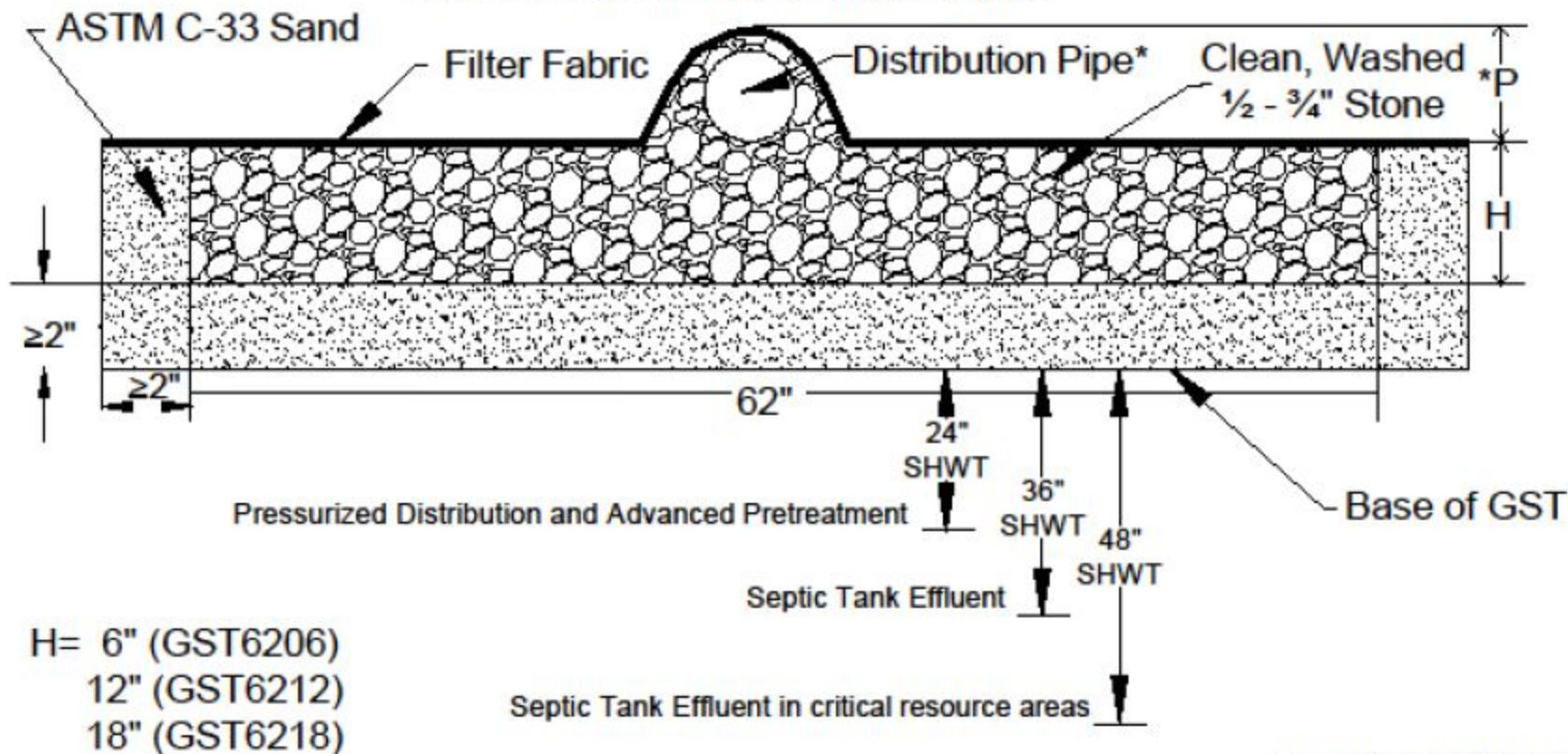
- *H= 6" (GST6206)
- 12" (GST6212)
- 18" (GST6218)

GST™ LEACHING SYSTEM

B-B' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



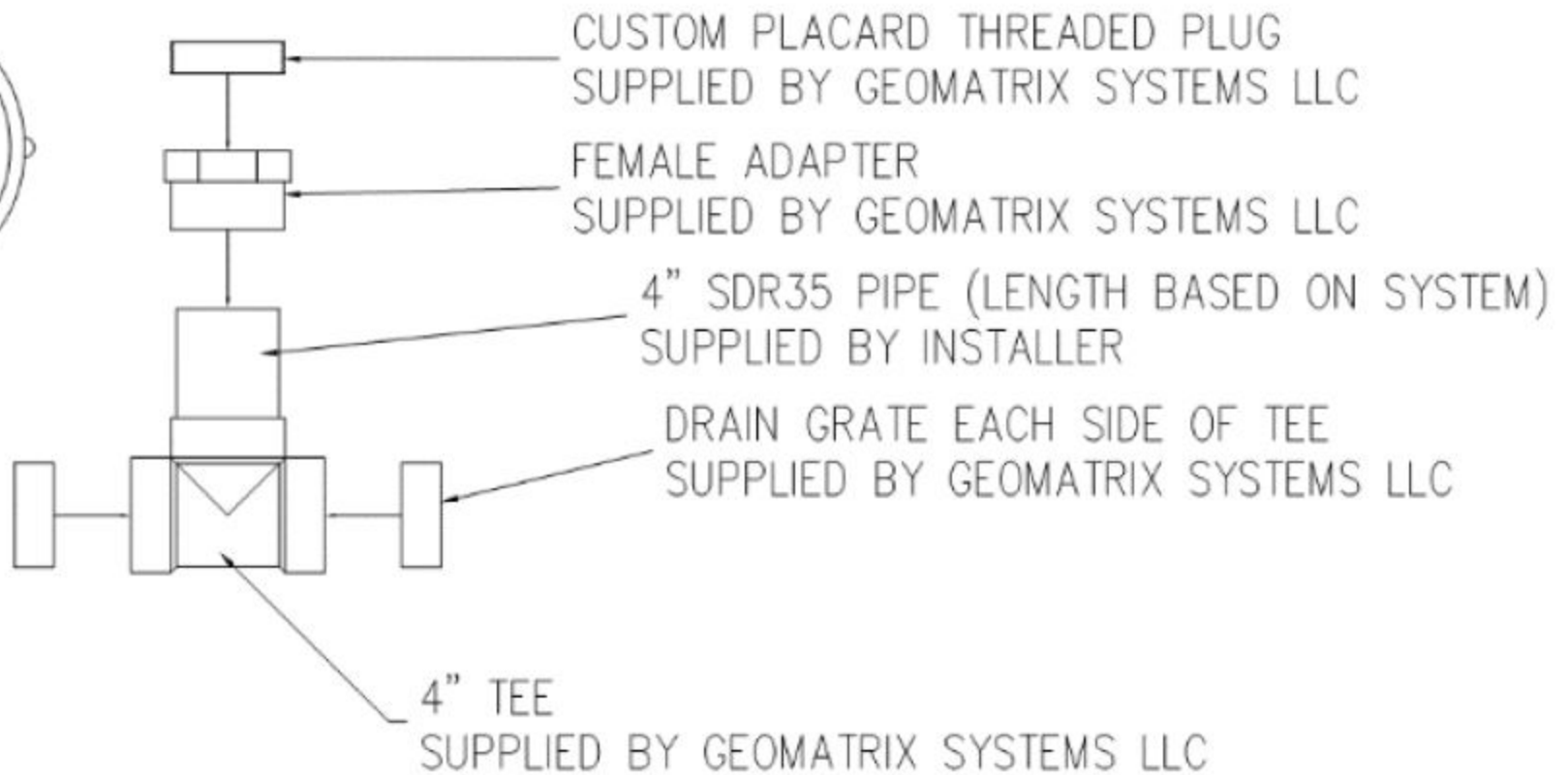
* Distribution pipe for gravity applications shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the
Design, Use and Maintenance of Pressurized Drainfields

Copyright 2022 GEOMATRIX SYSTEMS, LLC
patents: www.geomatrixsystems.com

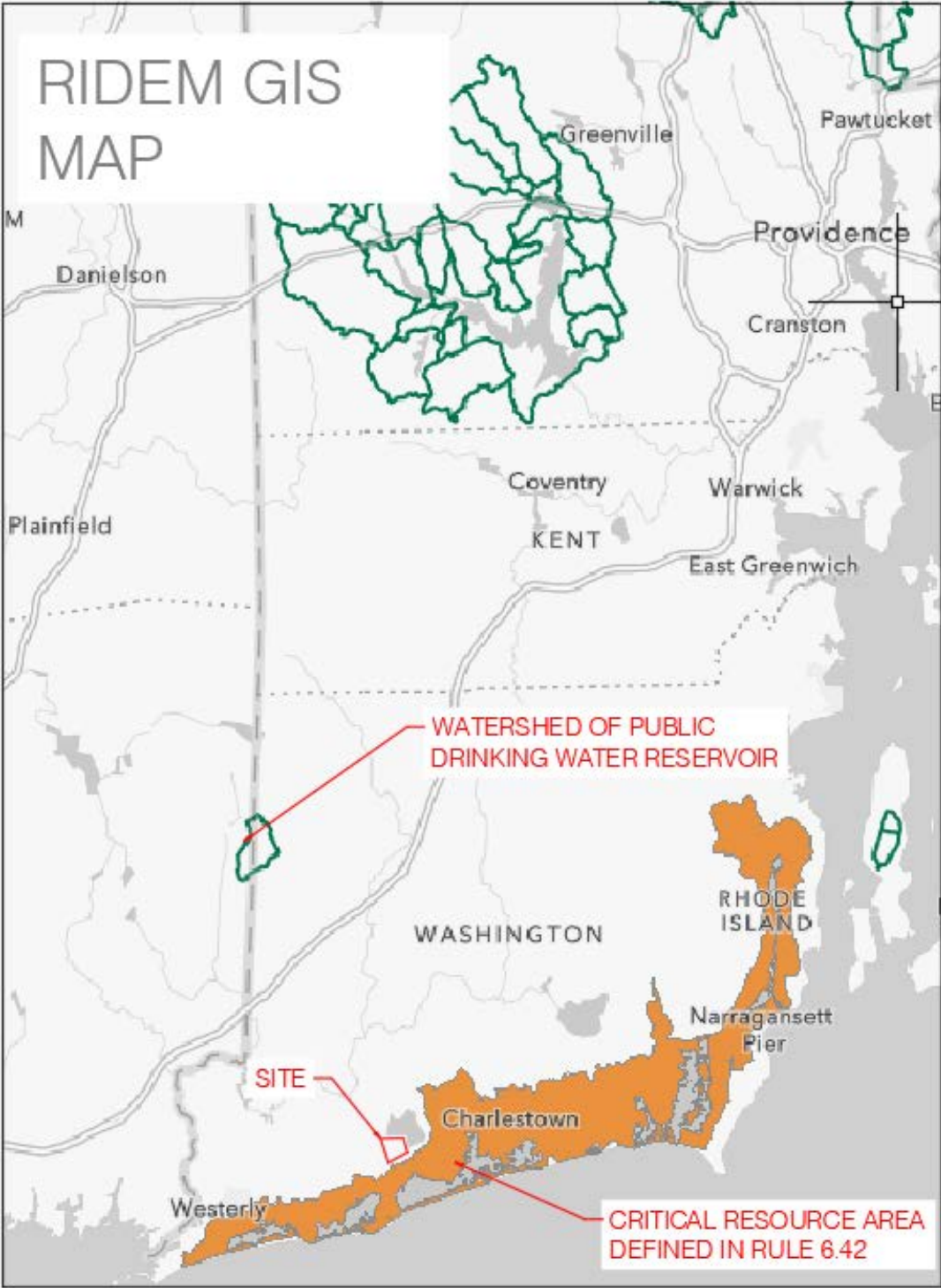
GST LEACHING SYSTEM
B-B' Cross Section
Geomatrix Systems, LLC., Old Saybrook, CT
860-510-0730

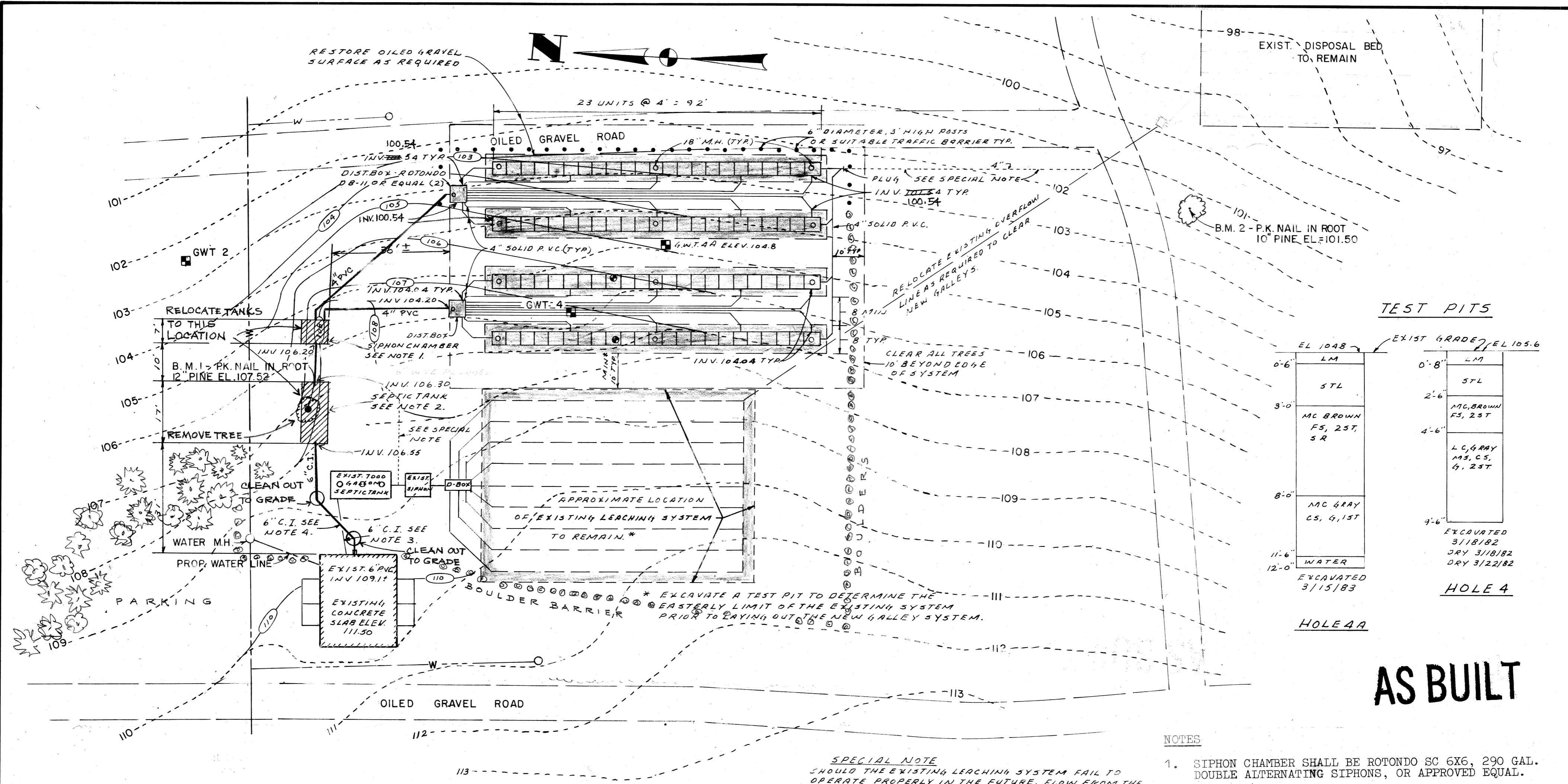
SCALE	None	REV.	0
DATE	9-4-2018	ACAD No.	040 GLS B-B'.DWG
DRAWN BY:	ERP	SHEET	3 Of 3

GEOMATRIX GST™ LEACHING SYSTEM INSPECTION PORT DETAIL



GST LEACHING SYSTEM			
Inspection Port Detail			
Geomatrix Systems, LLC., Old Saybrook, CT			
860-510-0730			
SCALE	None	REV.	A
DATE	6/2/2015	ACAD No.	GSTIP.DWG
DRAWN BY:	ERP	SHEET	1 OF 1





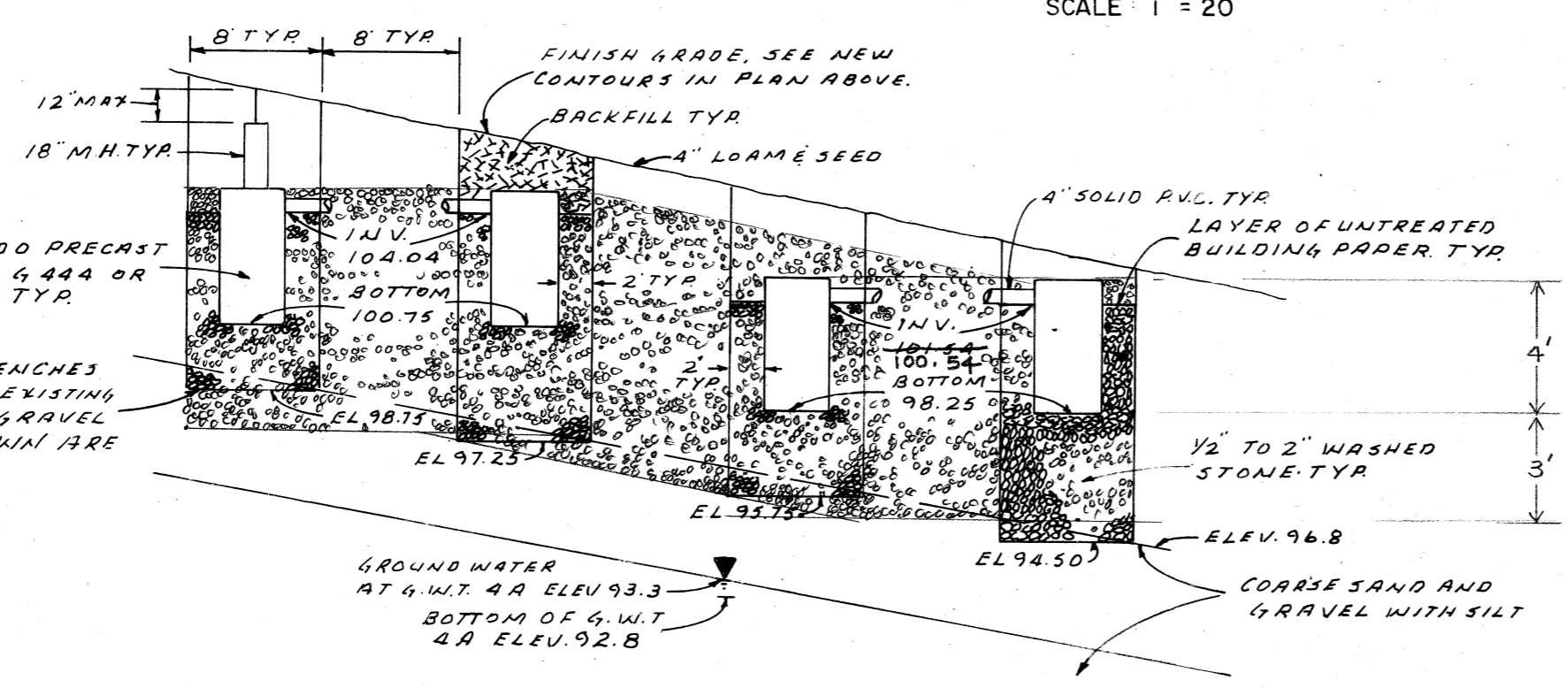
TEST PITS

HOLE 1		HOLE 4	
0'-6"	LM	0'-8"	LM
	STL		STL
3'-0"	MC BROWN F5, 2ST, 5R	2'-6"	MC BROWN F5, 2ST
		4'-6"	LC GRAY M3, C5, 4, 2ST
8'-0"	MC GRAY C5, 4, 1ST	9'-6"	EXCAVATED 3/18/82 DRY 3/18/82 DRY 3/22/82
11'-6"	WATER		
12'-0"	EXCAVATED 3/15/83		

AS BUILT

PLAN
SCALE 1" = 20'

SPECIAL NOTE
SHOULD THE EXISTING LEACHING SYSTEM FAIL TO OPERATE PROPERLY IN THE FUTURE, FLOW FROM THE EXISTING 7,000 GALLON SEPTIC TANK SHALL BE DIVERTED TO THE NEW SYSTEM AS SHOWN AND A NEW 4" OVERFLOW LAID TO CONNECT THE GALLEY SYSTEM TO THE EXISTING 4" OVERFLOW.

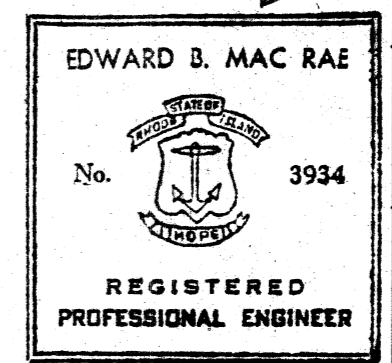


SECTION
SCALE HOR. 1" = 10'
VERT. 1" = 5'

NOTES

1. SIPHON CHAMBER SHALL BE ROTONDO SC 6X6, 290 GAL. DOUBLE ALTERNATING SIPHONS, OR APPROVED EQUAL.
2. SEPTIC TANK SHALL BE ROTONDO ST 7X16, 6000 GAL. OR APPROVED EQUAL.
3. NEW 6" C.I. FOR WASH BASINS AND WATER CLOSETS ONLY, TIE INTO EXIST SEPTIC TANK. VERIFY INVERT AT EXISTING TANK BEFORE LAYING PIPE.
4. NEW 6" C.I. FOR SHOWERS ONLY.

INV. OF EASTERLY GALLEYS LOWERED 3/22/83 PER ORDER OF



DATE	ITEM	CHECK	BY
REVISIONS			
STATE OF RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT DIVISION OF PLANNING AND DEVELOPMENT			
PROPOSED SEWAGE DISPOSAL SYSTEM			
BURLINGAME STATE PARK MAIN CAMP CHARLESTOWN, R.I.			
APPROVED DEPT. DIRECTOR		APPROVED DIV. CHIEF	
DRAWN BY: P.Mc.	DATE: 3-19-83	CHECKED BY:	SHEET NO. 1 OF 3



“Legion Town Bathhouse and Onsite Wastewater Treatment System Replacement”

For

Rhode Island Department of Environmental Management
Burlingame State Park and Campground

Burlingame Park Road
Charlestown, Rhode Island

Assessors Map 15 – Lot 10
Area: 847 Acres±

July 2022

Prepared by

Caputo & Wick Ltd.
1150 Pawtucket Avenue
Rumford, Rhode Island 02916-1897
401-434-8880



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**



www.dem.ri.gov/septic

FOR RIDEM USE ONLY

APPLICATION No. 2205-1142 DATE RECEIVED 06/29/23 AMOUNT RECEIVED \$ 0.00 CHECK # --- NOTE ---

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- | | |
|---|---|
| <input checked="" type="checkbox"/> NEW BUILDING CONSTRUCTION | <input type="checkbox"/> A/E TECHNOLOGY TYPE <u>DRIVE</u> |
| <input type="checkbox"/> ALTERATION | <input type="checkbox"/> VARIANCE |
| <input type="checkbox"/> REPAIR | <input type="checkbox"/> REDESIGN |
| <input type="checkbox"/> TRANSFER | <input type="checkbox"/> JOINT OWTS / WETLANDS PD |

CERTIFICATION

I, KEVIN HARROP (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULEs of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

SITE INFORMATION

BURLINGAME STATE PARK AND CAMP GROUND (LEGION TOWN)
1100 BURLINGAME PARK ROAD CHARLESTOWN
NO. STREET CITY/TOWN POLE #
PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N.A.
LOT SIZE 847 SF/ACRES
SUBDIVISION NAME N.A.
SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

Designer's Signature Kevin Harrop License # D 3155

Designer's Email kharp@dcwhill.com Phone # 401-454-4900

Business/Company Name CAPITO & WILKINS

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

OWNER INFORMATION

STATE OF RI
LAST NAME FIRST NAME M.I.
235 PROMENADE ST PROVIDENCE 02908
NO. STREET CITY/TOWN ZIP CODE

Owner's Phone Number (401) 222-4700 ext 2774307

Owner's Email MEGAN.DIERETE@DEM.RI.GOV

Owner(s) Signature M.D. Dierete

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # 2205-1142
DEPTH TO APPROVED WATER TABLE 40" HOW DETERMINED SOIL EVALUATION
TEST HOLE # LA DATE EXCAVATED 5/13/21 WETLANDS within 200' OF OWTS YES NO
WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE 1/1
LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other

DESIGN INFORMATION

BUILDING USE: Residential Commercial Environmental Management
 Other BATHHOUSE **MAR 6 2023**
WATER SUPPLY: public water public well private well
OF DESIGN UNITS 156 **Office of Water Resources**
UNIT DESIGN FLOW 50 gallons per UNIT (unit) TOTAL DAILY FLOW _____ gallons
TANK SIZE 16,000 gallons DESIGN LOADING RATE 3.5 gpd/sf
MINIMUM REQUIRED LEACHFIELD AREA 2,229 square feet
LEACHFIELD TYPE GRAVEL AND TREATMENT SYSTEM (EST)
TOTAL AREA OF LEACHFIELD PROVIDED 4,300 square feet

Signature of RIDEM Official	Date of Approval	Date of Expiration
<u>Kevin Harrop</u>	<u>3/15/23</u>	<u>3/15/25</u>

DESIGNER



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ONSITE WASTEWATER TREATMENT SYSTEM CONSTRUCTION PERMIT**
www.dem.ri.gov/septic



FOR RIDEM USE ONLY

APPLICATION No. _____ DATE RECEIVED ____/____/____ AMOUNT RECEIVED \$ _____ CHECK # _____ NOTE _____

TYPE OF APPLICATION (CHECK ALL THAT APPLY)

- NEW BUILDING CONSTRUCTION
- ALTERATION
- REPAIR
- TRANSFER

- A/E TECHNOLOGY TYPE ORENCO AX100/BSP
- VARIANCE
- REDESIGN
- JOINT OWTS / WETLANDS PD

CERTIFICATION

I, KEVIN HARROP (print), the undersigned licensed OWTS designer, certify that I prepared this application and accompanying forms, submittals, plans and sketches in accordance with the RULES of the RIDEM pertaining to OWTS and that all the information provided on this application and accompanying forms, submittals, plans and sketches is true and accurate.

Designer's Signature Kevin Harrop License # D3155

Designer's Email Kharrop@cw1td.net Phone # 401-434-8880

Business/Company Name CAPUTO and WICK LTD.

I certify that a) I am the owner of the property indicated under the site information on this application, b) I will hire a licensed OWTS installer to install the system proposed herein, c) the system will be installed in strict accordance with this application, d) I will hire and retain the licensed OWTS designer of record to witness and inspect the installation of the system, e) I assume all responsibility for the truth and accuracy of this application and all liability and responsibility for any improper installations of the system on this site and agree to hold the RIDEM harmless from any and all claims relating whatsoever to the system. In the case of a transfer application, I acknowledge that the permit application and plans previously approved and accompanying this application are the operative documents subject to certification.

Owner's Phone Number (401) 222-4700 ext. 2774307

Owner's Email MEGAN.DIPRETE@DEM.RI.GOV

Owner(s) Signature _____

SITE INFORMATION

BURLINGAME STATE PARK AND CAMPGROUND (LEGION TOWN)
1-100 BURLINGAME PARK ROAD CHARLESTOWN
NO. STREET CITY/TOWN POLE #

PLAT NUMBER 15 LOT NUMBER 10 SUBDIVISION LOT NUMBER N/A

LOT SIZE 847 SF/ACRES

SUBDIVISION NAME N.A.

SUBDIVISION SITE SUITABILITY CERTIFICATION # N.A.

OWNER INFORMATION

STATE OF RI DEM
LAST NAME FIRST NAME M.I.
235 PROMENADE ST. PROVIDENCE 02908
NO. STREET CITY/TOWN ZIP CODE

RIDEM APPLICATION HISTORY

PREVIOUS SITE TESTING YES NO APPLICATION # _____

DEPTH TO APPROVED WATER TABLE 40" HOW DETERMINED SOIL EVALUATION

TEST HOLE # 6A DATE EXCAVATED 8/18/21 WETLANDS within 200' OF OWTS YES NO

WETLAND DETERMINATION YES NO RIDEM FILE # _____ DATE ____/____/____

LARGE SYSTEM YES NO OCI FILE # IF APPLICABLE _____

DESIGN INFORMATION

BUILDING USE: Residential Commercial _____
 Other BATHHOUSE

WATER SUPPLY: public water public well private well

OF DESIGN UNITS 156

UNIT DESIGN FLOW 50 gallons per SITE (unit) TOTAL DAILY FLOW 7,800 gallons

TANK SIZE 16,000 gallons DESIGN LOADING RATE 3.5 gpd/sf

MINIMUM REQUIRED LEACHFIELD AREA 2,229 square feet

LEACHFIELD TYPE BOTTOMLESS SAND FILTER

TOTAL AREA OF LEACHFIELD PROVIDED 2,304 square feet

PERMIT APPROVAL SECTION: DO NOT WRITE BELOW THIS LINE

Based upon the representations of the owner and the owner's agents, including the representations of the owner's OWTS designer, and the truth and accuracy of all information submitted, this application for an OWTS is hereby approved. The RIDEM assumes no responsibility or liability for the future safe operation or maintenance of the aforesaid system, of the fitness or suitability of this system to this site, nor does it assume any responsibility for the accuracy and truth of the owner's, or the owner's agent's representations. This approval is subject to future suspension or revocation in the event that subsequent examination reveals any data indicated on any application, form, submittal, plan or sketch to be incorrect, or not in compliance with the RULES or any conditions at the site are such that the approved design is not in accordance with the RULES, or in the event that the system discharges inadequately treated wastewater to waters of the State or fails to operate satisfactorily in any other manner.

IMPORTANT: Additional terms of approval as circled.

- A. Bottom of leaching area excavation must be inspected by the RIDEM prior to placement of any gravel or stone.
- B. System installation must be inspected by RIDEM prior to covering any component of the system with backfill.
- C. Applicant shall comply with all requirements, conditions and stipulations of variance(s) approved on _____.
- D. Joint Permit: Designer of record must contact RIDEM prior to start of any site construction.
- E. A/E Technology: additional installation, operation or maintenance requirements may apply (see A/E Technology Certification.)
- F. Copy of this form and Operation/Maintenance contract must be filed in land evidence records prior to conformance.
- G. Proposed construction falls within "Coastal Zone". Contact Rhode Island Coastal Resources Management Council.
- H. Proper erosion and sedimentation controls must be installed prior to start of construction.
- I. Transfer: See original permit for all applicable conditions.
- J. Other

Signature of RIDEM Official _____ Date of Approval _____ Date of Expiration _____



RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
235 Promenade Street, Providence, Rhode Island 02908

March 15, 2023

State of Rhode Island
Rhode Island Department of Environmental Management Division of Planning and Development
235 Promenade Street
Providence, RI 02908

RE: Legion Town Bathhouse
Burlingame State Park and Campground
Charlestown, RI
OWTS Application No. 2205-1142

Dear Applicant:

Attached herewith are revised monitoring and reporting requirements applicable to the above listed permit. As you are aware the above listed Onsite Wastewater Treatment System (OWTS) permit is granted based on a maximum daily design flow of **7,800** gallons per day and includes 1 - 16,000 gallon septic tank, 1 - 8,000 gallon anoxic tank, 1 - 6,000 gallon recirculation tank, 2 - Advantex AX 100 filter pods followed by a 6 x 6 pump chamber to a Gravel Sand Treatment (GST) type of leaching system.

Advanced treatment systems are utilized to mitigate against possible adverse impacts of residual onsite wastewater pollutants on groundwater quality and surface water quality. Owners of advanced OWTSs with design flows $\geq 2,000$ gallons per day are subject to regular monitoring and reporting. The following stipulations now apply to your permit:

1. The following discharge limits as measured at the 6 x 6 pump chamber shall apply:

Orengo Systems, Inc. AdvanTex AX-100 – Mode 1
Biochemical Oxygen Demand (5 Day) ≤ 20 mg/L
Total Suspended Solids ≤ 20 mg/L
Oil & Grease ≤ 5 mg/L

2. Wastewater flow shall not exceed a maximum daily flow of **7,500** gallons per day. Wastewater flow shall be monitored and recorded to ensure compliance with this stipulation.
3. Sampling and testing shall be conducted quarterly at the compliance point specified in Item 1 above. Sampling and measurements shall be representative of the monitored activity. The Permittee shall sample and test the wastewater in each system as follows:

Dissolved Oxygen (mg/L) – *Field Test*
Effluent Temperature (°F) – *Field Test*
pH (s.u.) – *Field Test*
Biochemical Oxygen Demand (5-Day) (mg/L)
Total Suspended Solids (mg/L)
Oil and Grease (mg/L)
Alkalinity (mg/L)

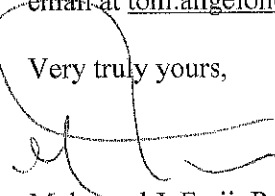
4. Corrective Action – Corrective action must be taken as soon as practicable following receipt of monitoring results which indicate that system modifications or maintenance is required. The system must be resampled no sooner than seven (7) days after any adjustment is made to the system and within thirty (30) days of the routine quarterly sample date. Samples must be analyzed for each of the parameters listed in Item 3 for any post corrective action sampling events.
5. Annual Report – All monitoring results including wastewater flow data shall be submitted to the DEM in the form of an annual report. The annual report is due **February 15th** of each year. The annual report must summarize all monitoring results and corrective actions implemented during the previous calendar year. A clear determination regarding the compliance status of the OWTS must be made as part of the annual report. The annual report must include a copy of the most recent Operation and Maintenance Contract as proof of compliance with this requirement.
6. The Permittee shall properly operate and maintain all facilities and equipment associated with the OWTS in accordance with the most recent operation and maintenance (O&M) plan. The O&M plan specifies procedures for operation, process control, record keeping, monitoring, weekly maintenance checks, other routine and periodic maintenance, safety and security. Also, the O&M plan includes a contingency plan to address emergency actions and procedures in the event of equipment failure and power loss.
7. Your permit approval is for the discharge of sanitary waste only. No toxic, hazardous or industrial processing waste may be discharged into the system.
8. All septage, sludges, screenings or other pollutants removed from the system shall be disposed in accordance with all applicable state and federal laws.
9. The permit may be automatically transferred by the Permittee to a new owner provided:
 - a. The current Permittee notifies the DEM by certified mail at least thirty (30) days in advance of the proposed transfer date;
 - b. The notice includes the name and address of the new Permittee and a written agreement between the existing and new Permittee containing a specific date for the transfer of permit responsibility, surety and liability between them and;
 - c. The DEM does not notify the existing Permittee and the proposed new Permittee of its intent to modify or reissue the permit.
10. The operator or person in responsible charge of the OWTS shall have at a minimum a Rhode Island Class 1 Wastewater Treatment Plant Operator Certification or an equivalent certification from another jurisdiction acceptable to the DEM. If the operator is not employed directly by the Permittee, a service agreement with the operator shall be entered into and continuously maintained, and a copy of the active service agreement shall be submitted to the DEM as part of the annual report.
11. The permit may be modified, suspended, or revoked for cause. The DEM reserves the right to revise the permit to ensure compliance with applicable state and federal regulations. Failure to comply with the conditions of this permit approval letter may result in an enforcement action.

12. The Permittee shall allow the DEM or their authorized representative to access the OWTS and work areas to inspect equipment, practices, records pertinent to this permit and stipulated compliance requirements, and to sample and monitor the wastewater for the purposes of determining compliance.
13. In the event of treatment interruption, bypass or sewage overflow, the Permittee shall notify the DEM verbally within twenty-four (24) hours. Such incident shall be reported in writing within five (5) days after it becomes known to the Permittee, the report shall include the date and time(s) of the incident, the duration of the incident, and actions taken to correct the problem and prevent a reoccurrence.
14. For purposes of notification, monitoring, compliance or inquiries pursuant to this permit, all correspondence, telephone calls and other contacts must reference the OWTS permit number and shall be directed to:

The Rhode Island Department of Environmental Management
Onsite Wastewater Treatment Systems Program
235 Promenade Street
Providence, RI 02908
Telephone: (401) 222-3961
www.dem.ri.gov/septic

Should you have any questions concerning these permit requirements, please contact Tom Angelone by email at tom.angelone@dem.ri.gov or by phone at 401-222-3961, extension 2777607.

Very truly yours,



Mohamed J. Freij, P.E., PLS
Supervising Sanitary Engineer

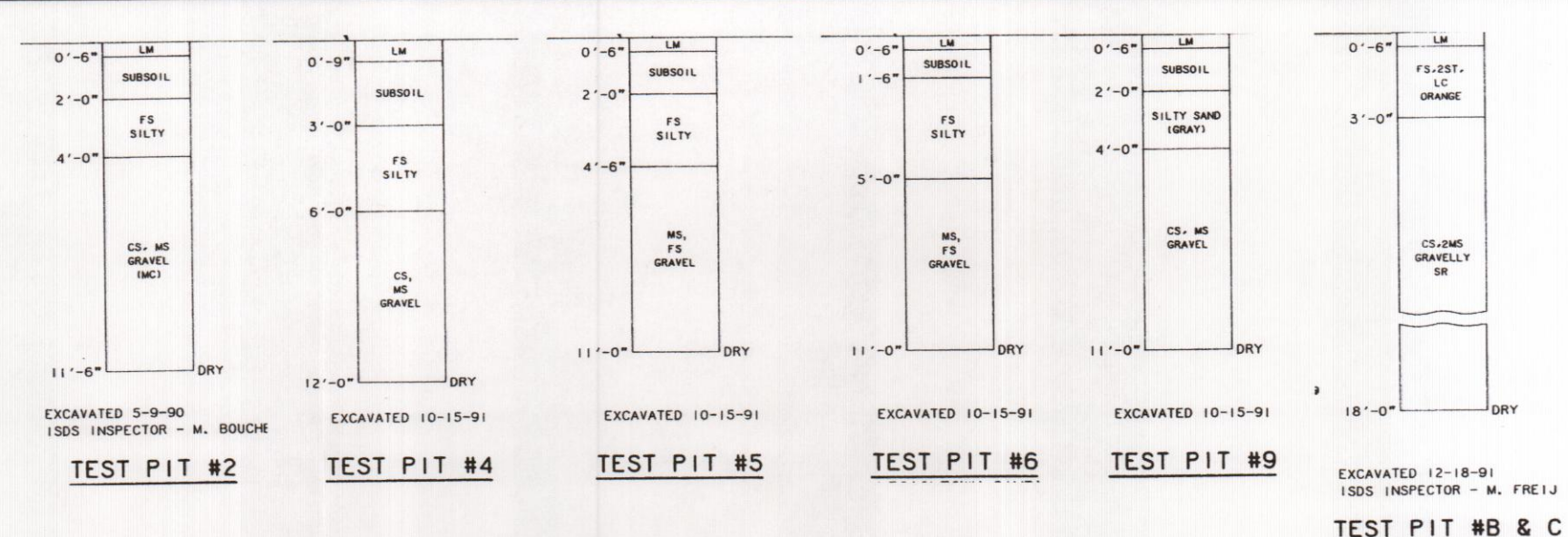
KF

Enclosure(s)

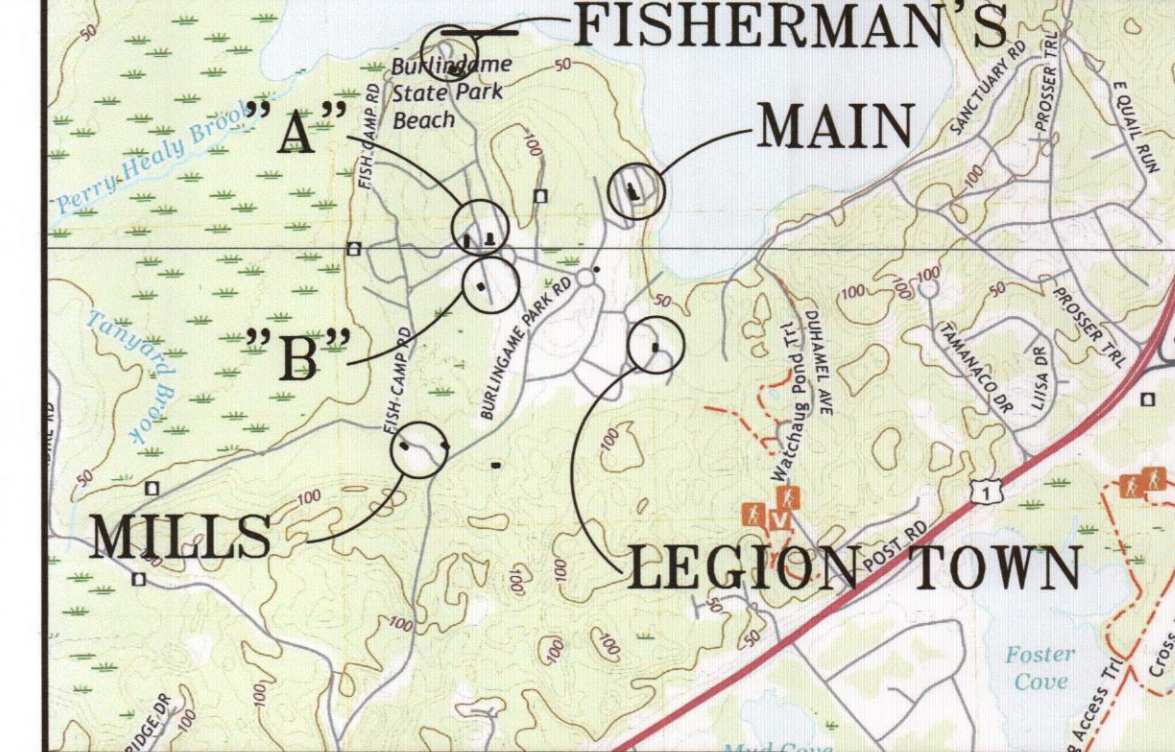
cc: Joseph L. Warner Jr., Charlestown Building Official

TH-6A - GROUND ELEV. 74.1 - AUGUST 18, 2021											
HORIZON	DEPTH	HORIZON	BOUNDARIES	SOIL	COLORS	RE-DOX	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 9"	C	S	2.5YR 6/3				Ls	2ghd	Wfr	3
Bw	9" - 25"	C	W	10YR 5/6				Ls	2ghd	Fr	3
C1	25" - 40"	C	S	2.5YR 7/3				Ls	2ghd	Fr	3
C2	40" - 120"	C	S	2.5YR 7/3	5YR 4/4	M M P		Ls	2ghd	Fr	3

TH-6B - GROUND ELEV. 70.5 - AUGUST 18, 2021											
HORIZON	DEPTH	HORIZON	BOUNDARIES	SOIL	COLORS	RE-DOX	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 16"	C	S	2.5YR 6/3				Ls	2ghd	Wfr	3
Bw	16" - 36"	C	W	10YR 5/6				Ls	2ghd	Fr	3
C1	36" - 42"	C	S	2.5YR 7/3				Ls	2ghd	Fr	3
C2	42" - 120"	C	S	2.5YR 7/3	5YR 4/4	M M P		Ls	2ghd	Fr	3



P#3		P#4	
TOP OF HOLE	EL. 88.5	TOP OF HOLE	EL. 88.2
BOT. OF HOLE	EL. 82.0	BOT. OF HOLE	EL. 82.6
PERC. RATE	5 MPH	PERC. RATE	4 MPH
DATE	5-10-90	DATE	5-10-90



LOCUS MAP

- NOTES:**
- ALL WORK SHALL CONFORM TO THE RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, OFFICE OF WATER RESOURCES "RULES AND REGULATIONS ESTABLISHING MINIMUM STANDARDS RELATING TO LOCATION, DESIGN, CONSTRUCTION AND MAINTENANCE OF ONSITE WASTEWATER TREATMENT SYSTEMS", LATEST EDITION.
 - THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL OF ALL PROPOSED CONSTRUCTION MATERIALS AND EQUIPMENT PRIOR TO ANY CONSTRUCTION.
 - EXISTING ONSITE WASTEWATER TREATMENT SYSTEM (OWTS) PRECAST STRUCTURES ARE TO BE PUMPED OUT, RINSED WITH CLEAN WATER AND PUMPED OUT AGAIN. PUMPING MUST BE PERFORMED BY A STATE LICENSED SEPTIC HAULER AND THE CONTENTS OF THE TANK DISPOSED OF PROPERLY. AFTER PUMPING, THE EXISTING OWTS STRUCTURES MUST BE FILLED WITH FLOWABLE FILL OR REMOVED AND REPLACED WITH GRAVEL BORROW AND 4" LOAM AND SEED.
 - REMOVE ALL PORTIONS OF THE EXISTING OWTS WITHIN 5' OF THE GRAVEL SAND TREATMENT SYSTEM AND ALL FILL, A HORIZON SOIL, B HORIZON SOIL AND SCARIFY 3" OF THE C HORIZON SOIL BELOW THE GRAVEL SAND TREATMENT SYSTEM AND THOUGHLY MIX WITH ASTM C-33 SAND (SEE NOTE 16) TO INTERFACE. THE FILL WITH THE SOIL, AND REPLACE ALL REMOVED SOIL WITH ASTM C-33 SAND. A AND B SOIL HORIZON LAYERS ARE TO BE REMOVED IN THIS APPLICATION DUE TO COMPACTION CAUSED BY PREVIOUS SYSTEM INSTALLATION AND FILL BEING PLACED ABOVE.
 - UNSATURABLE MATERIAL USED TO BACKFILL THE TEST HOLES SHALL BE REMOVED AND REPLACED WITH WITH ASTM C-33 SAND (SEE NOTE 16).
 - ASTM C-33 SAND (SEE NOTE 16) MUST BE PLACED ON SCARIFIED, RELATIVELY DRY NATURAL SOIL. THE CONTRACTOR SHALL PROVIDE FOR DETERWATERING AS REQUIRED AND ALL WORK SHALL BE PERFORMED UNDER DRY CONDITIONS.
 - BUILDING SEWER PIPE TO BE 4" P. V. C. SCH. 40 UNLESS OTHERWISE NOTED.
 - PLACE 6" MINIMUM COMPACTED CRUSHED STONE UNDER SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER, ADVANTEX TREATMENT TANKS AND SYSTEM STRUCTURES.
 - INLET AND OUTLET TEES FOR SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK AND PUMP CHAMBER ARE TO BE LOCATED DIRECTLY BELOW ACCESS COVERS.
 - SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
 - IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION. IF IN DOUBT, ASK.
 - NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6-27.
 - INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEX TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
 - IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
 - MINIMUM PERIMETER INVERT ELEVATION = 73.00. NO FINISHED GRADE BELOW 73.00 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM. THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL DELIVERED TO THE SITE IS REQUIRED.
 - OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEX PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEX INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
 - INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEX INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR-150-6. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEPT LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
 - REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY AN INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEX TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
 - THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-4.47 OF THE "REGULATIONS". FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE SYSTEM COMPONENTS FOR OBSERVATION.
 - THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
 - CONTRACTOR SHALL CONTACT "DIG-SAFE" PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
 - THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS AS SHOWN.
 - NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
 - I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
 - ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO BE WATER TIGHT.
 - PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR POCKETS.
 - CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
 - CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION, EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
 - THE PUMP DOSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTORS RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOWS.
 - ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
 - THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STAKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
 - NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
 - MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
ONITE PROGRAM
PLAN # 2020-1142 DATE 3/16/22
APPROVED: *[Signature]*
NO CHANGES ALLOWED WITHOUT PRIOR APPROVAL
APPROVED PLANS MUST BE KEPT AT CONSTRUCTION SITE

DESIGN DATA

DAILY SEWAGE FLOW:
50 GPD/CAMPSITE x 156 CAMPSITES = 7800 GALLONS PER DAY (G.P.D.)

GROUND WATER TABLE: 40"

DEPTH TO IMPERVIOUS: NOT ENCOUNTERED

SOIL CLASS: B, SOIL CATEGORY: 3, LOADING RATE: 0.70 GALS./S.F./DAY

SEPTIC TANK REQUIREMENTS VOLUME = 2 X 7,800 G.P.D. = 15,600 GALLONS

LEACHING AREA REQUIREMENTS:
GRAVEL SAND TREATMENT (GST) SYSTEM WITH CATEGORY 1 TREATMENT (ORENCO ADVANTEX TREATMENT AX100)

ASSIGNED EFFLUENT LOADING RATE = 3.5 GPD PER S. F.

SQUARE FOOTAGE OF GST REQUIRED = 7800 GPD / 3.5 GPD PER S.F. = 2,229 S.F.

LENGTH OF GST 6212 REQUIRED = 2,229 S.F. / 17.5 S.F./L.F. = 127 L.F.

LENGTH OF GST 6212 SPECIFIED: 280 L.F.

TOTAL GST SYSTEM CAPACITY = 280 L.F. X 17.5 S.F./L.F. X 3.5 G.P.D./S.F. = 17,150 GPD

17,150 GPD > 7,800 GPD - CAPACITY = 220% OF ANTICIPATED DESIGN FLOW

CERTIFICATION:

THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 8 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2015, AS FOLLOWS:

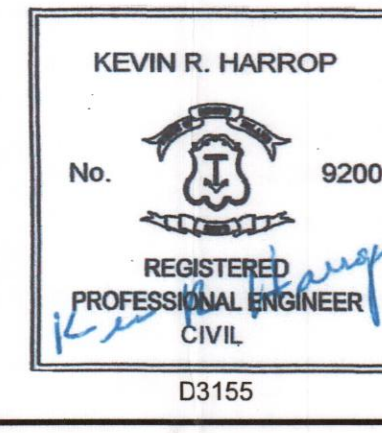
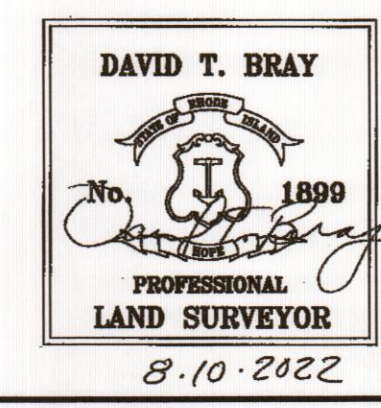
TYPE OF BOUNDARY SURVEY: LIMITED CONTENT BOUNDARY SURVEY
MEASUREMENT SPECIFICATION: NOT A BOUNDARY SURVEY

OTHER TYPE OF SURVEY: DATA ACQUISITION SURVEY (LOCATIONS)
CLASS II
T2 (IMMEDIATE AREA AROUND BATHHOUSE AND OWTS)

THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ONSITE WASTEWATER TREATMENT SYSTEM.

David T. Bray 3/10/2022
DATE

DAVID T. BRAY P.L.S. NO. 1899
CAPUTO AND WICK LTD., C/O NO. A177

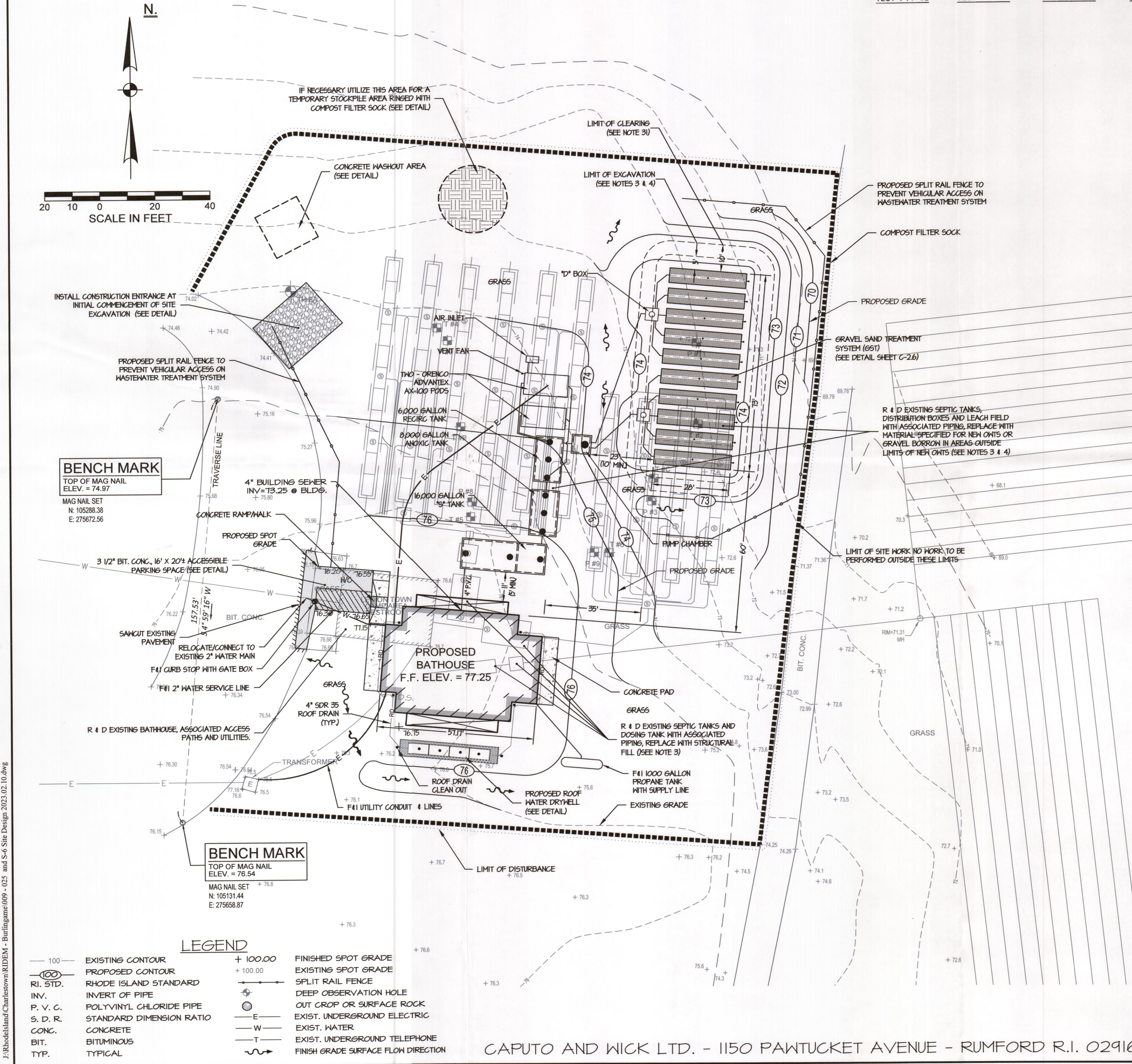


STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

LEGIONTOWN CAMP BATHHOUSE - SITE PLAN

Dwg:	Scale: 1" = 20'	C-1.6
Contract No. x	Date: FEBRUARY, 2023	14



P:\RhodeIsland\Charlestown\RIDEM - Burlingame\009 - 025 and S-c Site Design\2023.02.10.dwg

BURLINGAME STATE PARK AND CAMPGROUND

OWTS SUBMISSION - FEBRUARY 16, 2023

TH-6A - GROUND ELEV. 74.1 - AUGUST 18, 2021

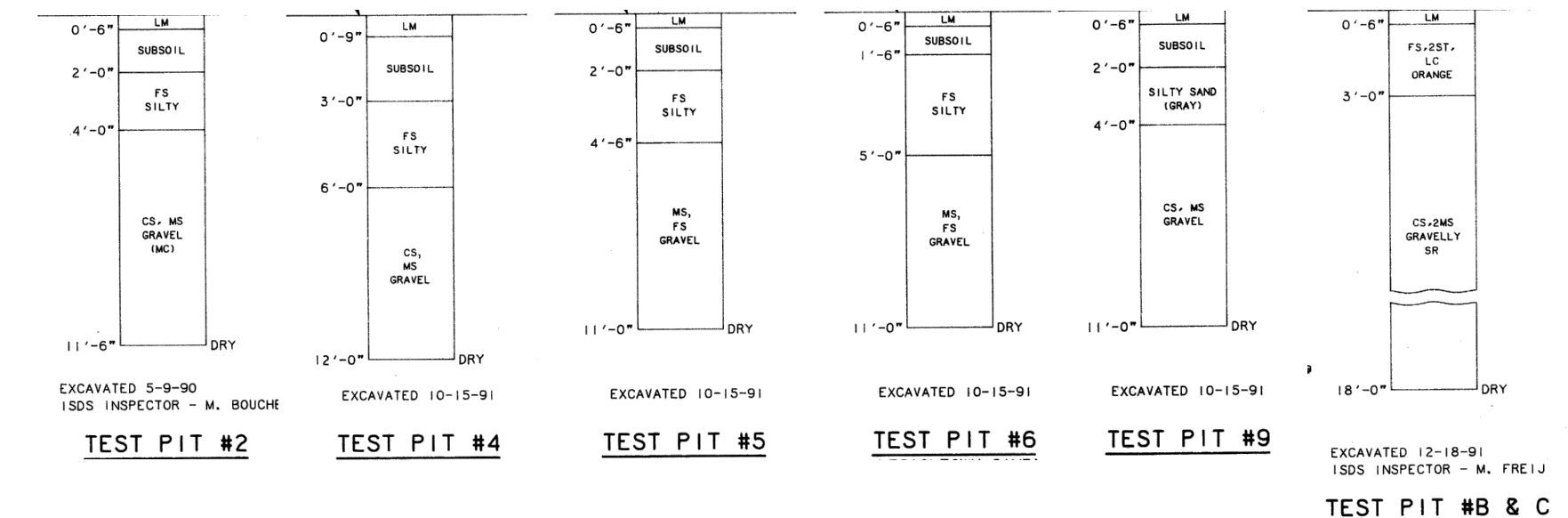
HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 9"	C	S	2.5YR 6/3			Ls	2ghd	Wf	3
Bw	9" - 25"	C	W	10YR 5/6			Ls	2ghd	Fr	3
C1	25" - 40"	C	S	2.5YR 7/3			Ls	2ghd	Fr	3
C2	40" - 120"	C	S	2.5YR 7/3	5YR 4/4	M M P	Ls	2ghd	Fr	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 40" (ELEV. 76.8)
OBSERVED WEEPING GROUNDWATER - NA
PERFORMED BY: KAMAL HINGORANY

TH-6B - GROUND ELEV. 70.5 - AUGUST 18, 2021

HORIZON	DEPTH	DIST	TOPO	MATRIX	RE-DOX FEATURES	Ab. S. CONTR.	TEXTURE	STRUCTURE	CONSISTENCE	SOIL CATEGORY
Ap	0 - 16"	C	S	2.5YR 4/3			Ls	2ghd	Wf	3
Bw	16" - 36"	C	W	10YR 5/6			Ls	2ghd	Fr	3
C1	36" - 42"	C	S	2.5YR 7/3			Ls	2ghd	Fr	3
C2	42" - 120"	C	S	2.5YR 7/3	5YR 4/4	M M P	Ls	2ghd	Fr	3

SOIL CLASS: B OBSERVED STANDING GROUNDWATER - NA
ESTIMATED SEASONAL HIGH WATER TABLE - 42" (ELEV. 67.0)
OBSERVED WEEPING GROUNDWATER - NA
PERFORMED BY: KAMAL HINGORANY



TEST PIT #2: EXCAVATED 5-9-90, 1505 INSPECTOR - M. BOUGH

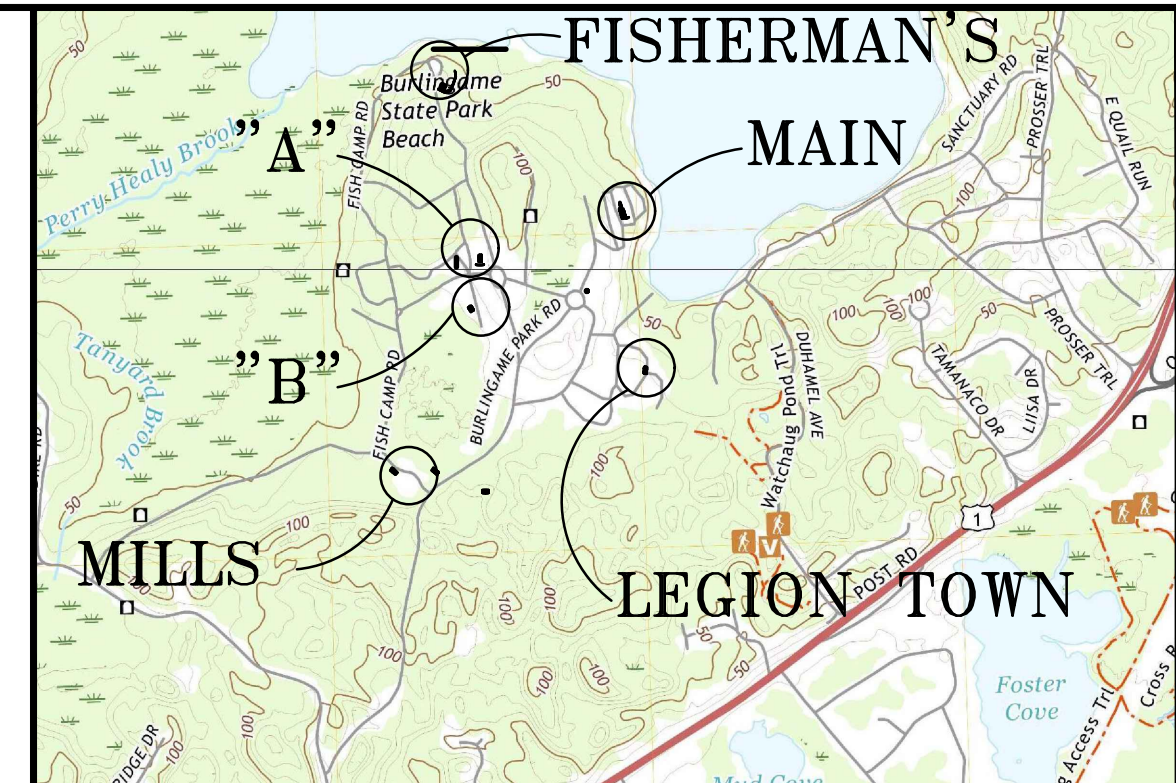
TEST PIT #4: EXCAVATED 10-15-91

TEST PIT #5: EXCAVATED 10-15-91

TEST PIT #6: EXCAVATED 10-15-91

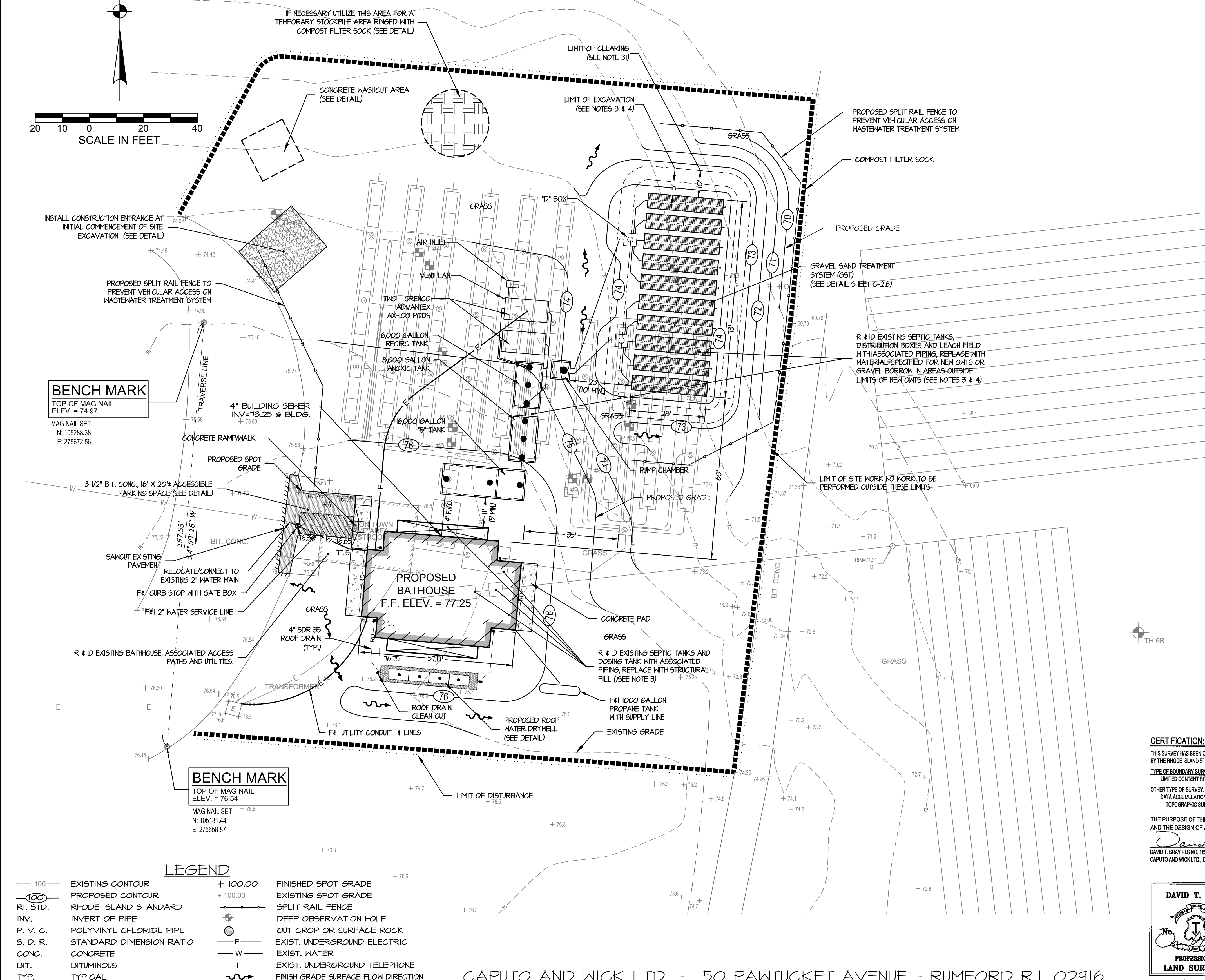
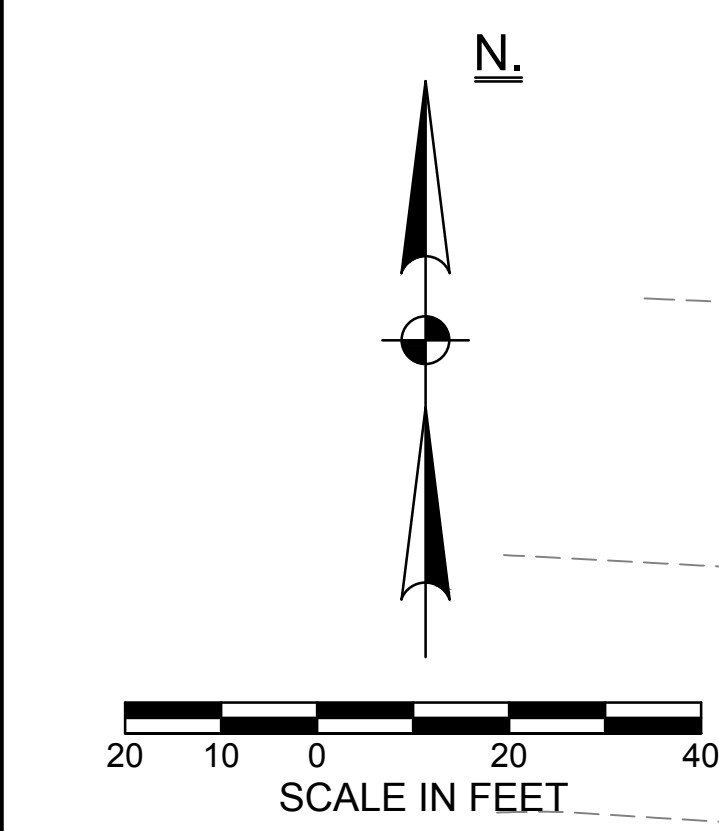
TEST PIT #9: EXCAVATED 10-15-91

TEST PIT #8 & C: EXCAVATED 12-18-91, 1505 INSPECTOR - M. FRELJ



LOCUS MAP

- NOTES:**
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 - THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO CAPUTO AND WICK LTD. FOR APPROVAL OF ALL PROPOSED CONSTRUCTION MATERIALS AND EQUIPMENT PRIOR TO ANY CONSTRUCTION.
 - EXISTING 'ONSITE WASTEWATER TREATMENT SYSTEM (OWTS) PRECAST STRUCTURES ARE TO BE PUMPED OUT, RINSED WITH CLEAN WATER AND PUMPED OUT AGAIN. PUMPING MUST BE PERFORMED BY A STATE LICENSED SEPTIC HAULER AND THE CONTENTS OF THE TANK DISPOSED OF PROPERLY. AFTER PUMPING, THE EXISTING OWTS STRUCTURES MUST BE FILLED WITH FLOWABLE FILL OR REMOVED AND REPLACED WITH GRAVEL BORROW AND 4" LOAM AND SEED.
 - REMOVE ALL PORTIONS OF THE EXISTING OWTS WITHIN 5' OF THE GRAVEL SAND TREATMENT SYSTEM, AND ALL FILL, A HORIZON SOIL, B HORIZON SOIL AND SCARIFY 3" OF THE C HORIZON SOIL BELOW THE GRAVEL SAND TREATMENT SYSTEM AND THOROUGHLY MIX WITH ASTM C-33 SAND (SEE NOTE 16) TO INTERFACE THE FILL WITH THE SOIL, AND REPLACE ALL REMOVED SOIL WITH ASTM C-33 SAND. A AND B SOIL HORIZON LAYERS ARE TO BE REMOVED IN THIS APPLICATION DUE TO COMPACTION CAUSED BY PREVIOUS SYSTEM INSTALLATION AND FILL BEING PLACED ABOVE.
 - UNSATURABLE MATERIAL USED TO BACKFILL THE TEST HOLES SHALL BE REMOVED AND REPLACED WITH WITH ASTM C-33 SAND (SEE NOTE 16).
 - ASTM C-33 SAND (SEE NOTE 16) MUST BE PLACED ON SCARIFIED, RELATIVELY DRY NATURAL SOIL. THE CONTRACTOR SHALL PROVIDE FOR DEWATERING AS REQUIRED AND ALL WORK SHALL BE PERFORMED UNDER DRY CONDITIONS.
 - BUILDING SEWER PIPE TO BE 4" P. V. C. SCH. 40 UNLESS OTHERWISE NOTED.
 - PLACE 6" MINIMUM COMPACTED CRUSHED STONE UNDER SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER, ADVANTEK TREATMENT TANKS AND SYSTEM STRUCTURES.
 - INLET AND OUTLET TEES FOR SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK AND PUMP CHAMBER ARE TO BE LOCATED DIRECTLY BELOW ACCESS COVERS.
 - SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEK TREATMENT TANK RISERS/COVERS TO BE AT FINISH GRADE.
 - IF CONDITIONS ENCOUNTERED DURING CONSTRUCTION VARY SUBSTANTIALLY FROM THOSE SHOWN ON THIS PLAN, NOTIFY CAPUTO AND WICK, LTD. BEFORE PROCEEDING WITH CONSTRUCTION, IF IN DOUBT, ASK.
 - NEW SEPTIC TANK SHALL MEET ALL OF THE REQUIREMENTS OF 250-RICR-150-10-6-27.
 - INSPECTION OF THE SEPTIC TANK, ANOXIC TANK, RECIRCULATION TANK, PUMP CHAMBER AND ADVANTEK TREATMENT TANK SHALL BE PART OF THE MAINTENANCE SERVICE FOR THE OWTS AND ALL COMPONENTS SHALL BE CLEANED WHEN REQUIRED.
 - IT IS RECOMMENDED THAT THE SEPTIC TANK BE INSPECTED TWICE A YEAR, AND BE CLEANED WHEN THE SOLIDS EQUAL ONE THIRD THE LIQUID DEPTH.
 - MINIMUM PERIMETER INVERT ELEVATION = 73.00. NO FINISHED GRADE BELOW 73.00 FROM THE EDGE OF THE GRAVEL SAND TREATMENT SYSTEM FOR A 10 FEET MINIMUM.
 - THE SAND MEDIA USED IN CONSTRUCTION SHALL MEET THE ASTM C-33 SPECIFICATIONS. SIEVE ANALYSIS FROM PROPOSED SOURCE IS REQUIRED TO BE SUBMITTED TOGETHER WITH SHOP DRAWINGS. TESTING OF SAND MATERIAL, DELIVERED TO THE SITE IS REQUIRED.
 - OWTS INSTALLER MUST BE FAMILIAR WITH ADVANTEK PRODUCTS AND GRAVEL SAND TREATMENT SYSTEMS PROPOSED FOR THIS SITE. SEE ADVANTEK INSTALLATION MANUAL, GRAVEL SAND TREATMENT SYSTEM DESIGN AND INSTALLATION MANUAL, AND RIDEM GUIDELINES FOR ADDITIONAL DETAILS OF INSTALLATION.
 - INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE ORENCO ADVANTEK INSTALLATION MANUAL AND GRAVEL SAND TREATMENT SYSTEM INSTALLATION MANUAL AND ALL OTHER APPLICABLE SECTIONS OF 250-RICR150-6. THE INSTALLATION SHALL ONLY BE PERFORMED BY A RHODE ISLAND DEM LICENSED INSTALLER WHO HAS RECEIVED TRAINING AND IS AUTHORIZED IN WRITING BY THE VENDORS TO INSTALL THE SYSTEM. AUTHORIZATION FROM THE VENDORS SHALL BE SUBMITTED TO ENGINEER PRIOR TO ANY CONSTRUCTION.
 - REFER TO 250-RICR-150-10-6 AND RIDEM GUIDELINES FOR ADDITIONAL INFORMATION CONCERNING THE INSTALLATION, OPERATION AND MAINTENANCE OF THE SYSTEM. THE INSTALLER AND OWNER SHOULD REVIEW AND APPLY 250-RICR-150-10-6 AND RIDEM GUIDELINES. THE SYSTEM TO BE CONSTRUCTED BY A INSTALLER LICENSED BY RIDEM AND THOROUGHLY FAMILIAR WITH THE INSTALLATION OF ADVANTEK TREATMENT DEVICES AND GRAVEL SAND TREATMENT SYSTEMS.
 - THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE DESIGN ENGINEER IN ORDER TO FACILITATE WITNESSING THE REQUIRED PHASES OF THE SYSTEM INSTALLATION AS STATED IN 250-RICR-150-10-6-47 OF THE 'REGULATIONS'. FAILURE OF THE CONTRACTOR TO NOTIFY THE DESIGN ENGINEER IN A TIMELY MANNER MAY REQUIRE THE CONTRACTOR TO EXCAVATE AND EXPOSE SYSTEM COMPONENTS FOR OBSERVATION.
 - THE DESIGNER EXPRESSLY DISCLAIMS ANY RESPONSIBILITY FOR THE INSTALLATION AND MAINTENANCE OF THE SYSTEM. IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER TO CONSTRUCT THE SYSTEM IN ACCORDANCE WITH THE ABOVE REFERENCED REGULATIONS.
 - CONTRACTOR SHALL CONTACT 'DIG-SAFE' PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES ON THIS PLAN ARE FROM EXISTING INFORMATION, BUT ARE ONLY TO BE CONSIDERED APPROXIMATE.
 - THERE ARE NO PUBLIC WELLS, EXISTING OR PROPOSED, FOUND TO BE LOCATED WITHIN 500 FEET OF THE PROPOSED OWTS EXCEPT AS SHOWN.
 - NO FRESHWATER WETLANDS OBSERVED WITHIN 200 FEET OF THE PROPOSED OWTS. THIS SITE DOES NOT LIE WITHIN A CRITICAL RESOURCE AREA.
 - I CERTIFY THAT THERE ARE NO WELLS FOUND TO BE LOCATED WITHIN 200 FEET OF THE PROPOSED LEACHING AREA, OTHER THAN AS SHOWN ON THIS PLAN. I ALSO CERTIFY THAT THERE ARE NO EXISTING OR PROPOSED DRAINS, FOUNDATION DRAINS OR SUB DRAINS FOUND TO BE LOCATED WITHIN 25 FEET OF THIS PROPOSED OWTS.
 - ALL PIPE JOINTS, PIPE CONNECTIONS AND ACCESS COVERS ARE TO BE WATERTIGHT.
 - PRESSURE PIPE SHALL BE INSTALLED TO MAINTAIN SLOPE BACK TO TANK/PUMP CHAMBER TO DRAIN BETWEEN PUMPING CYCLES. ELIMINATE ANY HIGH OR LOW POINTS THAT MAY PREVENT DRAINING AND/OR AIR LOCKS.
 - CONTRACTOR TO PAY ANY REQUIRED INSTALLATION FEES.
 - CONTROL PANEL AND ALARM TO BE MOUNTED INSIDE BUILDING IN A CONSPICUOUS LOCATION. EXACT LOCATION TO BE COORDINATED WITH OWNER. ALL CONTROL PANELS AND JUNCTION BOXES SHALL BE NEMA 4X.
 - THE PUMP DOSING CONTROLS WILL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER AND ORENCO REPRESENTATIVE. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
 - ALL TREES AND SHRUBS SHALL BE CLEAR AND NO NEW ONES SHALL BE PLANTED WITHIN 10' OF THE GRAVEL SAND TREATMENT SYSTEM.
 - THE GRAVEL SAND TREATMENT SYSTEM LOCATION SHALL BE STACKED OUT AND PROTECTED PRIOR TO ANY SITE PREPARATION ACTIVITIES.
 - NO IMPERVIOUS SURFACE IS TO BE PLACED ABOVE THE GST (LEACHING) SYSTEM.
 - MATERIAL AND EQUIPMENT FROM ALTERNATE MANUFACTURERS MAY BE USED IF EQUAL. APPROVAL FOR ALTERNATE MATERIAL AND/OR EQUIPMENT IS REQUIRED FROM THE OWNER AND ENGINEER. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY THE CONTRACTOR. IF ACCEPTABLE, THE CONTRACTOR MUST PREPARE AND SUBMIT FOR AN RIDEM OWTS CONSTRUCTION PERMIT BASED UPON THE REDESIGN.



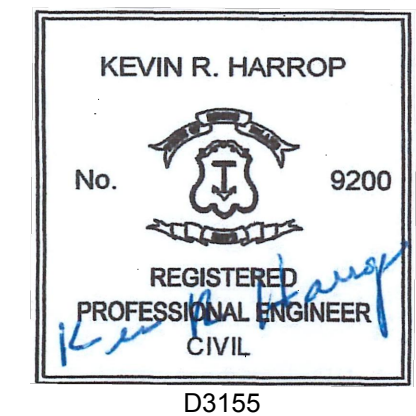
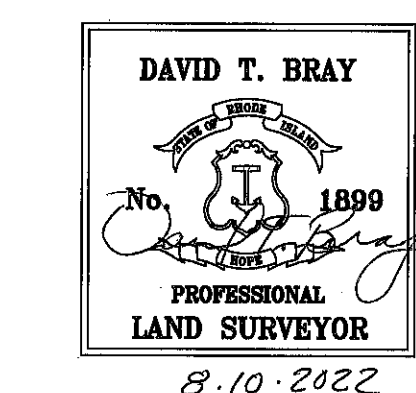
CERTIFICATION:
THIS SURVEY HAS BEEN CONDUCTED AND THE PLAN HAS BEEN PREPARED PURSUANT TO SECTION 6 OF THE RULES AND REGULATIONS ADOPTED BY THE RHODE ISLAND STATE BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS ON NOVEMBER 25, 2015, AS FOLLOWS:

TYPE OF BOUNDARY SURVEY: LIMITED CONTENT BOUNDARY SURVEY
MEASUREMENT SPECIFICATION: NOT A BOUNDARY SURVEY

OTHER TYPE OF SURVEY: DATA ACQUISITION SURVEY (LOCATIONS)
CLASS II: T2 (IMMEDIATE AREA AROUND BATHHOUSE AND OWTS)

THE PURPOSE OF THIS SURVEY IS TO DEPICT THE EXISTING CONDITIONS IN THE PROJECT AREA FOR CONSTRUCTION AND THE DESIGN OF A NEW ON-SITE WASTEWATER TREATMENT SYSTEM.

David T. Bray 8/10/2022
DAVID T. BRAY PLS NO. 1999
CAPUTO AND WICK LTD., COA NO. A177



LEGEND

— 100 —	EXISTING CONTOUR	+ 100.00	FINISHED SPOT GRADE
— 100 —	PROPOSED CONTOUR	+ 100.00	EXISTING SPOT GRADE
RI, STD.	RHODE ISLAND STANDARD	—	SPLIT RAIL FENCE
INV.	INVERT OF PIPE	—	DEEP OBSERVATION HOLE
P. V. C.	POLYVINYL CHLORIDE PIPE	—	OUT CROP OR SURFACE ROCK
S. D. R.	STANDARD DIMENSION RATIO	—	EXIST. UNDERGROUND ELECTRIC
CONC.	CONCRETE	—	EXIST. WATER
BIT.	BITUMINOUS	—	EXIST. UNDERGROUND TELEPHONE
TYP.	TYPICAL	—	FINISH GRADE SURFACE FLOW DIRECTION

CAPUTO AND WICK LTD. - 1150 PAWTUCKET AVENUE - RUMFORD R.I. 02916

DESIGN DATA

DAILY SEWAGE FLOW:
50 GPD/CAMPSITE x 156 CAMPSITES = 7800 GALLONS PER DAY (G.P.D.)

GROUND WATER TABLE : 40"

DEPTH TO IMPERVIOUS : NOT ENCOUNTERED

SOIL CLASS: B, SOIL CATEGORY: 3. LOADING RATE: 0.70 GALS./S.F./DAY

SEPTIC TANK REQUIREMENTS VOLUME = 2 X 7,800 G.P.D. = 15,600 GALLONS

LEACHING AREA REQUIREMENTS:
GRAVEL SAND TREATMENT (GST) SYSTEM WITH CATEGORY 1 TREATMENT (ORENCO ADVANTEK TREATMENT AX100)
ASSIGNED EFFLUENT LOADING RATE = 3.5 GPD PER S. F.
SQUARE FOOTAGE OF GST REQUIRED = 7800 GPD / 3.5 GPD PER S.F. = 2,229 S.F.
LENGTH OF GST 6212 REQUIRED = 2,229 S.F. / 17.5 S.F./L.F. = 127 L.F.
LENGTH OF GST 6212 SPECIFIED: 280 L.F.

TOTAL GST SYSTEM CAPACITY = 280 L.F. X 17.5 S.F./L.F. X 3.5 G.P.D./S.F. = 17,150 GPD
17,150 GPD > 7,800 GPD - CAPACITY = 220% OF ANTICIPATED DESIGN FLOW

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

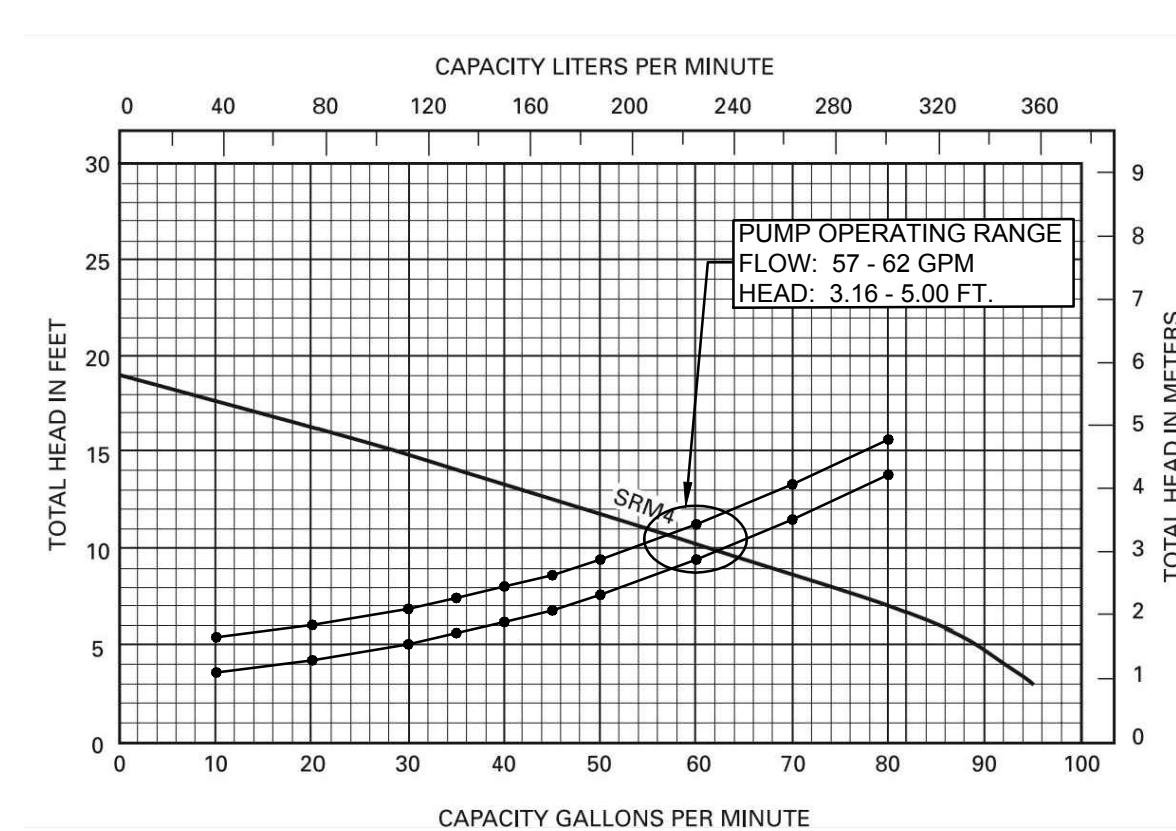
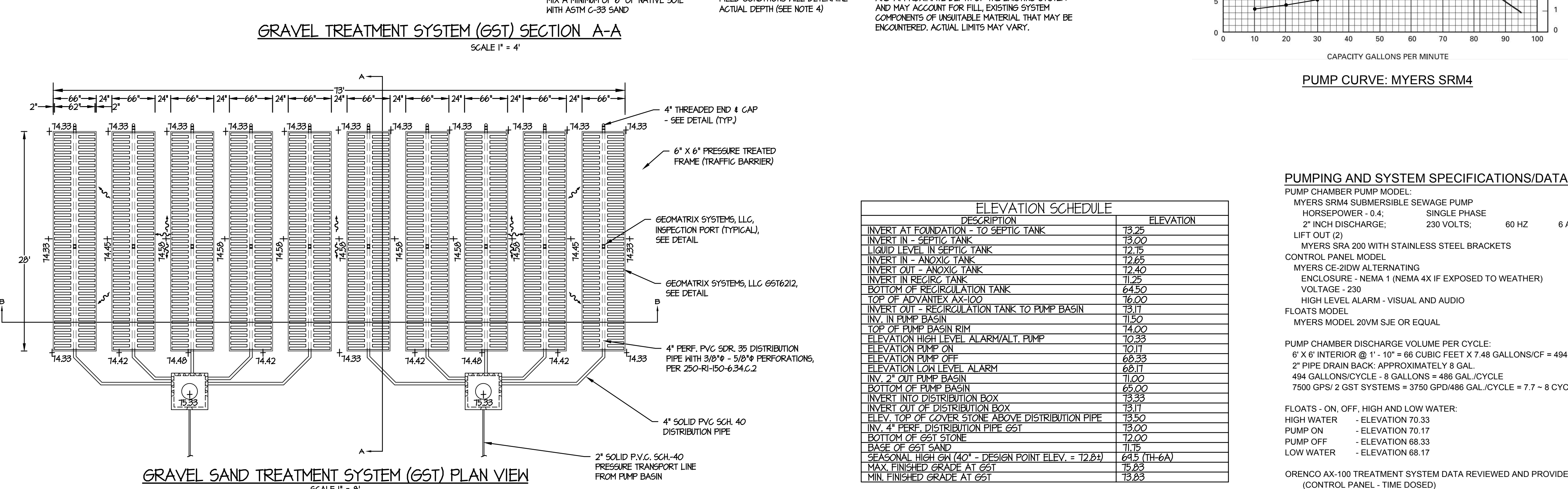
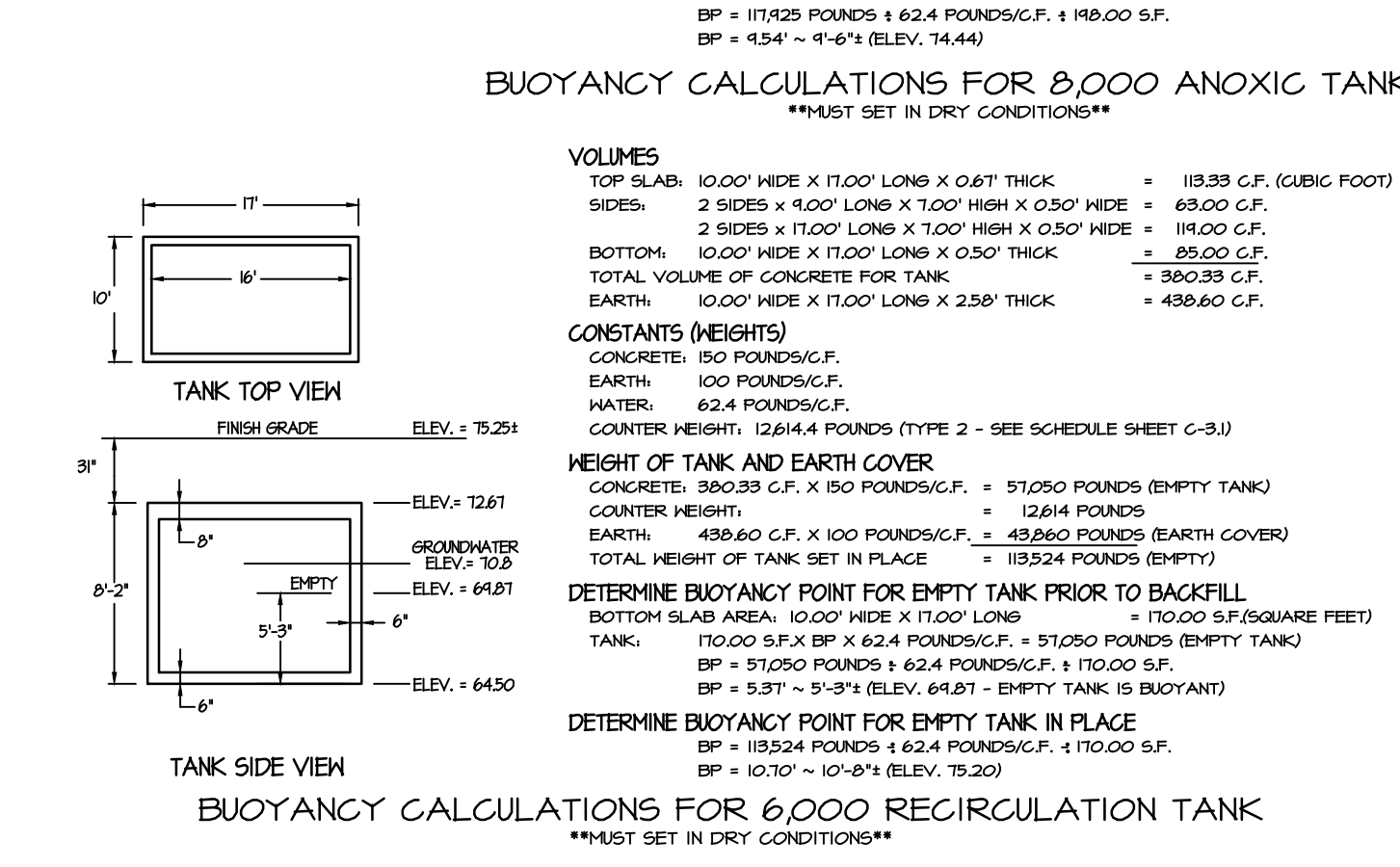
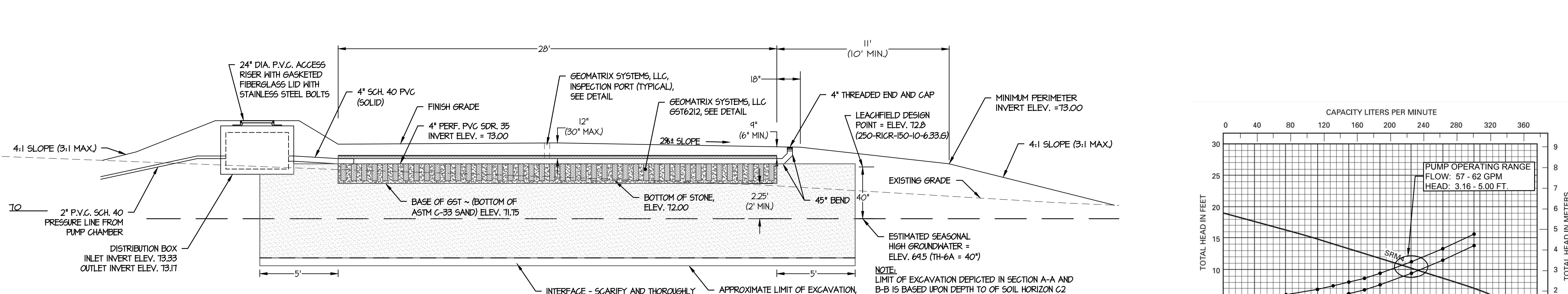
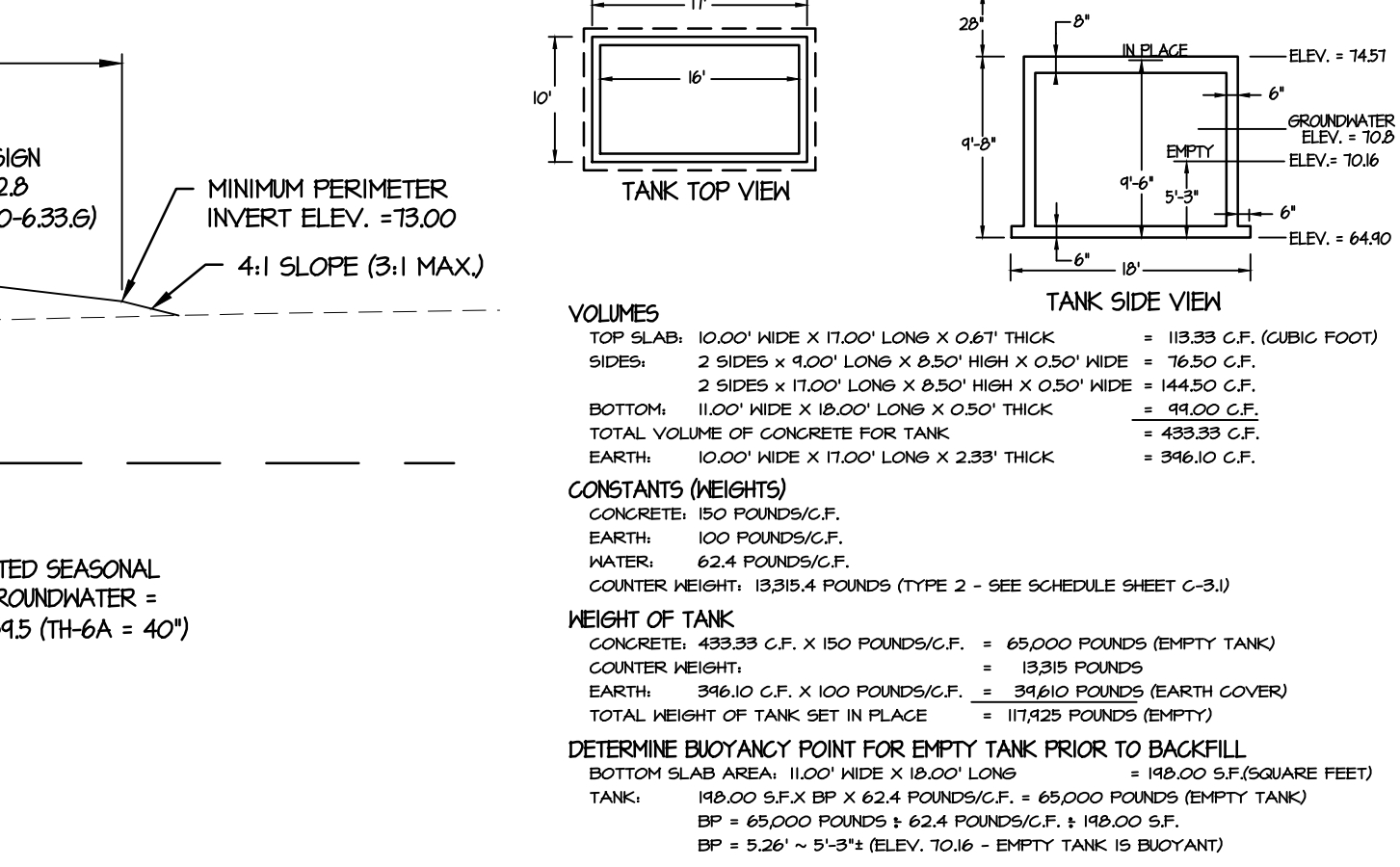
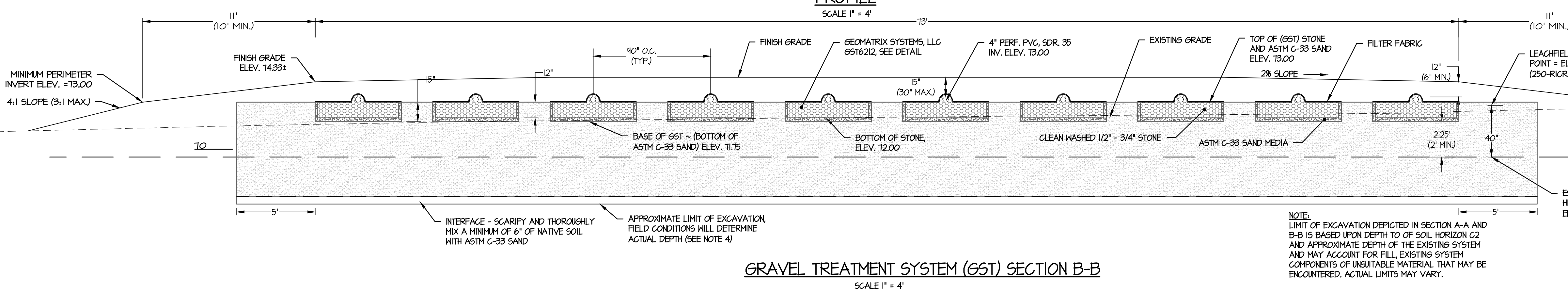
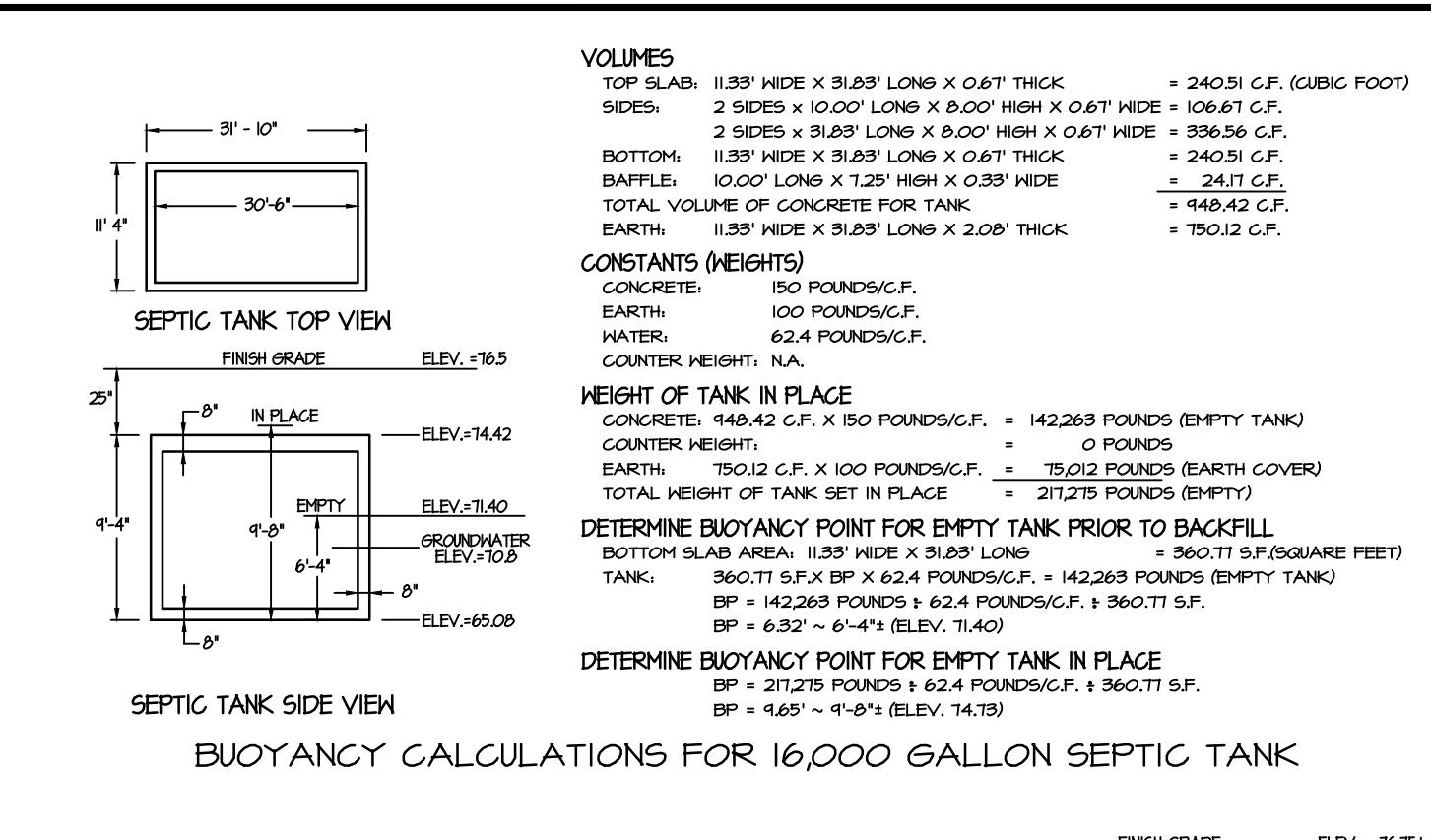
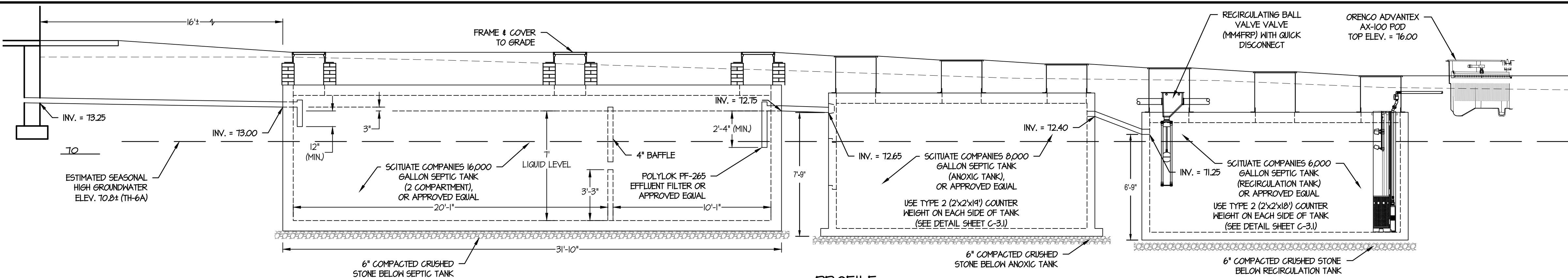
DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

LEGIONTOWN CAMP BATHHOUSE - SITE PLAN

Dwg: _____ Scale: 1" = 20'
Contract No. x _____ Date: FEBRUARY, 2023

C-1.6
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BURLINGAME STATE PARK AND CAMPGROUND



DESCRIPTION	ELEVATION
INVERT AT FOUNDATION TO SEPTIC TANK	13.25
INVERT IN - SEPTIC TANK	13.00
LIQUID LEVEL IN SEPTIC TANK	12.15
INVERT IN - ANOXIC TANK	12.65
INVERT OUT - ANOXIC TANK	12.40
INVERT IN RECIRC TANK	11.25
BOTTOM OF RECIRCULATION TANK	64.50
TOP OF ADVANTECH AX-100	16.00
INVERT OUT - RECIRCULATION TANK TO PUMP BASIN	13.11
INV. IN PUMP BASIN	11.50
TOP OF PUMP BASIN RIM	14.00
ELEVATION HIGH LEVEL ALARM/ALT. PUMP	10.33
ELEVATION PUMP ON	10.11
ELEVATION PUMP OFF	68.33
ELEVATION LOW LEVEL ALARM	68.11
INV. 2" OUT PUMP BASIN	11.00
BOTTOM OF PUMP BASIN	65.00
INVERT INTO DISTRIBUTION BOX	13.33
INVERT OUT OF DISTRIBUTION BOX	13.11
ELEV. TOP OF COVER STONE ABOVE DISTRIBUTION PIPE	13.50
INV. 4" PERF. DISTRIBUTION PIPE GST	13.00
BOTTOM OF GST STONE	12.00
BASE OF GST SAND	11.15
SEASONAL HIGH GW (40' - DESIGN POINT ELEV. = 12.81)	64.5 (TH-6A)
MAX FINISHED GRADE AT GST	15.83
MIN FINISHED GRADE AT GST	13.83

PUMPING AND SYSTEM SPECIFICATIONS/DATA:

PUMP CHAMBER PUMP MODEL:
 MYERS SRM4 SUBMERSIBLE SEWAGE PUMP
 HORSEPOWER - 0.4; SINGLE PHASE
 2" INCH DISCHARGE; 230 VOLTS; 60 HZ 6 AMPS
 LIFT OUT (2)
 MYERS SRA 200 WITH STAINLESS STEEL BRACKETS

CONTROL PANEL MODEL:
 MYERS CE-210W ALTERNATING
 ENCLOSURE - NEMA 4X IF EXPOSED TO WEATHER)
 VOLTAGE - 230
 HIGH LEVEL ALARM - VISUAL AND AUDIO
 FLOATS MODEL
 MYERS MODEL 20VM S/E OR EQUAL

PUMP CHAMBER DISCHARGE VOLUME PER CYCLE:
 6' X 6' INTERIOR @ 1' - 10" = 66 CUBIC FEET X 7.48 GALLONS/CF = 494 GAL./CYCLE
 2" PIPE DRAIN BACK: APPROXIMATELY 8 GAL.
 494 GALLONS/CYCLE - 8 GALLONS = 486 GAL./CYCLE
 7500 GPS/2 GST SYSTEMS = 3750 GPD/486 GAL./CYCLE = 7.7 - 8 CYCLES/DAY/GST

FLOATS - ON, OFF, HIGH AND LOW WATER:
 HIGH WATER - ELEVATION 70.33
 PUMP ON - ELEVATION 70.17
 PUMP OFF - ELEVATION 68.33
 LOW WATER - ELEVATION 68.17

ORENCO AX-100 TREATMENT SYSTEM DATA REVIEWED AND PROVIDED BY ATLANTIC SOLUTIONS (CONTROL PANEL - TIME DOSED)

GRAVEL SAND TREATMENT (GST) SYSTEM DATA REVIEWED BY GEOMATRIX SYSTEMS, LLC.

STATE OF RHODE ISLAND
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
 DIVISION OF PLANNING AND DEVELOPMENT

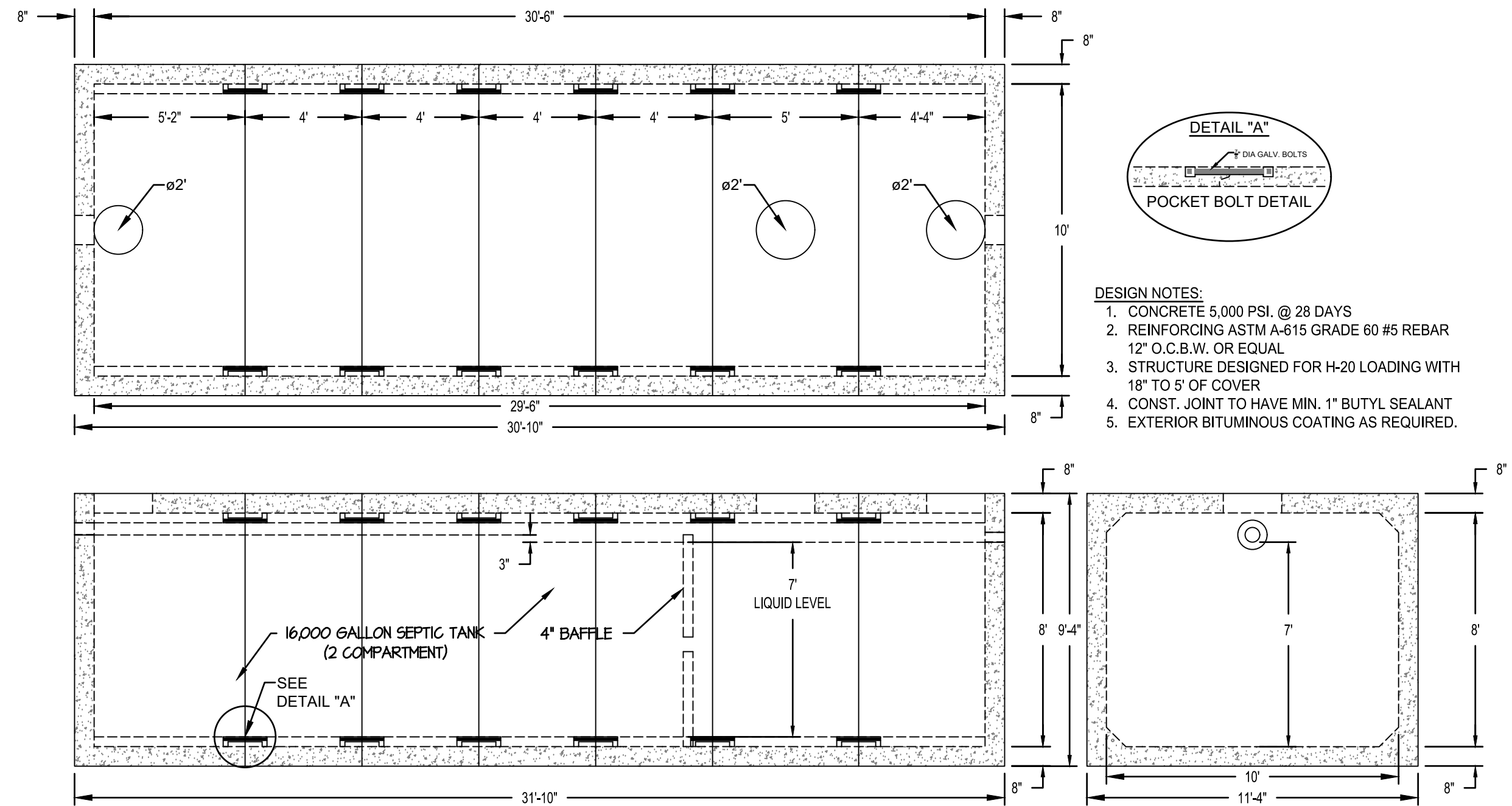
DEMOLITION AND REBUILD OF BATHHOUSES
 BURLINGAME STATE PARK AND CAMPGROUND
 CHARLESTOWN, RHODE ISLAND

LEGION TOWN BATHHOUSE - OWTS DETAILS

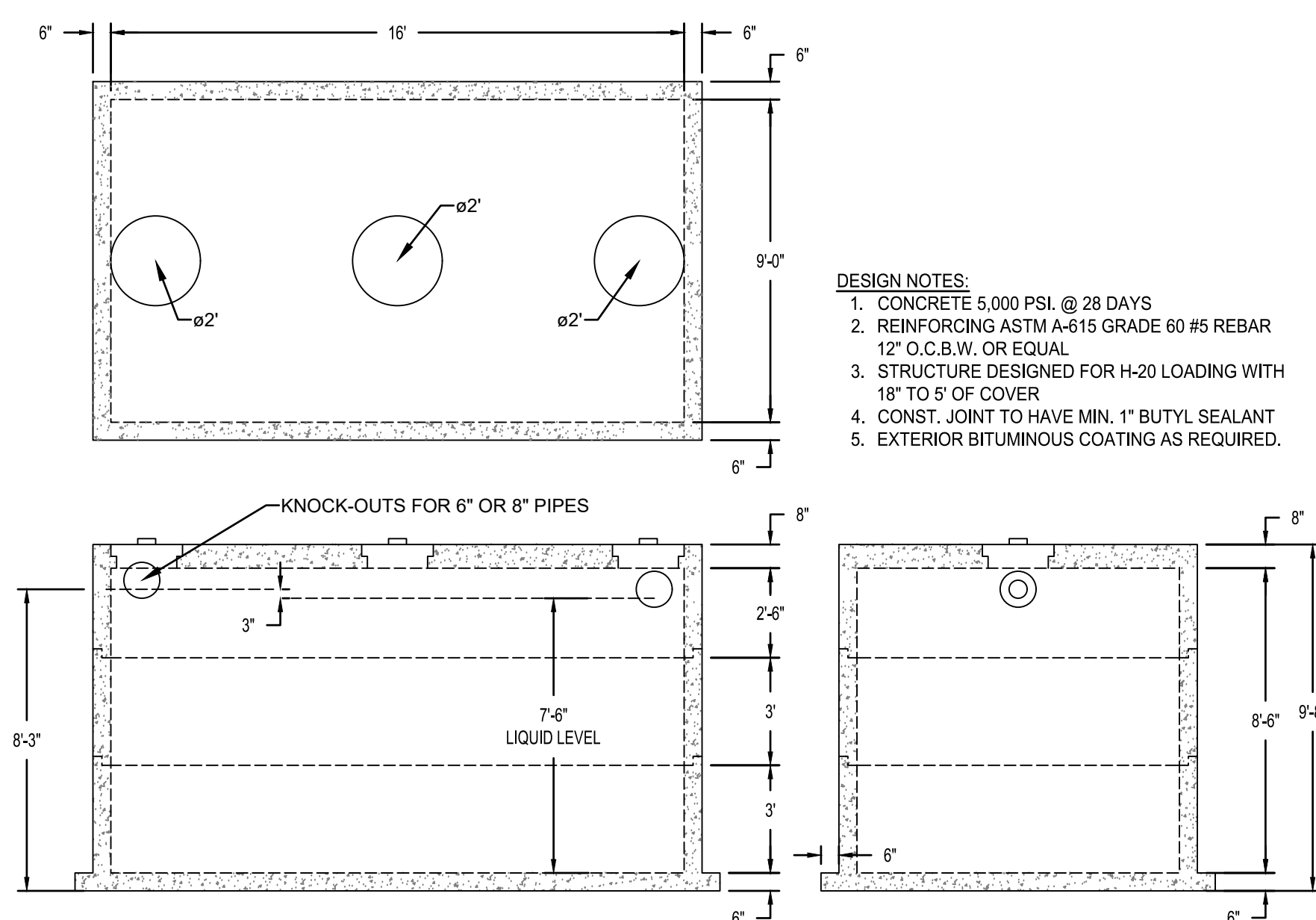
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 Contract No. x _____ Date: FEBRUARY, 2023

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 20

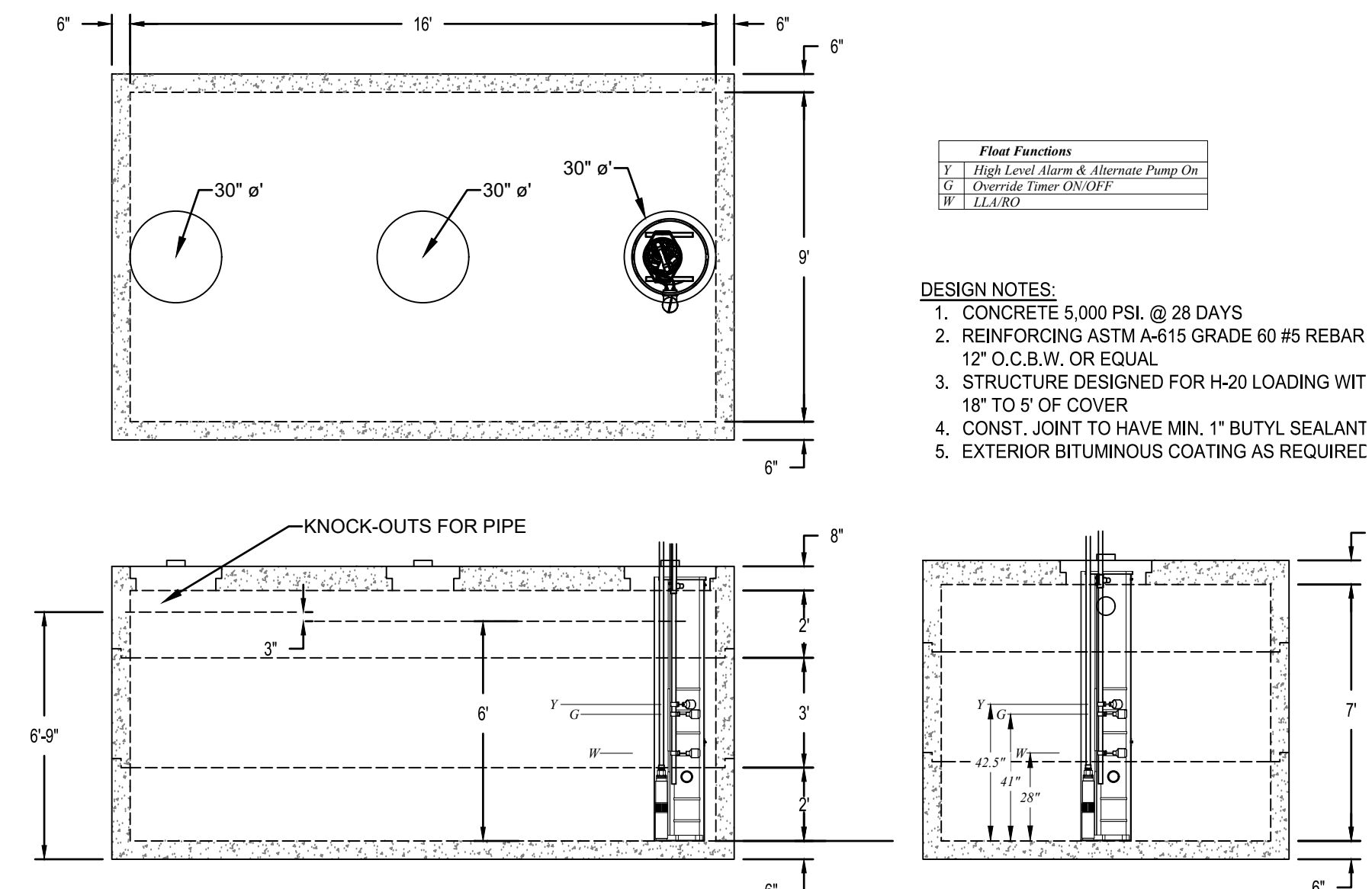
J:\RhodeIsland\Charleston\RIDDEM - Burlingame\009 - 025 - and S-6 Site Design\2023.02.10.dwg



16,000 GALLON TWO COMPARTMENT H-20 TANK
SCALE 1" = 4"



8,000 GALLON ANOXIC TANK
SCALE 1" = 4"



6,000 GALLON RECIRCULATION TANK
SCALE 1" = 4"

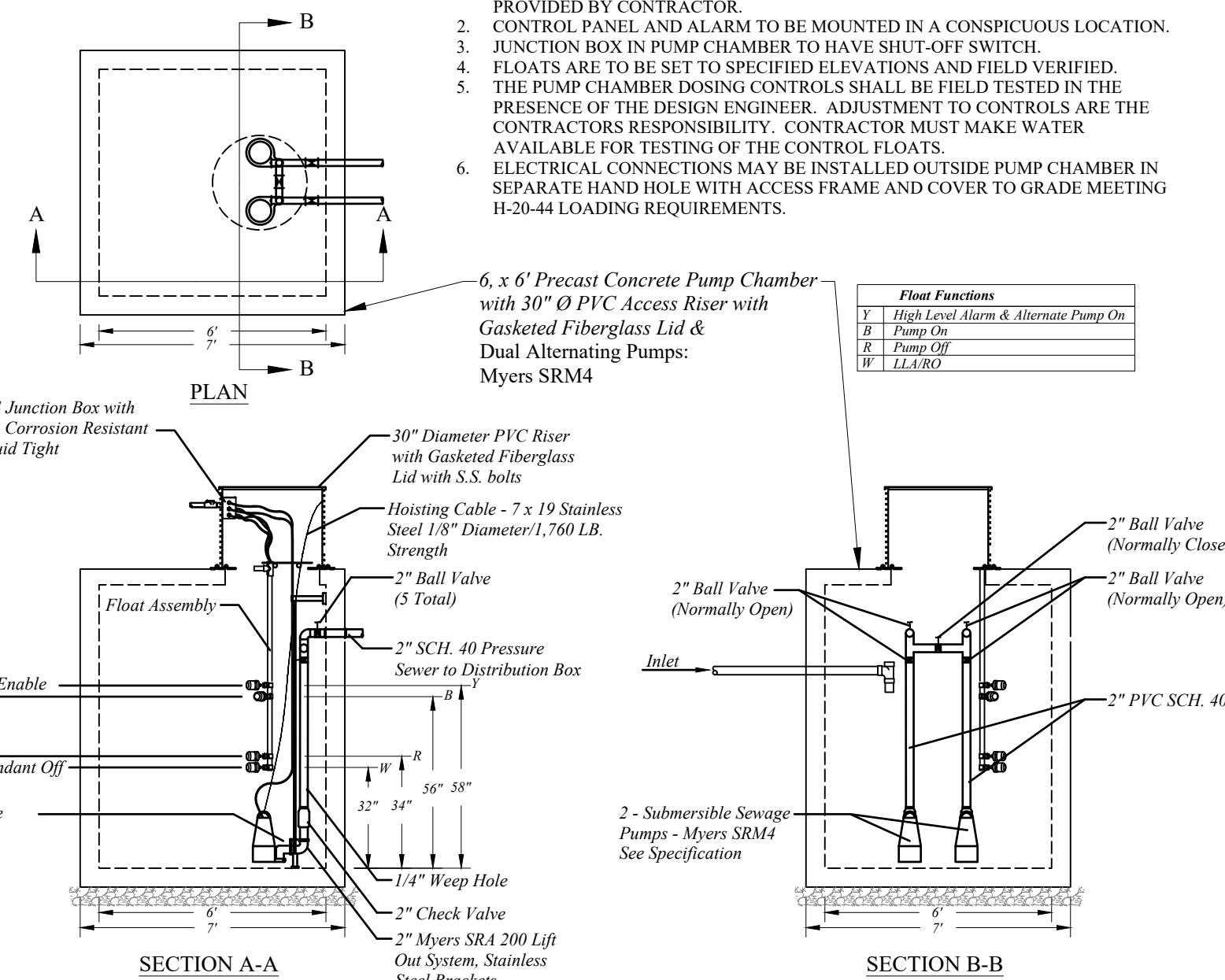
DESIGN NOTES:
1. CONCRETE 5,000 PSI @ 28 DAYS
2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR
3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

DESIGN NOTES:
1. CONCRETE 5,000 PSI @ 28 DAYS
2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR
3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

Float Functions
Y - High Level Alarm & Alternate Pump On
G - Overload Timer ON/OFF
W - LL/RL

DESIGN NOTES:
1. CONCRETE 5,000 PSI @ 28 DAYS
2. REINFORCING ASTM A-615 GRADE 60 #5 REBAR
3. STRUCTURE DESIGNED FOR H-20 LOADING WITH 18" TO 5' OF COVER
4. CONST. JOINT TO HAVE MIN. 1" BUTYL SEALANT
5. EXTERIOR BITUMINOUS COATING AS REQUIRED.

PUMPING NOTES:
1. EQUIPMENT FROM OTHER MANUFACTURERS MAY BE USED IF EQUAL APPROVAL FOR ALTERNATE EQUIPMENT REQUIRED FROM ENGINEER PRIOR TO CONSTRUCTION. FULL SPECIFICATIONS FOR ALTERNATE EQUIPMENT MUST BE PROVIDED BY CONTRACTOR.
2. CONTROL PANEL AND ALARM TO BE MOUNTED IN A CONSPICUOUS LOCATION.
3. JUNCTION BOX IN PUMP CHAMBER TO HAVE SHUT-OFF SWITCH.
4. FLOATS ARE TO BE SET TO SPECIFIED ELEVATIONS AND FIELD VERIFIED.
5. THE PUMP CHAMBER DOSING CONTROLS SHALL BE FIELD TESTED IN THE PRESENCE OF THE DESIGN ENGINEER. ADJUSTMENT TO CONTROLS ARE THE CONTRACTOR'S RESPONSIBILITY. CONTRACTOR MUST MAKE WATER AVAILABLE FOR TESTING OF THE CONTROL FLOATS.
6. ELECTRICAL CONNECTIONS MAY BE INSTALLED OUTSIDE PUMP CHAMBER IN SEPARATE HAND HOLE WITH ACCESS FRAME AND COVER TO GRADE MEETING H-20-44 LOADING REQUIREMENTS.



PUMP CHAMBER DETAIL
SCALE 1" = 4"

ANTI-FLOATATION AREA

16,000 GALLON TANK (TYPE 1) - 2 SIDES x 32.83' LONG x 1.00' WIDE	= 66.66 S.F.
16,000 GALLON TANK (TYPE 2) - 2 SIDES x 31.83' LONG x 1.00' WIDE	= 63.66 S.F.
15,000 GALLON TANK (TYPE 1) - 2 SIDES x 31.83' LONG x 2.00' WIDE	= 127.32 S.F.
8,000 GALLON TANK (TYPE 1) - 2 SIDES x 19.00' LONG x 1.00' WIDE	= 38 S.F.
8,000 GALLON TANK (TYPE 2) - 2 SIDES x 19.00' LONG x 2.00' WIDE	= 76 S.F.
7,500 GALLON TANK (TYPE 1) - 2 SIDES x 18.00' LONG x 1.00' WIDE	= 36 S.F.
7,500 GALLON TANK (TYPE 2) - 2 SIDES x 18.00' LONG x 2.00' WIDE	= 72 S.F.
6,000 GALLON TANK (TYPE 1) - 2 SIDES x 18.00' LONG x 1.00' WIDE	= 36 S.F.
6,000 GALLON TANK (TYPE 2) - 2 SIDES x 18.00' LONG x 2.00' WIDE	= 72 S.F.
PUMP CHAMBER (TYPE 1) - 2 SIDES x 8.00' LONG x 1.00' WIDE	= 16 S.F.
PUMP CHAMBER (TYPE 2) - 2 SIDES x 8.00' LONG x 2.00' WIDE	= 32 S.F.

ANTI-FLOATATION VOLUMES

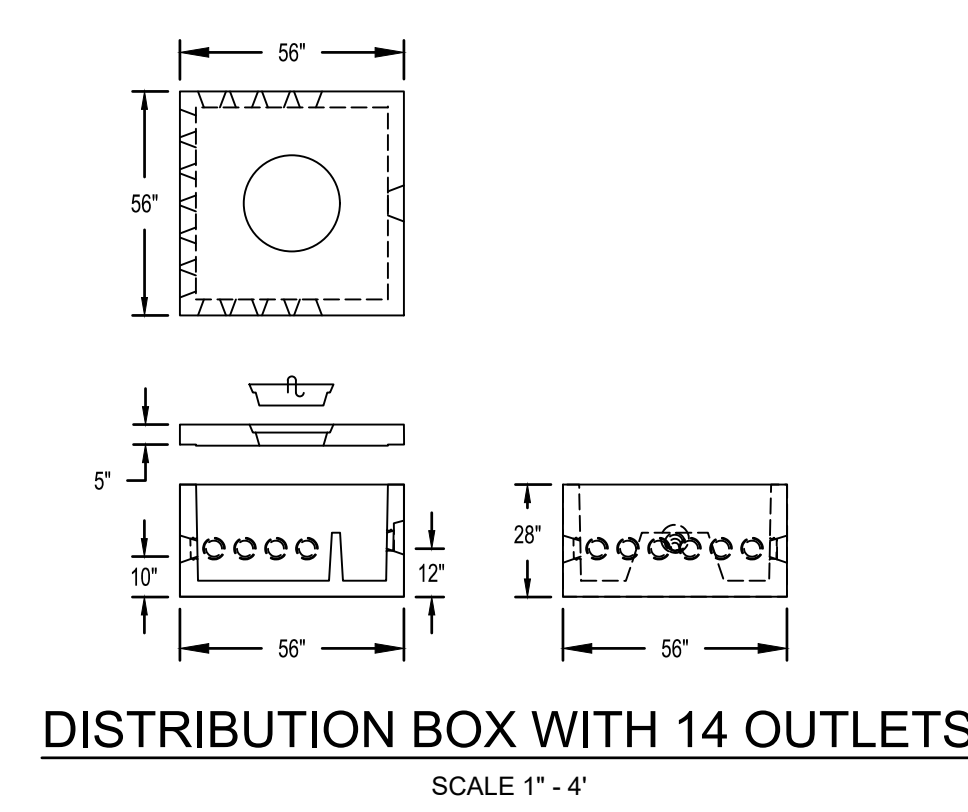
16,000 GALLON TANK (TYPE 1) - 66.66 S.F. x 2.00' HIGH	= 133.32 G.F.
16,000 GALLON TANK (TYPE 2) - 63.66 S.F. x 2.00' HIGH	= 127.32 G.F.
15,000 GALLON TANK (TYPE 1) - 127.32 S.F. x 2.00' HIGH	= 254.64 G.F.
8,000 GALLON TANK (TYPE 1) - 38 S.F. x 2.00' HIGH	= 76 G.F.
8,000 GALLON TANK (TYPE 2) - 76 S.F. x 2.00' HIGH	= 152 G.F.
7,500 GALLON TANK (TYPE 1) - 36 S.F. x 2.00' HIGH	= 72 G.F.
7,500 GALLON TANK (TYPE 2) - 72 S.F. x 2.00' HIGH	= 144 G.F.
6,000 GALLON TANK (TYPE 1) - 36 S.F. x 2.00' HIGH	= 72 G.F.
6,000 GALLON TANK (TYPE 2) - 72 S.F. x 2.00' HIGH	= 144 G.F.
PUMP CHAMBER (TYPE 1) - 16 S.F. x 2.00' HIGH	= 32 G.F.
PUMP CHAMBER (TYPE 2) - 32 S.F. x 2.00' HIGH	= 64 G.F.

CONSTANTS (WEIGHTS)

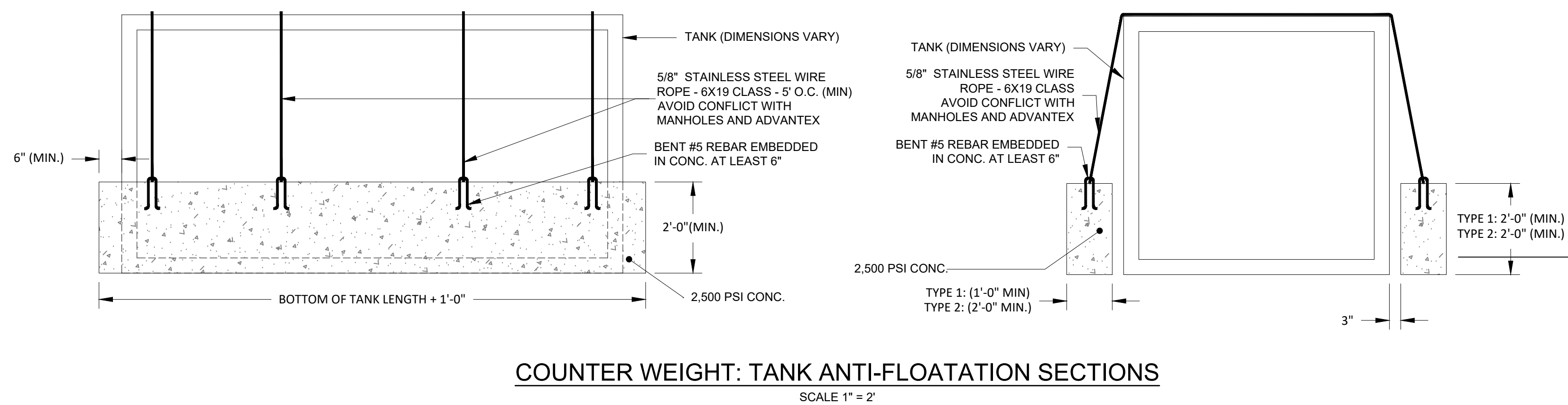
CONCRETE	150 POUNDS/C.F.
WATER	62.4 POUNDS/C.F.
SUBMERGED CONCRETE	87.6 POUNDS/C.F.

WEIGHT OF ANTI-FLOATATION IN PLACE

16,000 GALLON TANK (TYPE 1) - 133.32 G.F. x 87.6 POUNDS/G.F.	= 11,680 POUNDS
16,000 GALLON TANK (TYPE 2) - 127.32 G.F. x 87.6 POUNDS/G.F.	= 11,093 POUNDS
15,000 GALLON TANK (TYPE 1) - 254.64 G.F. x 87.6 POUNDS/G.F.	= 22,386 POUNDS
8,000 GALLON TANK (TYPE 1) - 76 G.F. x 87.6 POUNDS/G.F.	= 6,666 POUNDS
8,000 GALLON TANK (TYPE 2) - 152 G.F. x 87.6 POUNDS/G.F.	= 13,312 POUNDS
7,500 GALLON TANK (TYPE 1) - 72 G.F. x 87.6 POUNDS/G.F.	= 6,307 POUNDS
7,500 GALLON TANK (TYPE 2) - 144 G.F. x 87.6 POUNDS/G.F.	= 12,614 POUNDS
6,000 GALLON TANK (TYPE 1) - 72 G.F. x 87.6 POUNDS/G.F.	= 6,307 POUNDS
6,000 GALLON TANK (TYPE 2) - 144 G.F. x 87.6 POUNDS/G.F.	= 12,614 POUNDS
PUMP CHAMBER (TYPE 1) - 32 G.F. x 87.6 POUNDS/G.F.	= 2,803 POUNDS
PUMP CHAMBER (TYPE 2) - 64 G.F. x 87.6 POUNDS/G.F.	= 5,606 POUNDS



DISTRIBUTION BOX WITH 14 OUTLETS
SCALE 1" = 4"



COUNTER WEIGHT: TANK ANTI-FLOATATION SECTIONS
SCALE 1" = 2"

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS PRECAST STRUCTURES DETAILS

Dwg: _____ Scale: 1" = 20'
Contract No. x _____ Date: FEBRUARY, 2023

C-3.1
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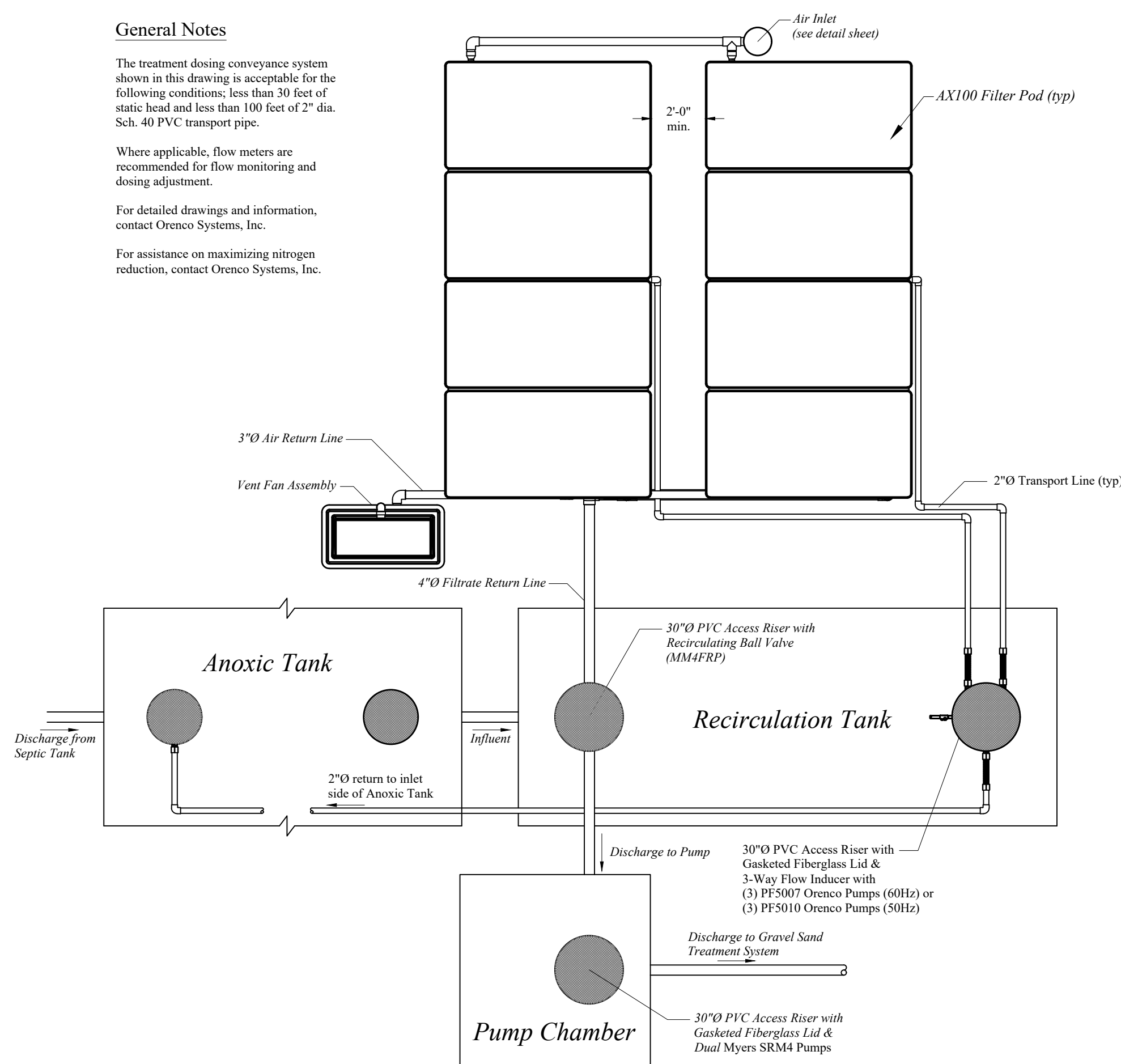
General Notes

The treatment dosing conveyance system shown in this drawing is acceptable for the following conditions: less than 30 feet of static head and less than 100 feet of 2" dia. Sch. 40 PVC transport pipe.

Where applicable, flow meters are recommended for flow monitoring and dosing adjustment.

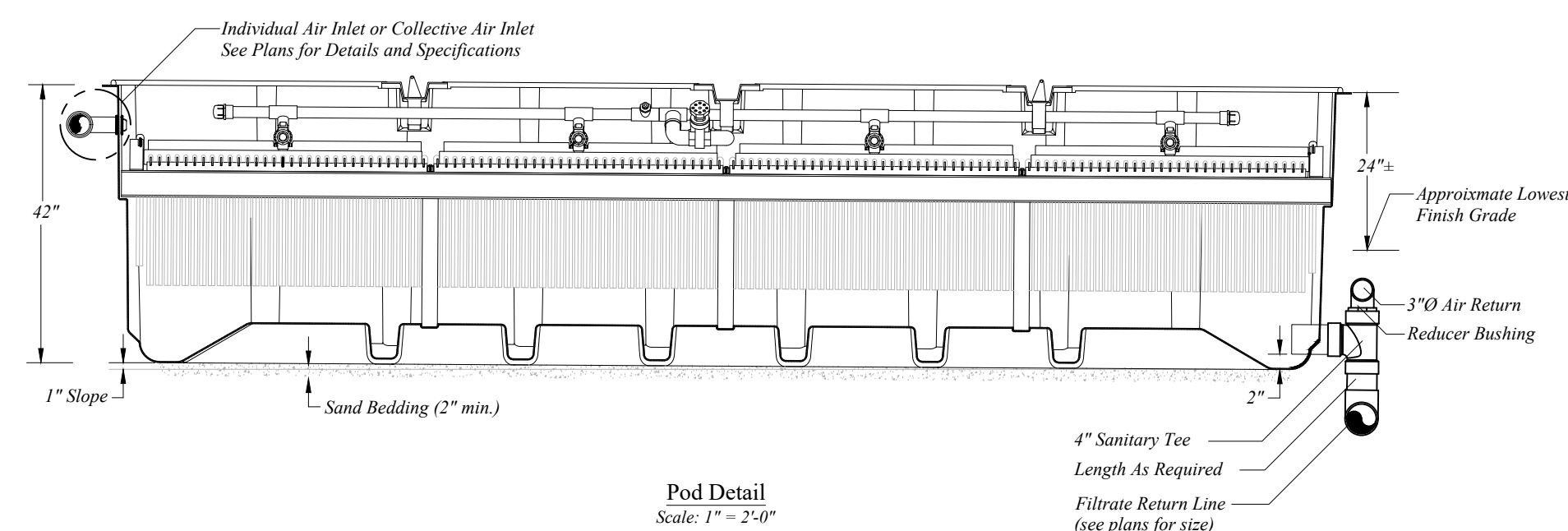
For detailed drawings and information, contact Orenco Systems, Inc.

For assistance on maximizing nitrogen reduction, contact Orenco Systems, Inc.

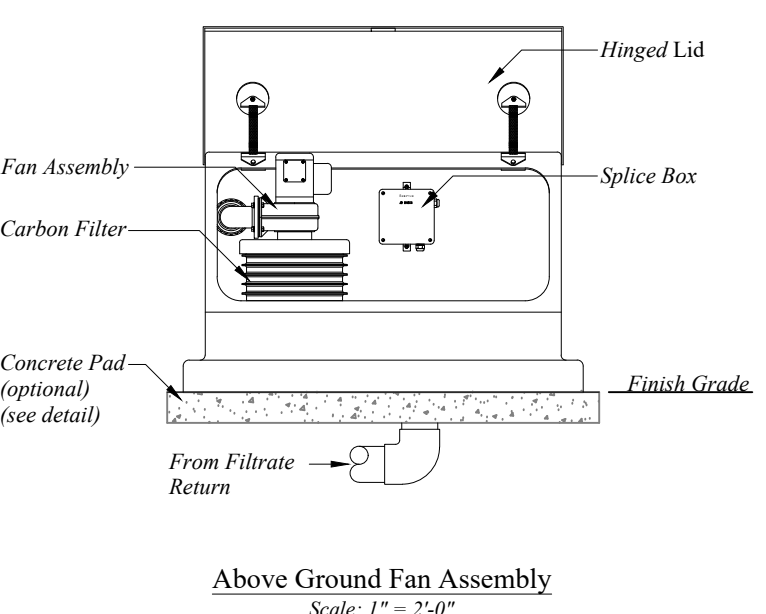


**AdvanTex AX100 SYSTEM - MANIFOLDED VENT INLET
2 POD CONFIGURATION**

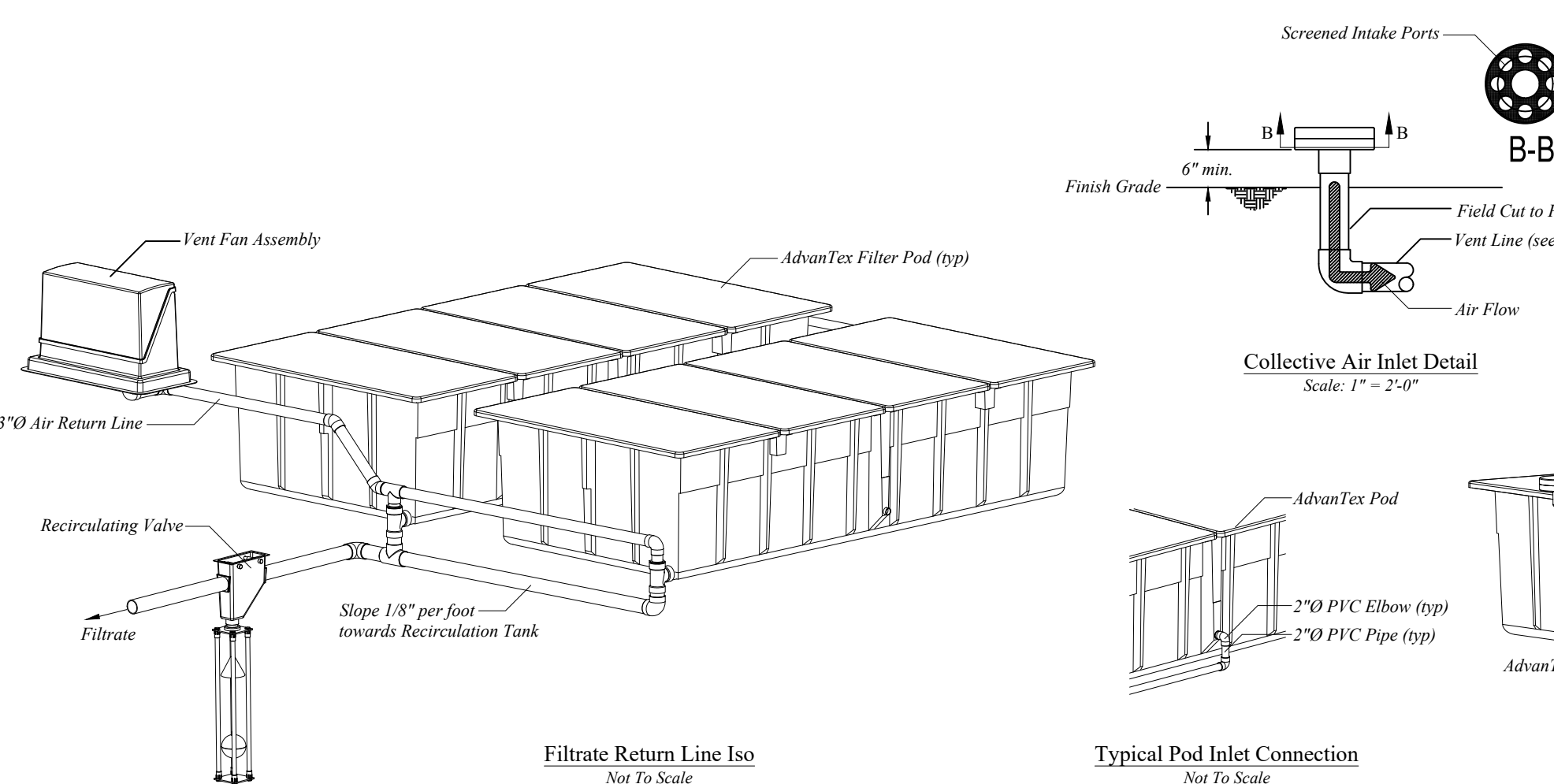
SCALE 1" = 4'



Pod Detail
Scale: 1" = 2'-0"

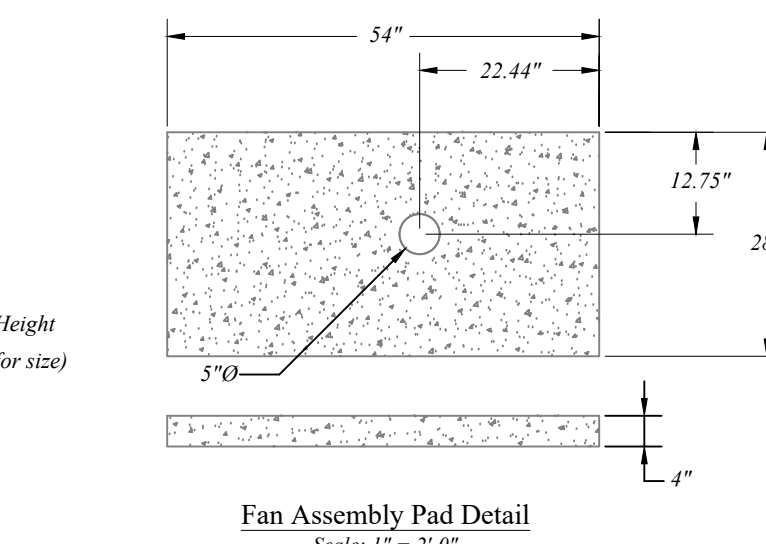


Above Ground Fan Assembly
Scale: 1" = 2'-0"

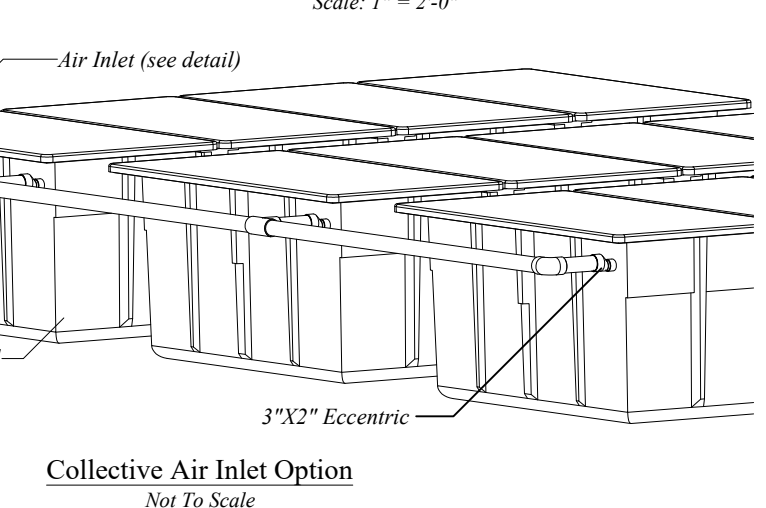


COLLECTIVE AIR INLET DETAIL

SCALE: VARIES



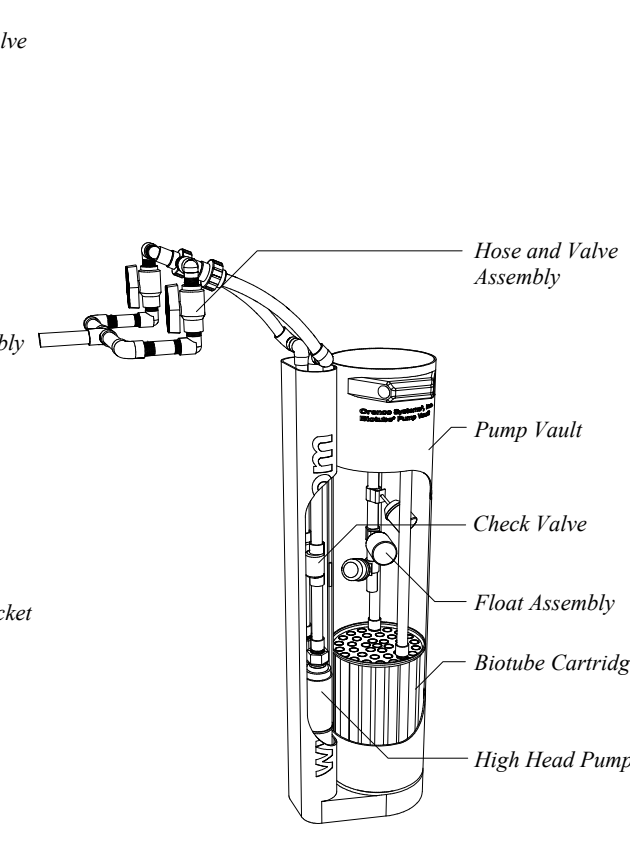
Fan Assembly Pad Detail
Scale: 1" = 2'-0"



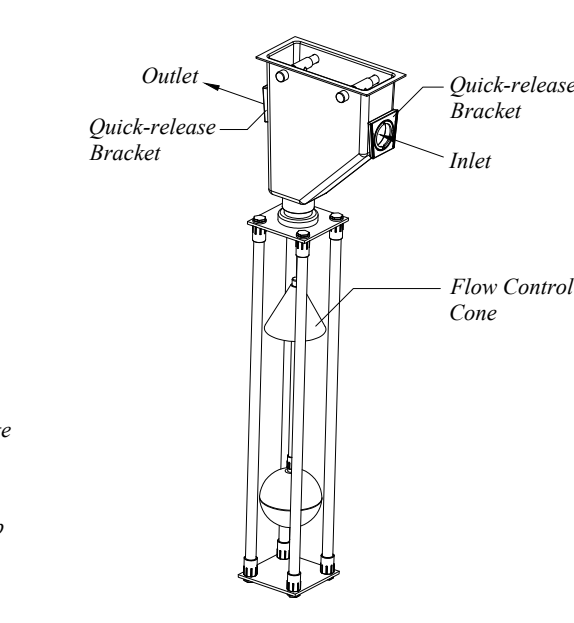
Collective Air Inlet Option
Not To Scale



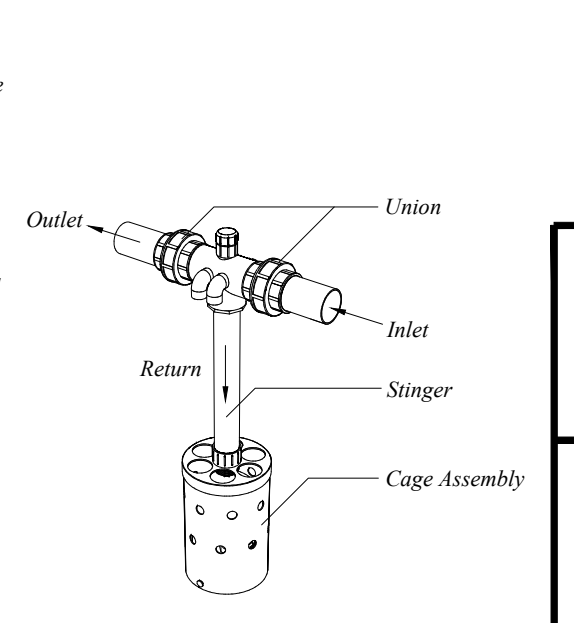
Duplex Flow Inducer Tower Detail
Scale: NTS



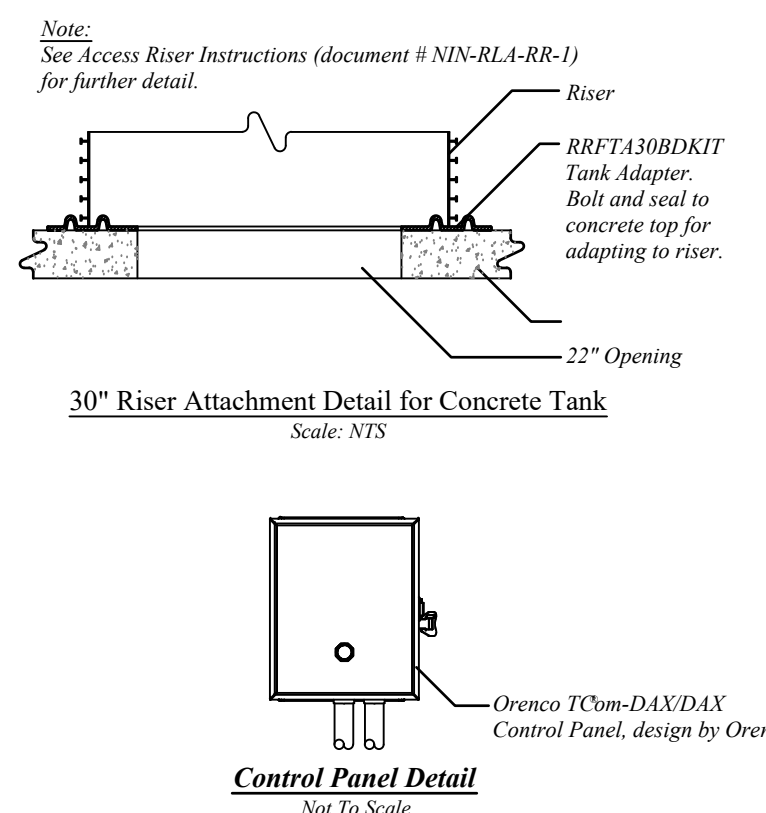
Duplex Pump Vault Detail
Scale: NTS



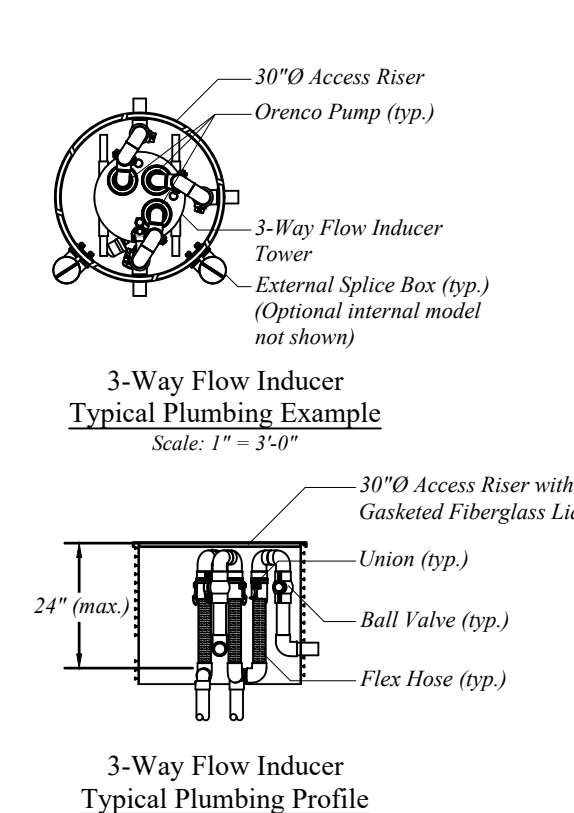
Recirculating Ball Valve Detail
Scale: NTS



Recirculating Splitter Valve Detail
Scale: NTS



30" Riser Attachment Detail for Concrete Tank
Scale: NTS



Typical Plumbing Example
Scale: 1" = 3'-0"

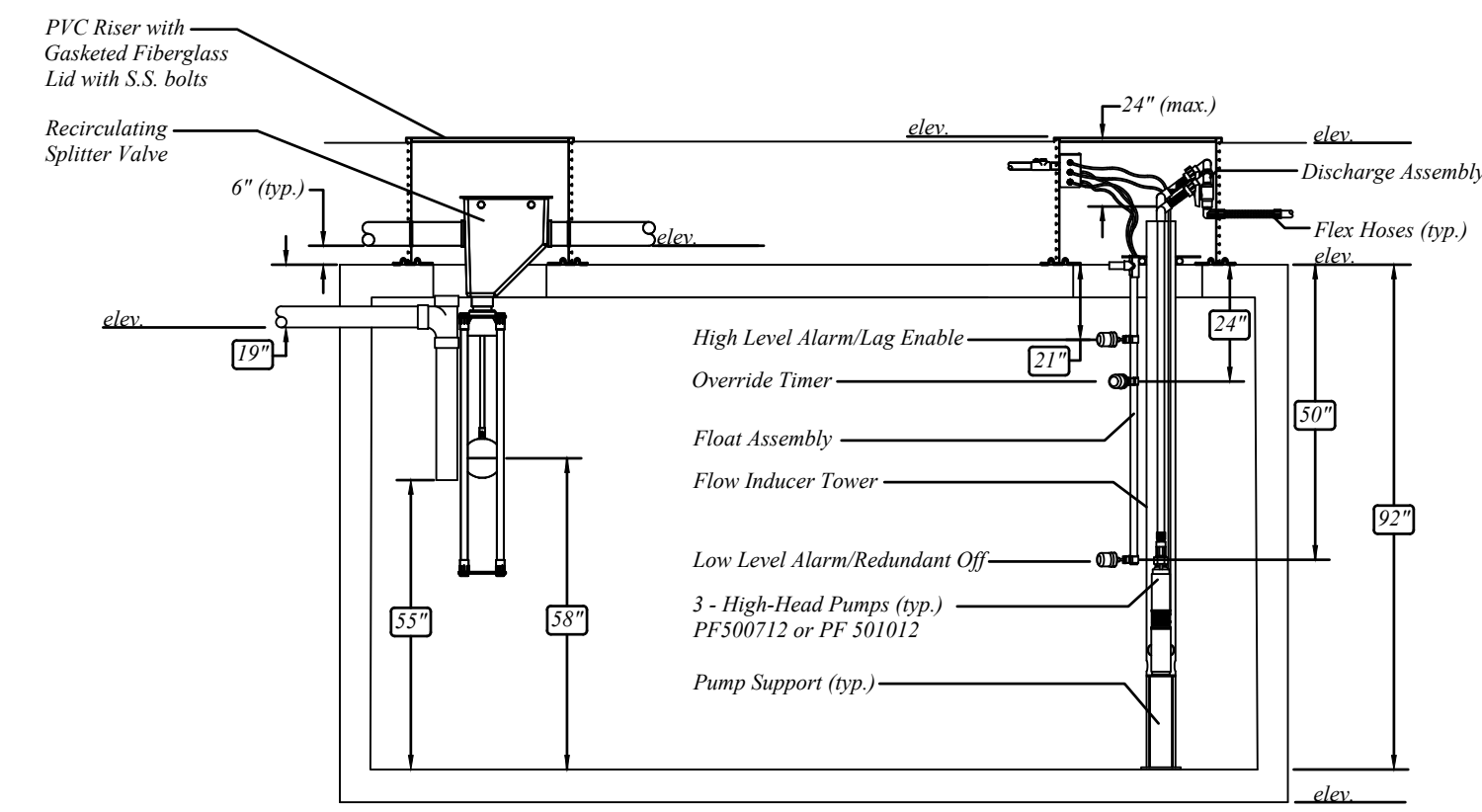
3-Way Flow Inducer Typical Plumbing Profile
Scale: 1" = 3'-0"

Control Panel Detail
Not To Scale

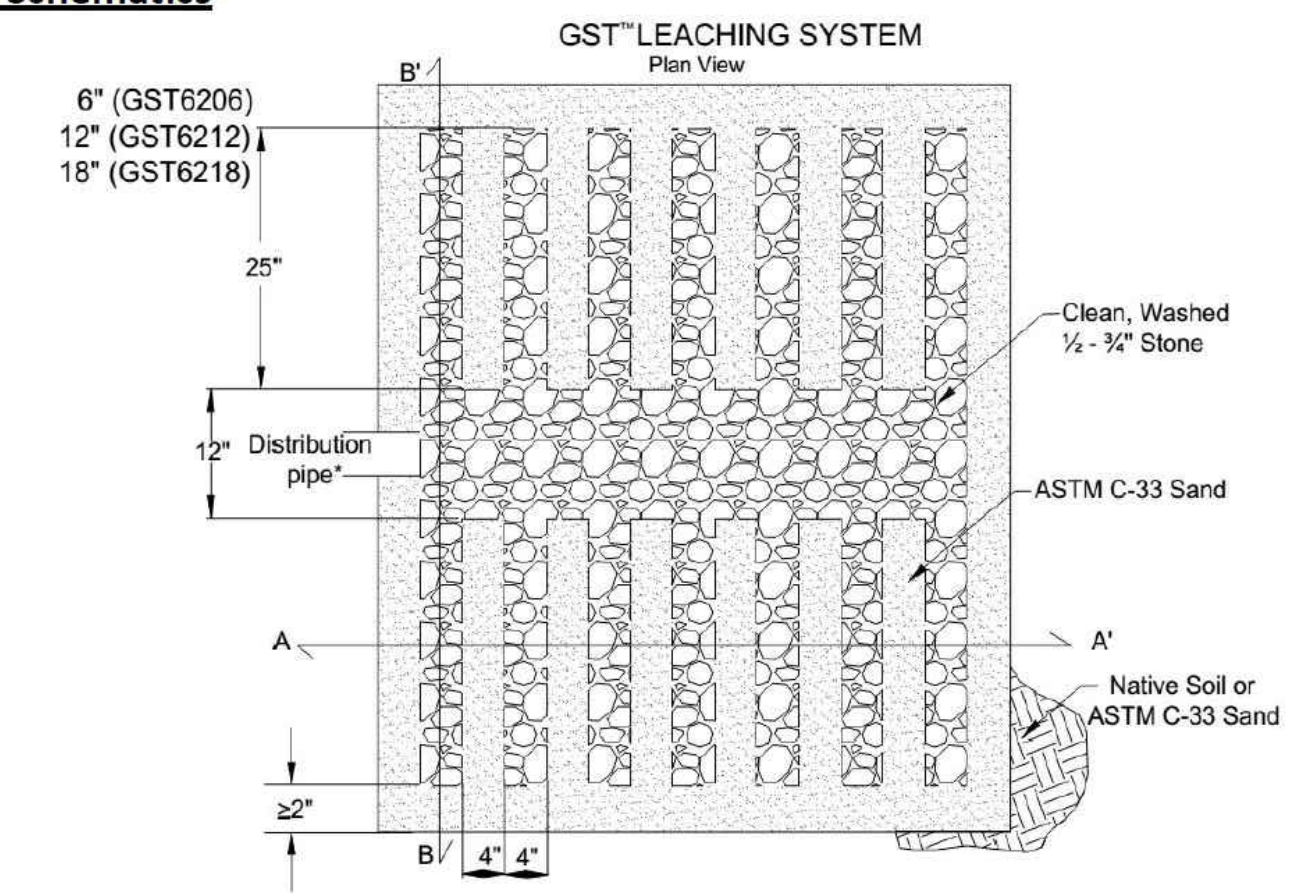
Note: See Access Riser Instructions (document # NIN-RLA-RR-1) for further detail.

RECIRCULATION TANK FLOAT AND RSV SETTINGS

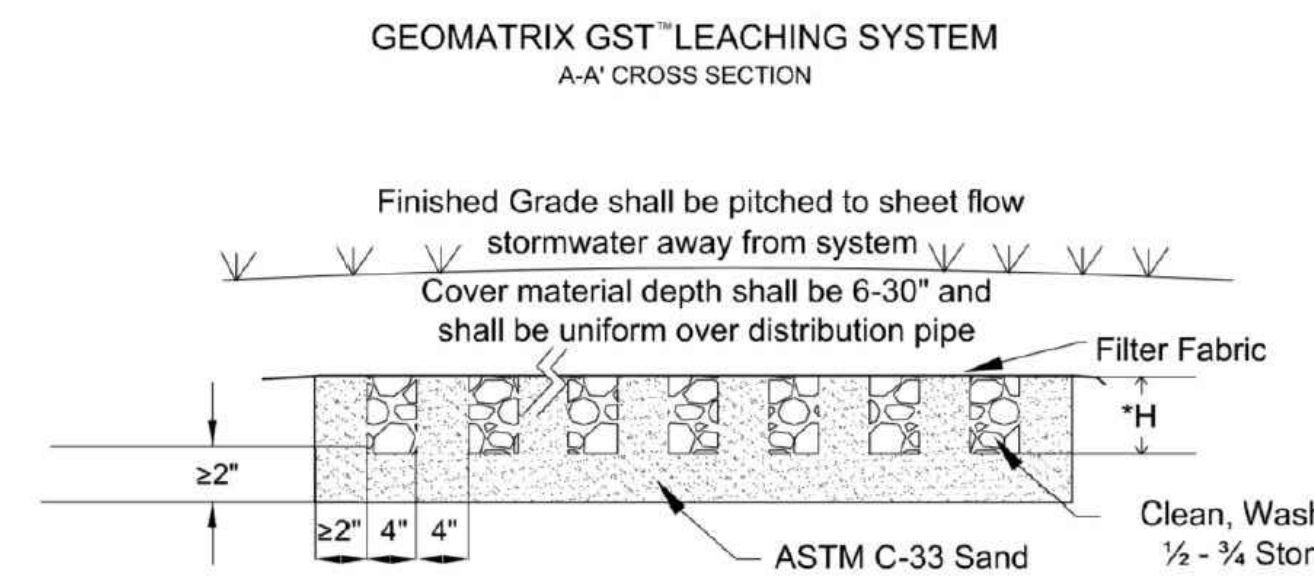
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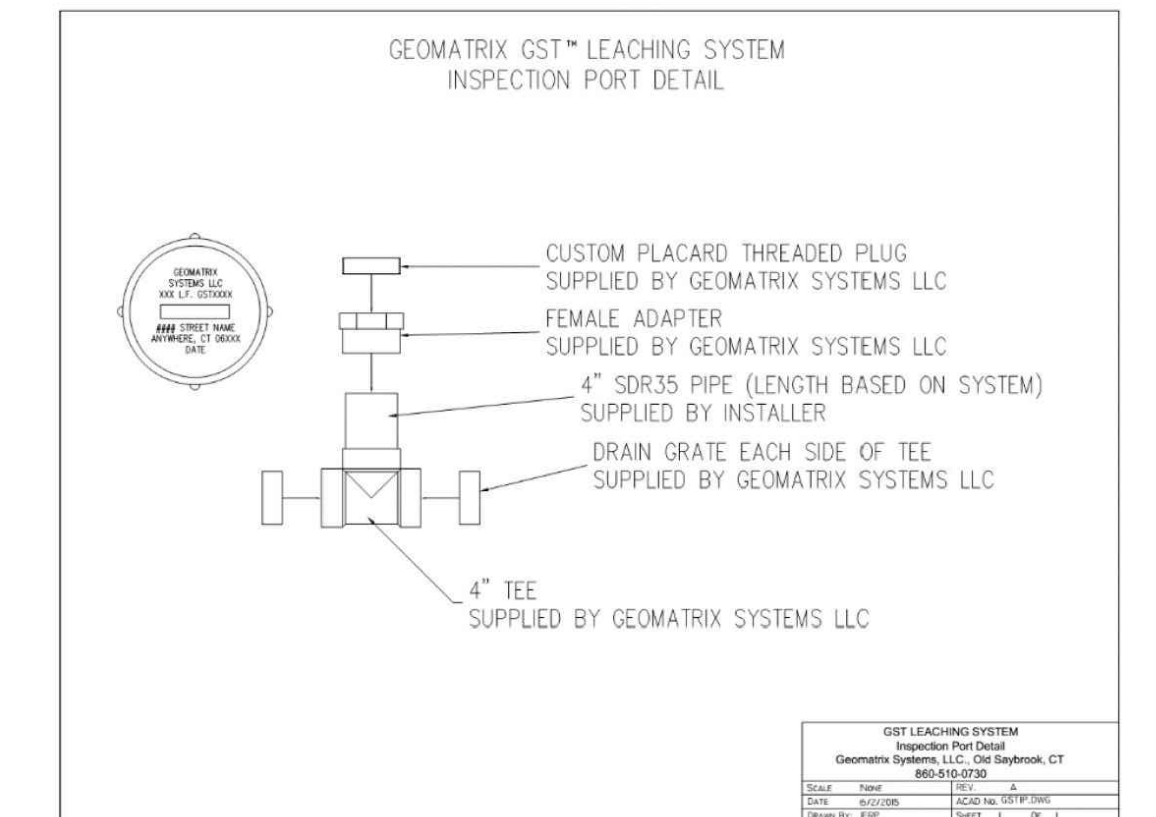
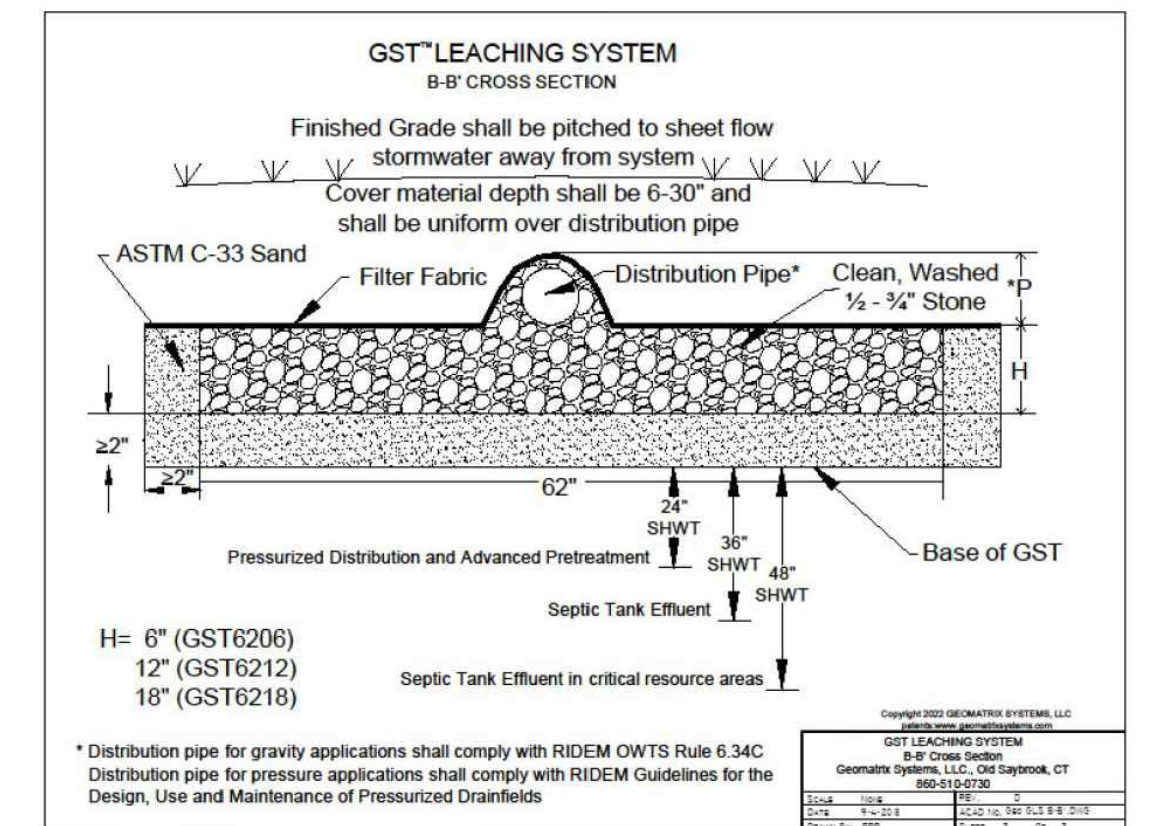
GST Schematics



* Distribution pipe for gravity systems shall comply with RIDEM DWTS Rule 6.34C. Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.



*H= 6" (GST6206)
12" (GST6212)
18" (GST6218)



BURLINGAME STATE PARK AND CAMPGROUND

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING AND DEVELOPMENT

DEMOLITION AND REBUILD OF BATHHOUSES
BURLINGAME STATE PARK AND CAMPGROUND
CHARLESTOWN, RHODE ISLAND

OWTS DETAILS

Dwg: Scale: 1" = 20'
Contract No. x Date: FEBRUARY, 2023

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STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

20.0179 6A, 6B
SHEET 1-2



Site Evaluation Form
Part A - Soil Profile Description

Application Number

Property Owner: RHODE ISLAND STATE OF (DEM) DIVISION OF PARKS

Property Location: 1-100 BURLINGAME PARK RD, CHARLESTOWN, RI PLAT 15 LOT 10

Date of Test Hole: 8/18/21

Soil Evaluator: KAMAL HINGORANY License Number: D4005

Weather: CLOUDY Shaded: Yes No Time: 9:30

Table with 11 columns: TH Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Contains two sections for TH 6A and TH 6B horizons.

TH 6A Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 40" (og)

TH 6B Soil Class B Total Depth 120" Impervious/Limiting Layer Depth 120" (og) GW Seepage Depth - SHWT 42" (og)

Comments:

Part B

Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer





20.0179 6A, 6B
SHEET 2-2

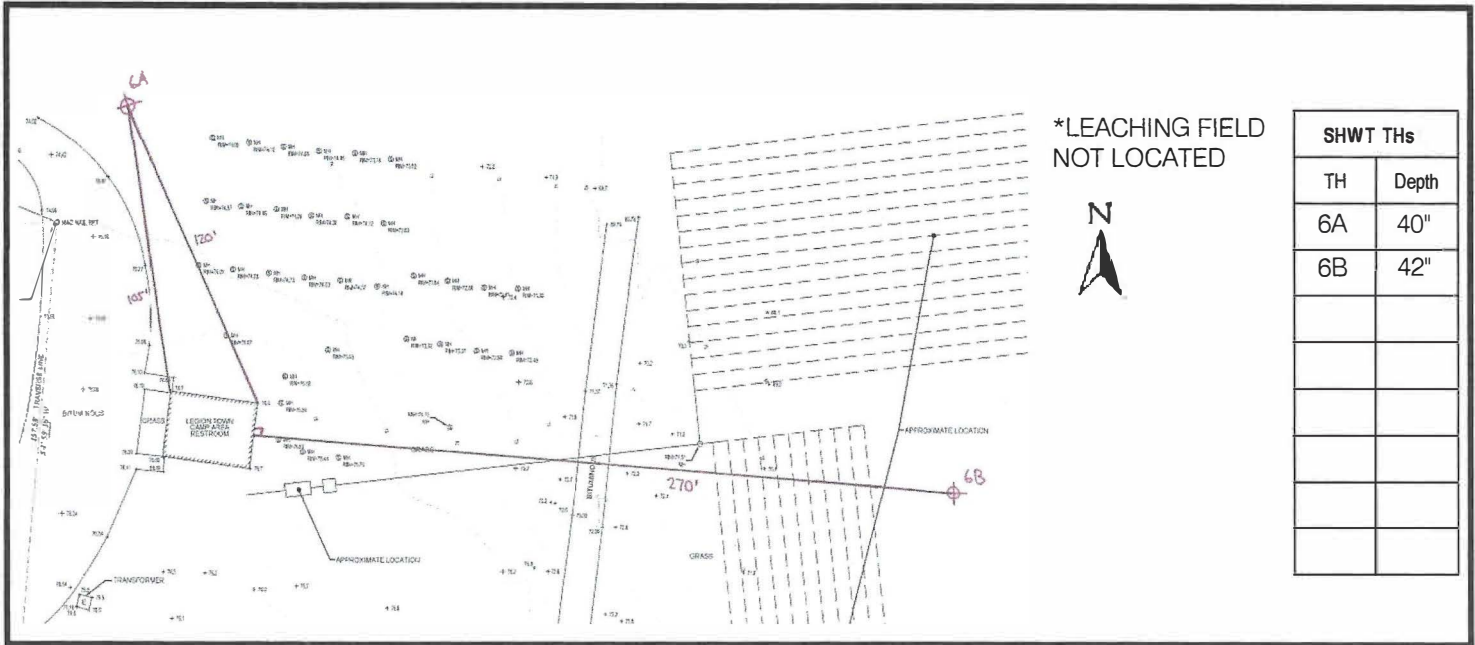
Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*

***OFFSETS MUST BE SHOWN**

Key:

-  Approximate location of test holes
-  Approximate location of bedrock test holes
-  Estimated gradient and direction of slope
-  Approximate direction of due north



1. Relief and Slope: _____
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO YES
8. Site's potential for flooding or ponding: NONE SLIGHT MODERATE SEVERE
9. Landscape position: SHOULDER
10. Vegetation: GRASS
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site: _____

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: [Signature] D4005 License # _____ Part B prepared by: [Signature] D4005 License # _____

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur Inconclusive Disclaim

Unwitnessed Soil Evaluations Decision: Accept Inconclusive Disclaim

Wet Season Determination required Additional Field Review Required

Explanation: _____

Signature Authorized Agent

Date



Legiontown Bathhouse and System Replacement Project
Burlingame State Park and Campground
Charlestown, Rhode Island

DESIGN NARRATIVE

RIDEM is in the process of replacing the Bathhouse and Onsite Wastewater System (OWTS) at this location. Soil logs can be found on Sheet C-1.6 together with the proposed site layout and System Design Data and Notes. Details for the system are on Sheets C-2.6, C-3.1 and C-3.2.

Soil evaluations for this OWTS location were conducted on August 18, 2021, soils are Category 3 and the Estimated Seasonal High Water Table depth at the OWTS is 40" or at elevation 70.8±.

In total the six bathhouses for the overall campground accommodate approximately 720 campsites. Utilizing the RIDEM wastewater design flow for a campground with washroom and toilets of 50 gallons per day we determine a daily flow for the entire campground to be approximately 36,000 gallons per day (GPD). The average daily flow per acre of the campground is (36,000 GPD / 847 Acres) 42.5 GPD/Acre. The average daily flow for each bathhouse is approximately 6,000 GPD. In calculating an estimated daily flow for the Legiontown Bathhouse OWTS we took a conservative approach utilizing 156 campsites at 50 GPD/campsite to determine a design flow for the Legiontown Bathhouse to be 7,800 GPD which is greater than the 6,000 GPD average. Please see the attached campsite map which depicts the campsites (as highlighted) chosen to be included within the 156 sites utilized for sizing the OWTS. Please note that sites throughout the campground overlap to agree with the conservative estimate. The system as sized is oversized and is considered a large system. The system is used on a seasonal basis between the months of April and October.

The OWTS will utilize Two (2) Orenco AdvanTEX AX100 Pods for advanced treatment. This system is a Category 1 advanced treatment technology. The system will treat the wastewater and reduce the biochemical oxygen demand (BOD) and comply with the latest Orenco system design criteria and thus the RIDEM OWTS criteria. See attached Final Design Review Letter from Orenco.

The systems drainfield is designed as a Geomatrix Gravel Sand Treatment (GST) System. The Loading Rate for Category 1 Technology for the GST is 3.5 GPD/square feet (SF). The minimum size drainfield is 7,800 GPD/3.5 GPD/SF which equals 2,229 SF. We propose to use the GST 6212 and the minimum size drainfield requirement for this application is 127 lineal feet (LF). We propose to use the 280 lineal feet (LF) of GST 6212 which provides 17.5 S.F. per LF, which equals 4,900 SF. and is greater than 2,229 SF (minimum size). The GST system has been divided into two equal drainfields and the GST are spaced 7'6" on center. The two drainfields consist of 5 rows each 28 feet long and 62" wide with a stone depth of 12" below the 4" perforated distribution pipe. See pump selection and system specifications on Sheet C-2.6 for additional information. Please see the attached review letter from Geomatrix.

WATCHAUG POND



FISH CAMP AREA
150

400 AREA

MAIN CAMP AREA
146

A 150

B 150

LEGIONTOWN
CAMP AREA
156

500 AREA

MILLS CAMP AREA
150

- CHECK STATION
- PERMITS
- COMFORT STATION

TO WESTERLY
TO WAKEFIELD & PROVIDENCE

DEVELOPED BY:

 PARE CORPORATION
 100 BERRY STREET, SUITE 100
 BURLINGTON, MASSACHUSETTS 01803



BURLINGAME STATE PARK
 RHODE ISLAND DEPT. OF
 ENVIRONMENTAL MANAGEMENT

LEGEND

- | | |
|---------------------------------|--------------------------|
| A TENTS ONLY | Ⓐ WATER |
| B SMALL TRAILERS | ▨ RESTROOMS WITH SHOWERS |
| C LARGE TRAILERS AND MOTORHOMES | ★ DUMPING STATIONS |
| M MOTORHOMES | ▢ CABIN |
| P PORTAJONS | D DUMPSTERS |

01/19/2023

Kevin Harrop
Caputo & Wick
1150 Pawtucket Ave
Rumford, RI 02916

Subject: Final Design Review of Burlingame Park/Legion Town

Kevin,

Orenco Systems, Inc. (“Orenco”) has received the Plans with all required fields completed (attached to this letter), a copy of the plan set showing the designed site layout and configuration plans, and other documents that comprise the Final Design for the Burlingame Park project. Orenco staff reviews the Final Design of all wastewater collection and treatment systems for commercial applications to ensure that the design is compliant with the most current version of the system’s applicable design criteria published by Orenco for the specified parameters provided by the system’s designer in the Plans. The findings and conclusions of my review of this Final Design are as follows:

Design Basis

The system has been designed for a Type 2, Park application. Influent flow and constituent concentrations and effluent constituent concentration requirements have been provided by the system’s designer on the Plans and were used in my review of the Final Design.

The influent flow on the Plans were not extrapolated from the metered flows from the subject site, but in our experience, they are consistent with influent flows from other, similar Type 2, Park systems that Orenco has previously observed. As such, I have no reason to doubt the accuracy of the designer’s findings and assumptions as to the influent flow, and find that it was reasonable for the designer to use them as the design basis for the system.

System Design

The proposed Final Design of the system consists of a treatment plant for a state park and campground. Influent will enter a 16,000 gallon Primary Tank, which will then flow into an 8,000 gallon Pre-Anoxic Tank. From here, effluent flow will gravity discharge into a 6,000 gallon Recirculation Tank. The recirc-filtrate blend in this tank will pump into (2) AX100 pods and the filtrate will enter a splitter valve in the front of the Recirculation Tank where it will either be recirculated again or discharge to a pump chamber that leads to a drain field.

Design Criteria

The applicable design criteria for this system, which I used to conduct the review of its Final Design, is revision 8.0 of document NDA-ATX-1, titled *Orenco[®] AdvanTex[®] Design Criteria, Commercial Treatment Systems*, which was published by Orenco in October, 2020. A copy of the design criteria can be downloaded from Orenco’s online document library at www.orenco.com/corporate/doclibrary.cfm.

Findings

The findings of my review as to whether the Final Design complies with Orenco’s design criteria for treating wastewater to the effluent constituent concentration requirements provided in the Plans are as follows:

Primary Treatment

The Final Design specifies the use of 1 - 16,000 U.S. Gallon Primary concrete and 1 – 8,000 U.S. Gallon Primary concrete tank in series for primary treatment. Using the flow data specified on the Plans the hydraulic retention times for primary treatment calculates as follows:

Primary Tank(s) Hydraulic Retention Time (HRT)¹				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Effective Combined Primary Tankage (gpd)	Avg HRT (days)	Max Day HRT (days)
3,900	7,800	24,000	6.2	3.1

¹ Design Max Day Flow is the maximum daily flow a facility is expected to receive no more than one day within any week’s time.

The Primary Tank Sizing Recommendations states that the recommended primary tankage for a Park treatment system should be sized to at a minimum of 3 days of hydraulic retention time at the Design Max Day Flow. Therefore, the configuration and specifications of the primary treatment tanks in the Final Design satisfy Orenco’s recommendation for primary tankage for this Park application. This pre-anoxic tank should be sized equal to one day at maximum day design flow and is considered part of the overall primary tank volume.

Recirculation Tank — Standard Stage

The Final Design further specifies the use of 1 - 6,000 U.S. Gallon concrete tank for recirculation and blending of the AdvanTex-treated effluent with primary tank effluent. Using the flow data specified on the Plans the tank is sized to be equal to 77% of the Maximum Day Design Flow. The recirculation tank for the standard stage should be sized at a minimum of 75% of the Maximum Day Design Flow. Therefore, the specification of the recirculation-blend tank in the Final Design satisfies Orenco’s design criteria.

Hydraulic Load — Standard Stage

The Final Design specifies the use of 2 - AX100 pods, which contain a nominal surface area of 200 square feet of treatment media. Using the flow data specified on the Plans the hydraulic loading rate for the system calculates as follows:

Hydraulic Loading Rate (HLR) — Standard Stage				
Design Average Flow (gpd)	Design Maximum Day Flow (gpd)	Nominal Textile Area (sq. ft.)	Average HLR (gal. per day/sq. ft.)	Peak HLR (gal. per day/sq. ft.)
3,900	7,800	200	19.5	39.0

According to the AdvanTex System Loading Chart in the applicable design criteria, the standard AdvanTex treatment system (Stage 1) should not be hydraulically loaded more than 25 gpd/square foot at Design Average Flow or 50 gpd/square foot at Design Max Day Flow. Therefore, the specified type and number of AdvanTex pods in the Final Design satisfy Orenco’s design criteria to achieve the effluent quality listed in the design criteria at a 95% confidence level for this Type 2, Park application.

Organic Load — Standard Stage

The following influent characteristics provided on the Plans were estimated and not derived from direct sampling. Even though the influent characteristics were not derived from direct sampling, the values provided are consistent with values we have seen in other, similar Type 2, Park applications.

Influent (Primary Tank Effluent) Characteristics — Loading to Textile	
Average BOD ₅ (mg/L)	Average TSS (mg/L)
250	200

Based on the average influent biochemical oxygen demand (BOD₅) concentration and flow data specified on the Plans, the system will receive approximately 8.1 pounds of BOD₅ per day at Design Average Flow, and 16.3 pounds of BOD₅ per day at Maximum Day Design Flow. Using this information, the organic loading rate of the system calculates as:

Organic Loading Rate (OLR) — Standard Stage				
Average Organic Load (lbs/day)	Maximum Organic Load (lbs/day)	Nominal Treatment Area (sq. ft.)	Average OLR (lbs BOD/sq. ft./day)	Maximum OLR (lbs BOD/sq. ft./day)
8.1	16.3	200	0.04	0.08

Conclusions

I have reviewed the Final Design of the Burlingame Park wastewater treatment system, and have found that the design is compliant with the most current version of the system's applicable design criteria published by Orenco for the specified parameters provided by the system's designer in the Plans. In addition, I noted no anomalies in the site layout or configuration of the system during my review.

Compliance Table — Meets Minimum Design Standards	
	Standard Stage
Recirc Tank Size	Yes
Hydraulic Load	Yes
Organic Load	Yes

As such, the system as designed satisfactorily complies with Orenco's design criteria to meet the following effluent limits specified in the Plans at a 95% confidence level, provided that all influent flows and constituent concentrations specified in the Plans are not exceeded:

Expected Effluent Quality	
Constituent	Average (mg/L)
BOD ₅	20
TSS	20

It is important to note that even though the AdvanTex Treatment System has the capability to meet or exceed the required treatment parameters, there is no way that Orenco can guarantee that a particular system will be operated or maintained in a manner consistent with the Final Design reviewed. Once the facility is placed into operation, the influent flows and constituent concentrations to the facility should be monitored, and if flow or any of the influent constituent concentrations exceed those listed in the Plans, measures should be taken to reduce the flow or constituent concentration to those listed. However, if additional treatment capacity becomes necessary, the system is designed to have the capability to expand to account for the new flow or constituent concentration.

Proper air ventilation is a critical feature of all commercial AdvanTex Treatment Systems, and as such, adequate active ventilation is required for all systems. In addition, please note that disposing of toxics or chemicals into the system is strictly prohibited. Examples of toxics include restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo, waste products, or any other toxins. Furthermore, water softener brine discharge is prohibited from being discharged into the AdvanTex Treatment System. Failure to adhere to these policies will void Orenco's limited product warranties.

If you have any questions about my review process, findings, or conclusions, please feel free to call or e-mail me.

Sincerely,



Caleb Castleman
Systems Engineering
Orenco Systems Inc.
(800) 348-9843 ext. 548
ccastleman@orencocom

Project: Burlingame State Park and Camp Ground
 Location: Legion Town

Description	Input values	Units
Finish Grade	76.50	Elevation
Water Table Elevation	70.80	Elevation
Bottom of Tank Elevation	65.08	Elevation
Lowest Pipe Invert	72.75	Elevation
Counter Weight	0.00	lbs
Soil Above Tank	25.00	Inches
Length of Tank	31.83	Feet
Width of Tank	11.33	Feet
Depth of Tank	9.33	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	8.00	Inches
Sides Concrete Thickness	8.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	4.00	Inches
Compartment Wall Height	87.00	Inches
	Computed Value	
Submerged Depth	5.72	Feet
Top/Bottom Surface Area of Tank	360.77	SF
Displaced Volume	2,063.59	CF
Volume of Tank Top	240.51	CF
Volume of Tank Sides	446.20	CF
Volume of Tank Bottom	240.51	CF
Volume of Baffle	24.17	CF
Weight of Tank Top	36,076.68	lbs
Weight of Tank Sides	66,929.96	lbs
Weight of Tank Bottom	36,076.68	lbs
Weight of Baffle	3,624.88	lbs
Total Weight of Tank	142,708.19	lbs
Volume of Soil	751.60	CF
Weight of Soil Above Tank	75,159.75	lbs
Uplift Created by Submerged Tank	128,767.77	lbs
Total Weight of Tank, Counter Weight and Soil	217,867.94	lbs
Exceeds Displaced Volume by	89,100.17	lbs
Buoyance Point for Empty Tank	6.34	Feet (above bottom)
Buoyance Point for Empty Tank	71.42	Elev
Buoyance Point for Tank in Place	9.68	Feet (above bottom)
Buoyance Point for Tank in Place	74.76	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Legion Town

Description	Input values	Units
Finish Grade	76.75	Elevation
Water Table Elevation	70.80	Elevation
Bottom of Tank Elevation	64.90	Elevation
Lowest Pipe Invert	72.40	Elevation
Counter Weight (Type2)	13,315.20	lbs
Soil Above Tank	28.00	Inches
Length of Tank	17.00	Feet
Width of Tank Top	10.00	Feet
Additional Bottom Overhang	6.00	Inches
Depth of Tank	9.67	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
	Computed Value	
Submerged Depth	5.90	Feet
Bottom Surface Area of Tank	198.00	SF
Displaced Volume	1,168.20	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	221.00	CF
Volume of Tank Bottom	99.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	33,150.13	lbs
Weight of Tank Bottom	14,850.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	65,000.13	lbs
Volume of Soil	396.67	CF
Weight of Soil Above Tank	39,666.67	lbs
Uplift Created by Submerged Tank	72,895.68	lbs
Total Weight of Tank, Counter Weight and Soil	117,982.00	lbs
Exceeds Displaced Volume by	45,086.32	lbs
Buoyance Point for Empty Tank	5.26	Feet (above bottom)
Buoyance Point for Empty Tank	70.16	Elev
Buoyance Point for Tank in Place	9.55	Feet (above bottom)
Buoyance Point for Tank in Place	74.45	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
Location: Legion Town

Description	Input values	Units
Finish Grade	75.25	Elevation
Water Table Elevation	70.80	Elevation
Bottom of Tank Elevation	64.50	Elevation
Lowest Pipe Invert	71.25	Elevation
Counter Weight (Type 2)	12,614.00	lbs
Soil Above Tank	31.00	Inches
Length of Tank	17.00	Feet
Width of Tank	10.00	Feet
Depth of Tank	8.17	Feet
Top of Concrete Thickness	8.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Sides Concrete Thickness	6.00	Inches
Two Compartment Tank		
Compartment Wall Thickness	0.00	Inches
Compartment Wall Height	0.00	Inches
Computed Value		
Submerged Depth	6.30	Feet
Top/Bottom Surface Area of Tank	170.00	SF
Displaced Volume	1,071.00	CF
Volume of Tank Top	113.33	CF
Volume of Tank Sides	182.00	CF
Volume of Tank Bottom	85.00	CF
Volume of Baffle	0.00	CF
Weight of Tank Top	17,000.00	lbs
Weight of Tank Sides	27,300.13	lbs
Weight of Tank Bottom	12,750.00	lbs
Weight of Baffle	0.00	lbs
Total Weight of Tank	57,050.13	lbs
Volume of Soil	439.17	CF
Weight of Soil Above Tank	43,916.67	lbs
Uplift Created by Submerged Tank	66,830.40	lbs
Total Weight of Tank, Counter Weight and Soil	113,580.80	lbs
Exceeds Displaced Volume by	46,750.40	lbs
Buoyance Point for Empty Tank	5.38	Feet (above bottom)
Buoyance Point for Empty Tank	69.88	Elev
Buoyance Point for Tank in Place	10.71	Feet (above bottom)
Buoyance Point for Tank in Place	75.21	Elev

(Soil friction has not been taken into account)

Project: Burlingame State Park and Camp Ground
 Location: Legion Town

Description	Input values	Units
Finish Grade	74.00	Elevation
Water Table Elevation	69.80	Elevation
Bottom of Chamber Elevation	65.00	Elevation
Lowest Pipe Invert	71.00	Elevation
Counter Weight	0.00	lbs
Soil Above Chamber	12.00	Inches
Chamber Length	7.00	Feet
Chamber Width	7.00	Feet
Diameter of Opening	2.50	Feet
Chamber Interior Height	7.00	Feet
Top of Concrete Thickness	6.00	Inches
Bottom of Concrete Thickness	6.00	Inches
Concrete Wall Thickness	6.00	Inches
	Computed Value	
Submerged Depth	4.80	Feet
Top Surface Area of Chamber	44.09	SF
Surface Area of Chamber Sides	182.00	SF
Bottom Surface Area of Chamber	49.00	SF
Displaced Volume	235.20	CF
Volume of Chamber Top	22.05	CF
Volume of Chamber Sides	91.00	CF
Volume of Chamber Bottom	24.50	CF
Weight of Chamber Top	3,306.84	lbs
Weight of Tank Side	13,650.00	lbs
Weight of Chamber Bottom	3,675.00	lbs
Total Weight of Chamber	20,631.84	lbs
Volume of Soil	44.09	CF
Weight of Soil Above Chamber	4,409.13	lbs
Uplift Created by Submerged Chamber	14,676.48	lbs
Total: Chamber, Counter Weight and Soil	25,040.97	lbs
Exceeds Displaced Volume by	10,364.49	lbs
Buoyance Point for Empty Chamber	6.75	Feet (above bottom)
Buoyance Point for Empty Chamber	71.75	Elev
Buoyance Point for Chamber in Place	8.19	Feet (above bottom)
Buoyance Point for Chamber in Place	73.19	Elev

(Soil friction has not been taken into account)

Duplex Control Panels

Applications

Orenco Duplex Control Panels are used to control dual pumps, alarms, and other equipment as specified in pressure sewers and onsite septic systems.



Orenco[®] DAX2 Control Panel



General

Orenco Duplex Control Panels are specifically engineered for pressure sewer (STEP) systems and onsite septic treatment systems that require the use of two alternating pumps. Standard features include circuit breakers, an automatic/manual/off motor control toggle for each pump, an audio/visual high level alarm, an alarm reset, and a duplex alternator. Other standard features and options are listed on page 2. Orenco panels are designed for use with mechanical and/or mercury float switches. Listed per UL 508 in the US and Canada.

Standard Models

DAX1, DAX2

Product Code Diagram



Standard options (list in order):
 PT = programmable timer
 RO = redundant off relay
 CS = current sensor
 ETM = elapsed time meter
 CT = event counter
 HT = heater
 SA = surge arrester
 PRL = pump run light
 PL = power light

Intrinsically safe relays:
 Blank = standard, no IR relays
 IR = intrinsically safe relays

Pump voltage:
 1 = 120 VAC
 2 = 120 VAC or 240 VAC

DAX series duplex control panel

Materials of Construction

Enclosure	UV-resistant fiberglass, UL Type 4X
Hinges	Stainless steel

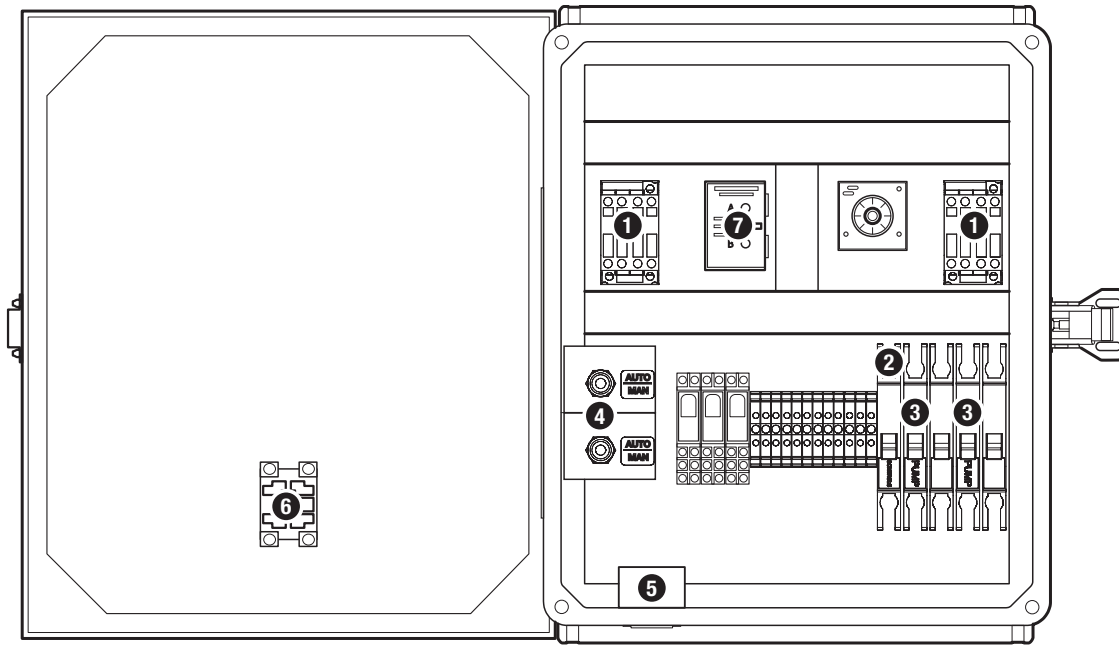
Specifications

Panel Ratings

DAX1:	120 V, 1 hp, 16 amps, single phase, 60 Hz.
DAX2:	240 V, 3 hp, 16 amps, single phase, 60 Hz.

Dimensions

Height, in. (mm)	15.5 (394)
Width, in. (mm)	13.5 (343)
Depth, in. (mm)	6.7 (170)



Orenco® DAX2PTR0 240 V panel

Standard Components

Feature	Specification(s)
1. Motor-Start Contactor	120 V, 16 FLA, 1 hp (0.75 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA). 240 V, 16 FLA, 3 hp (2.24 kW), 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).
2. Controls Circuit Breaker	10 A, OFF/ON switch. Single-pole 120 V. DIN rail mounting with thermal magnetic tripping characteristics.
3. Pump Circuit Breakers	20 A, OFF/ON switch. Single-pole 120 V or double-pole 240 V. DIN rail mounting with thermal magnetic tripping characteristics.
4. Toggle Switches	20 A, 1hp (0.75 kW). Single-pole, double-throw HOA switch,
5. Audible Alarm	95 dB at 24 in. (610 mm), warble-tone sound.
6. Visual Alarm	7/8-in. (22-mm) diameter red lens, "Push-to-silence." UL Type 4X rated, 1 W LED light, 120 V.
7. Duplex Alternator	120 V. Cross-wired style for independent lag pump function. Selector switch for locking one pump into lead position.
Audible Alarm Silence Relay (Not shown)	120 V. Automatic reset. DIN rail mount.

Optional Features

Feature	Specification(s)	Code Adder
Intrinsically Safe Control Relays	Listed per UL 698A, for Class 1 Div. 1, groups A, B, C, D hazardous locations (requires larger enclosure).	IR
Programmable Timer	120 V. Repeat cycle from 0.05 seconds to 30 hours. Separate variable controls for OFF & ON time periods.	PT
Redundant Off Relay	120 V. Provides a secondary off. Sounds alarm on low level condition. DIN rail mount.	RO
Elapsed Time Meter	120 V, 7-digit, non-resettable. Limit of 99,999 hours; accurate to 0.01 hours.	ETM
Event Counter	120 V, 6-digit, non-resettable.	CT
Heater	Anti-condensation heater. Self-adjusting: radiates additional wattage as temperature drops.	HT
Surge Arrestor	Status light on unit; protects incoming power supply from electrical surges.	SA
Pump Run Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PRL
Power Light	7/8-in. (22-mm) diameter green lens. UL Type 4X rated, 1 W LED light, 120 V.	PL

PF-Series Submersible Effluent Pumps: 1-Phase, 60-Hz, 4-inch (100-mm)

Applications

Our PF-Series 4-inch (100-mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or dosing tanks. These pumps are constructed of light-weight, corrosion-resistant stainless steel and engineered plastics, and are field-serviceable and repairable with common tools. They're also CSA- and UL-certified to U.S. and Canadian safety standards for effluent pumps.

PF-Series pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.



Features/Specifications

To specify this pump for your installation, require the following:

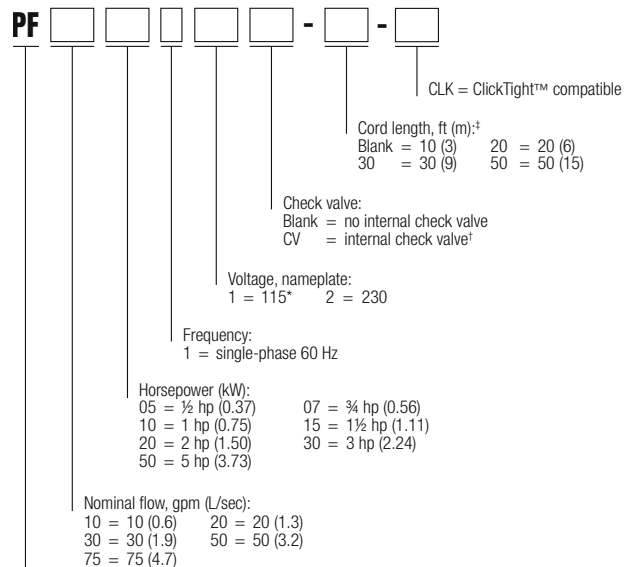
- Minimum 24-hour run-dry capability (liquid end) with no deterioration in pump life or performance*
- 1/8-inch (3-mm) bypass orifice to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid-end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10, 20, and 30 gpm (0.6, 1.3, and 1.9 L/sec) models; floating stack design on 50 and 75 gpm (3.2 and 4.7 L/sec) models
- Franklin Electric Super Stainless motor, rated for continuous use and frequent cycling
- Type SOOW 600-V motor cable (model PF751512 uses 14 AWG, SJ00W, 300-V cord)

* Not applicable for 5-hp (3.73 kW) models

Standard Models

See specifications chart on page 2 for a list of standard pumps. For a complete list of available pumps, call Orenco.

Product Code Diagram



Pump, PF Series

* ½-hp (0.37 kW) only

† Available for 10 gpm (0.6 L/sec), 1/2 hp (0.37 kW)

‡ Note: 20-ft cords are available only for pumps through 1½ hp



C US
LR80980
LR2053896



Powered by
Franklin Electric

Specifications

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Discharge size and material ¹	Length in. (mm)	Min. liquid level in. (mm)	Weight lb (kg)	Rated cycles per day
PF100511 ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100511CV ⁹	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512 ⁹	10 (0.6)	0.50 (0.37)	1	230	240	6.3	6.3	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712 ^{4,5,9}	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	1 ¼ in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF101012 ^{5,6,9}	10 (0.6)	1.00 (0.75)	1	230	240	9.6	9.6	1 ¼ in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF200511 ⁹	20 (1.3)	0.50 (0.37)	1	115	120	12.3	12.5	1 ¼ in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512 ⁹	20 (1.3)	0.50 (0.37)	1	230	240	6.4	6.5	1 ¼ in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF201012 ^{4,5,9}	20 (1.3)	1.00 (0.75)	1	230	240	10.5	10.5	1 ¼ in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF201512 ^{4,5}	20 (1.3)	1.50 (1.11)	1	230	240	12.4	12.6	1 ¼ in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF300511 ⁹	30 (1.9)	0.50 (0.37)	1	115	120	11.8	11.8	1 ¼ in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512 ⁹	30 (1.9)	0.50 (0.37)	1	230	240	6.2	6.2	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712 ⁹	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	1 ¼ in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF301012 ^{4,9}	30 (1.9)	1.00 (0.75)	1	230	240	10.4	10.4	1 ¼ in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF301512 ^{4,5}	30 (1.9)	1.50 (1.11)	1	230	240	12.6	12.6	1 ¼ in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF302012 ^{5,6,7}	30 (1.9)	2.00 (1.49)	1	230	240	11.0	11.0	1 ¼ in. SS	35.5 (902)	26 (660)	44 (20)	100
PF303012 ^{5,6,7,8}	30 (1.9)	3.00 (2.23)	1	230	240	16.8	16.8	1 ¼ in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF305012 ^{5,6,7,8}	30 (1.9)	5.00 (3.73)	1	230	240	25.6	25.8	1 ¼ in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF500511 ⁹	50 (3.2)	0.50 (0.37)	1	115	120	12.1	12.1	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512 ⁹	50 (3.2)	0.50 (0.37)	1	230	240	6.2	6.2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500712 ⁹	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501012 ⁹	50 (3.2)	1.00 (0.75)	1	230	240	10.1	10.1	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF501512 ⁴	50 (3.2)	1.50 (1.11)	1	230	240	12.5	12.6	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF503012 ^{4,5,7,8}	50 (3.2)	3.00 (2.23)	1	230	240	17.7	17.7	2 in. SS	43.0 (1092)	37 (940)	55 (25)	100
PF505012 ^{5,6,7,8}	50 (3.2)	5.00 (3.73)	1	230	240	26.2	26.4	2 in. SS	65.4 (1661)	55 (1397)	64 (29)	100
PF751012 ⁹	75 (4.7)	1.00 (0.75)	1	230	240	9.9	10.0	2 in. SS	27.0 (686)	27 (686)	34 (15)	100
PF751512	75 (4.7)	1.50 (1.11)	1	230	240	12.1	12.3	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

¹ GFP = glass-filled polypropylene; SS = stainless steel. The 1 ¼-in. NPT GFP discharge is 2 7/8 in. octagonal across flats; the 1 ¼-in. NPT SS discharge is 2 1/8 in. octagonal across flats; and the 2-in. NPT SS discharge is 2 7/8 in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

² Minimum liquid level is for single pumps when installed in an Orenco Biotube® Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

³ Weight includes carton and 10-ft (3-m) cord.

⁴ High-pressure discharge assembly required.

⁵ Do not use cam-lock option (Q) on discharge assembly.

⁶ Custom discharge assembly required for these pumps. Contact Orenco.

⁷ Capacitor pack (sold separately or installed in a custom control panel) required for this pump. Contact Orenco.

⁸ Torque locks are available for all pumps and are supplied with 3-hp and 5-hp pumps.

⁹ ClickTight™ compatible.

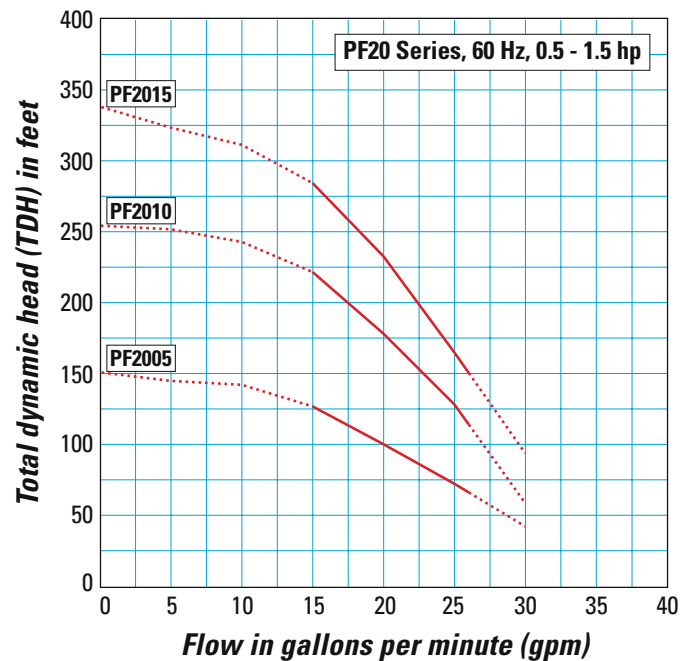
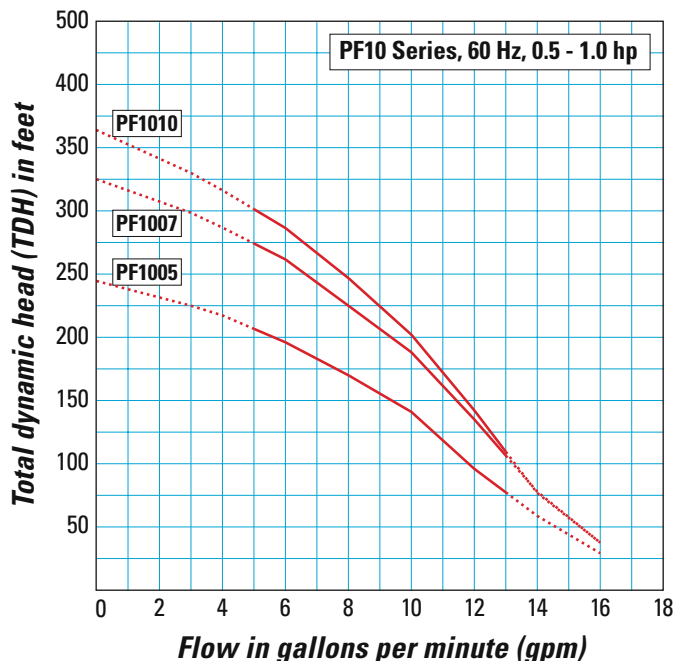
Materials of Construction

Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (Noryl GFN3)
Impellers	Celcon® acetal copolymer on 10-, 20-, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	7/16-in. hexagonal stainless steel, 300 series
Coupling	Sintered stainless steel, 300 series
Shell	Stainless steel, 300 series
Motor	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing ensures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Single-phase motors are equipped with surge arrestors for added security. Single-phase motors through 1.5 hp (1.11 kW) have built-in thermal over-load protection, which trips at 203-221° F (95-105° C).

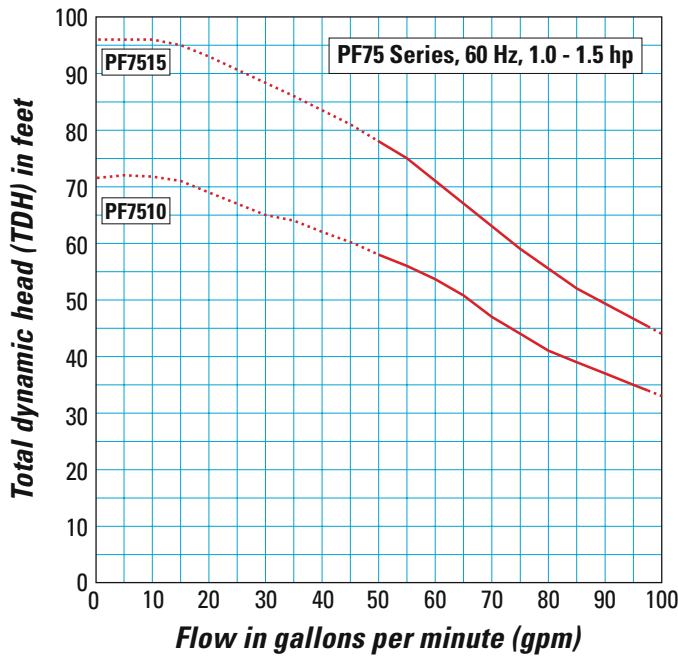
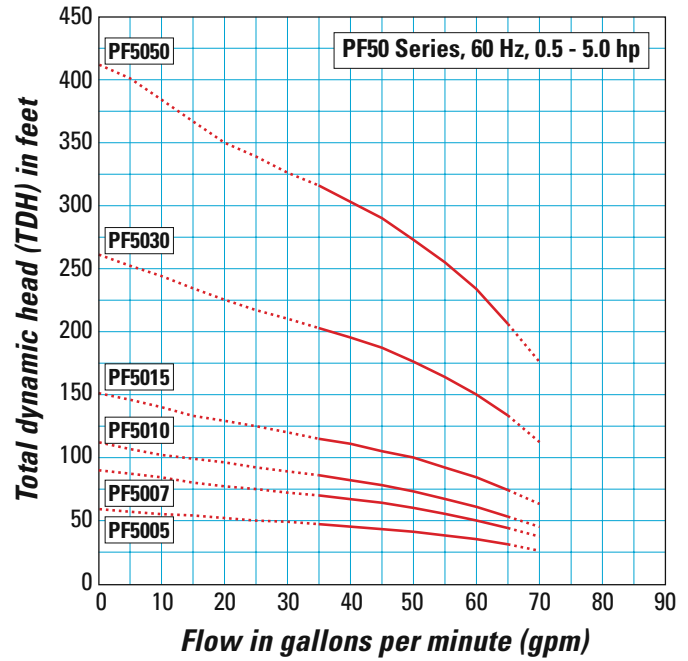
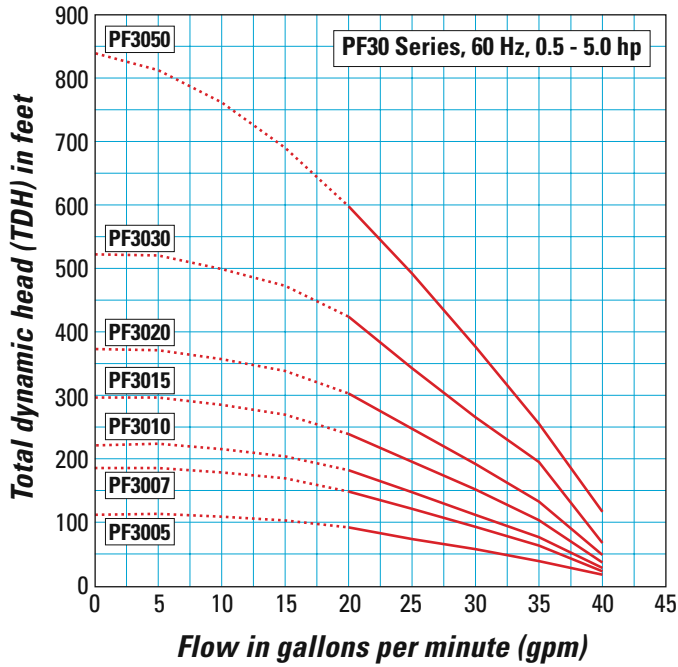
Using a Pump Curve

A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow and pressure (total dynamic head or “TDH”), providing a graphical representation of a pump’s optimal performance range. Pumps perform best at their nominal flow rate. These graphs show optimal pump operation ranges with a solid line and show flow rates outside of these ranges with a dashed line. For the most accurate pump specification, use Orenco’s PumpSelect™ software.

Pump Curves



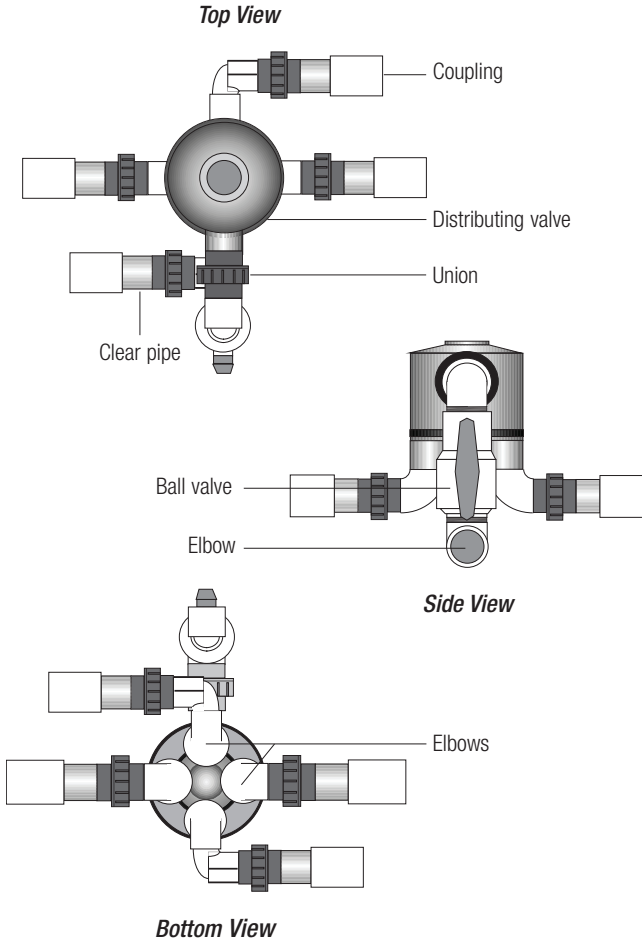
Pump Curves, cont.



Distributing Valves

Applications

Automatic Distributing Valve Assemblies are used to pressurize multiple zone distribution systems including textile filters, sand filters and drainfields.



General

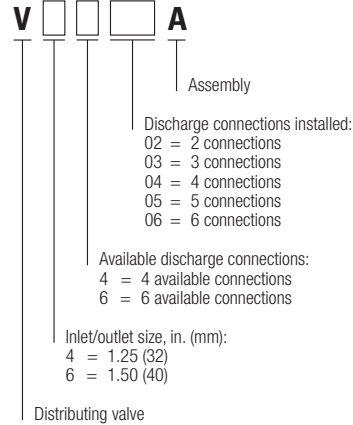
Orenco's Automatic Distributing Valve Assemblies are mechanically operated and sequentially redirect the pump's flow to multiple zones or cells in a distribution field. Valve actuation is accomplished by a combination of pressure and flow. They allow the use of smaller horsepower pumps on large sand filters and drainfields. For example, a large community drainfield requiring 300 gpm (18.90L/sec) can use a six-line valve assembly to reduce the pump flow rate requirement to only 50 gpm (3.14L/sec).

Orenco only warrants Automatic Distributing Valves when used in conjunction with High-Head Effluent Pumps with Biotube[®] pump vaults to provide pressure and flow requirements, and to prevent debris from fouling valve operation. An inlet ball valve, a section of clear pipe, and a union for each outlet are provided for a complete assembly that is easy to maintain and monitor. Ideal valve location is at the high point in the system. Refer to Automatic Distributing Valve Assemblies (NTP-VA-1) for more information.

Standard Models

V4402A, V4403A, V4404A, V4605A, V4606A, V6402A, V6403A, V6404A, V6605A, V6606A.

Product Code Diagram



Materials of Construction

All Fittings	Sch. 40 PVC per ASTM specification
Unions	Sch. 80 PVC per ASTM specification
Ball Valve	Sch. 40 PVC per ASTM specification
Clear Pipe	Sch. 40 PVC per ASTM specification

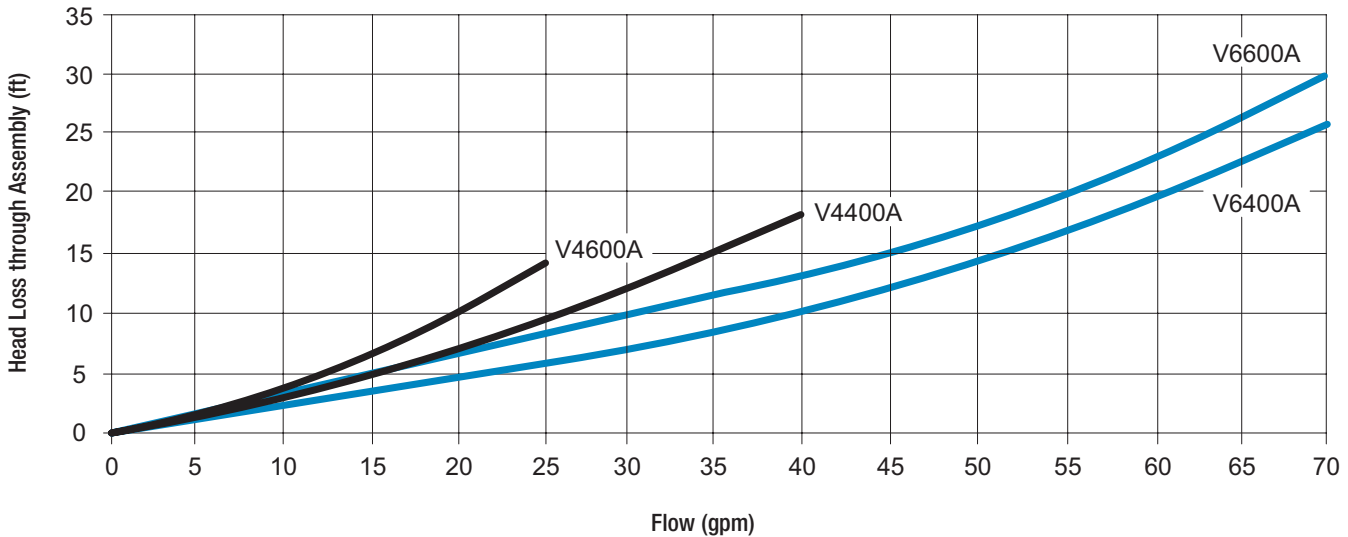
Specifications

Model	Inlet Size, in. (mm)	Outlets Size, in. (mm)	Flow Range, gpm (L/sec)	Max Head, ft (m)	Min. Enclosure*
V4402A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4403A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4404A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	VB1217
V4605A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V4606A	1.25 (32)	1.25 (32)	10 – 40 (0.63 – 2.52)	170 (51.816)	RR2418
V6402A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6403A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6404A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6605A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6606A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418

* When using an enclosed basin, choose the next larger-sized diameter.

Table 1. Automatic Distributing Valve Assembly Headloss Equations

Model Series	Equation	Operating Range, gpm (L/sec)
V4400A	$H_L = 0.085 \times Q^{1.45}$	10 - 40 (0.63 – 2.52)
V4600A	$H_L = 0.085 \times Q^{1.58}$	10 - 25 (0.63 – 1.57)
V6400A	$H_L = 0.0045 \times Q^2 + 3.5 \times (1 - e^{-0.06Q})$	15 - 70 (0.95 – 4.42)
V6600A	$H_L = 0.0049 \times Q^2 + 5.5 \times (1 - e^{-0.1Q})$	15 - 70 (0.95 – 4.42)



AdvanTex® AX100 Textile Filter

Applications

Orenco's AdvanTex® AX100 Treatment System is an innovative technology for onsite treatment of domestic-strength wastewater. The heart of the system is the AdvanTex Filter, a sturdy, watertight fiberglass basin filled with an engineered textile material. This lightweight, highly absorbent textile material treats a tremendous amount of wastewater in a small space. AX100 Treatment Systems are ideal for:

- New construction
- System upgrades and repairs
- Small sites
- Poor soils
- Pretreatment
- Nitrogen reduction
- Price-sensitive markets

For sizing, see AdvanTex® Design Criteria (NDA-ATX-COMM-1-PKG).



The heart of the AdvanTex® AX100 Treatment System is this sturdy, watertight fiberglass basin filled with an engineered textile material.

Features/Specifications

To specify this product, require the following:

- Wastewater treatment to better than secondary treatment standards
- Consistent treatment, even during peak flows
- Timer operation for flow monitoring, flow modulation, and surge control
- Fixed-film, engineered textile media, operated in an unsaturated condition
- Consistent media quality
- Low energy consumption
- Low maintenance requirements
- Complete pre-manufactured package, ready to install
- Watertight construction, corrosion-proof materials, and components
- Foam-core lid provides insulation value of R-6 (RSI-1.1)
- Quiet operation

Standard Model

AX100

Specifications**

Length, in. (mm)	191 (4851)
Width, in. (mm)	94 (2388)
Height, in. (mm)	42 (1067)
Area (footprint), ft ² (m ²)	128 (11.9)
Dry Weight, lb (kg)	1616 (733)

* Covered by U.S. patent numbers 6,540,920; 6,372,137; 5,531,894; 5,480,561; 5,360,556

** Nominal values provided. See AdvanTex® Treatment System drawings for exact dimensions.

AdvanTex[®] Vent Fan Assembly

Applications

Oreco's AdvanTex[®] Vent Fan Assembly consists of a water-proof fiberglass enclosure with equipment for venting onsite wastewater treatment systems. One enclosure can hold a vent fan with carbon filter and an optional heater.

The vent fan is used in commercial-sized AdvanTex Treatment Systems to gently pull air through the textile media, ensuring that adequate oxygen is available for biological treatment. The carbon filter scrubs the air that the system exhausts. An optional heater can be added where climate requires heating of the air that enters the AdvanTex textile filter pods.



Standard Models

AXVFACF — AX above ground Vent Fan Assembly with LMF-3 Fan

AXVFACF-HT — AX above ground Vent Fan Assembly with LMF-3 Fan and HT10 Heater

Enclosure

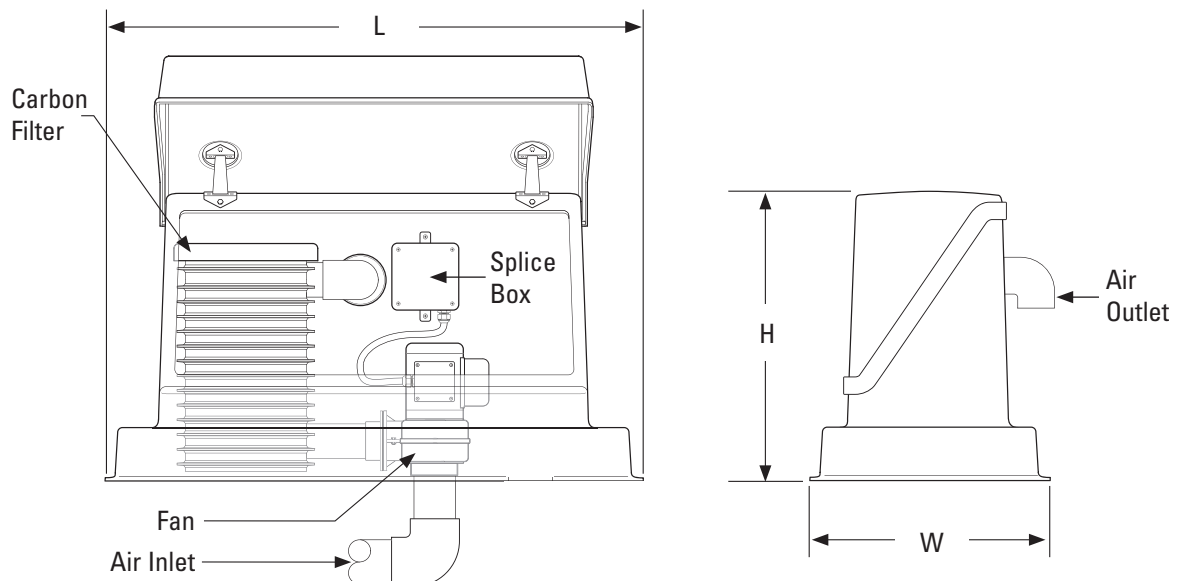
Physical Specifications

Materials of Construction

Shell	Fiberglass-reinforced polyester (FRP)
Hardware	Stainless steel
Exterior finish	Green, textured, UV resistant
Straps	Nylon

Dimensions

Length (L)	50 in. (1270 mm)
Width (W)	24 in. (610 mm)
Height (H)	30 in. (762 mm)
Volume	15.1 ft ³ (0.43 m ³)
Area (footprint)	8.3 ft ² (0.77 m ²)



AdvanTex[®] Vent Fan Assembly (continued)

Fan

Physical Specifications

Dimensions

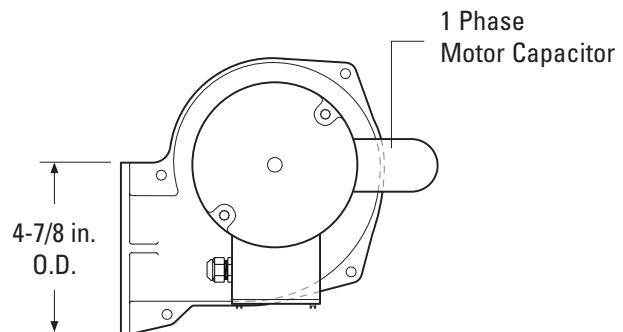
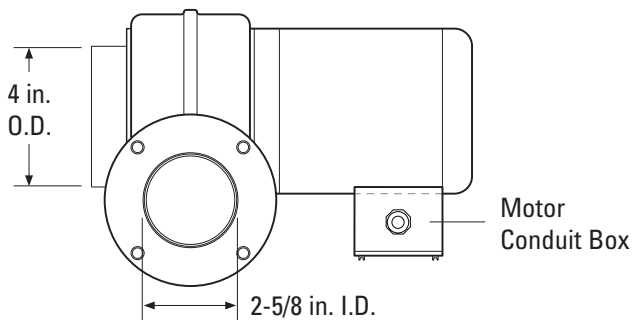
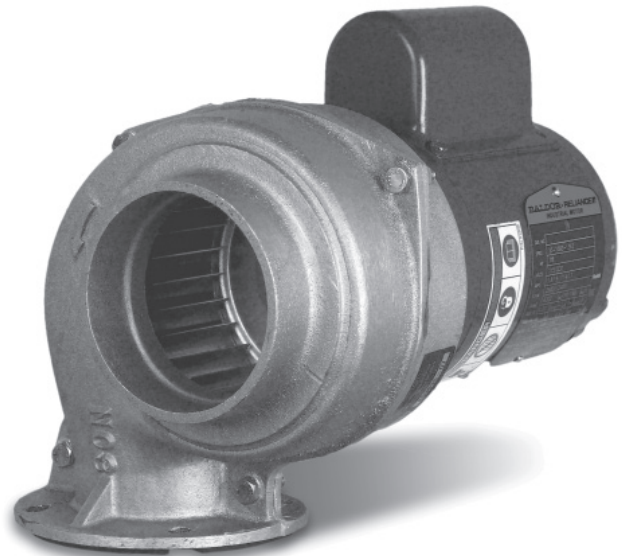
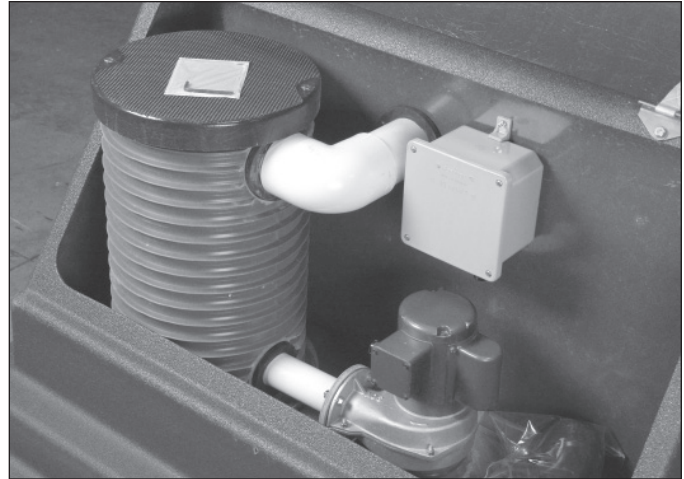
Inlet O.D.	4 in. (100 mm)
Inlet nominal pipe size	4 in. (100 mm)
Outlet I.D.	2-5/8 in. (67 mm)
Outlet Flange O.D.	4-7/8 in. (124 mm)

Materials of Construction

Housing	Aluminum
Wheel	Steel

Performance Data

	60 Hz	50 Hz
Horsepower (kW)	0.08 (0.06 kW)	0.08 (0.06 kW)
Phase	1 phase	1 phase
Volts	115/230	110/220
Amperage	1.4 A/0.7 A	1.8 A/0.9 A
RPM	3400	2900
CFM at 0" H ₂ O static pressure	245	205
CFM at 0.4" H ₂ O static pressure	220	170
CFM at 0.8" H ₂ O static pressure	190	130
CFM at 1.5" H ₂ O static pressure	120	N/A



AdvanTex® Vent Fan Assembly (continued)

Carbon Filter Basin

Physical Specifications

Dimensions

Outlet diameter	Accepts nominal 3-in. PVC pipe
Inlet diameter	Accepts nominal 2-in. PVC pipe
Height	21.5 in. (546 mm)
Diameter	12 in. (305 mm)

Materials of Construction

Housing	PVC
Bottom	Fiberglass-reinforced polyester (FRP)
Interior supports	Polypropylene grid and polyethylene screen
Support rings	PVC
Lid	Fiberglass
Fill material	Activated carbon



Heater (Optional)

Physical Specifications

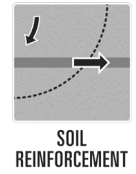
Dimensions

Outlet diameter	Fits nominal 3-in. Class 125 PVC pipe
Length (inlet to outlet)	11.75 in. (297 mm)
Width	11.25 in. (286 mm)
Depth	8.25 in. (210 mm)

Performance Data

Watts	1000
Volts	120
Amps	8.3





Miragrid[®] 22XT

Miragrid[®] 22XT geogrid is composed of high molecular weight, high tenacity polyester multifilament yarns woven in tension and finished with a PVC coating. Miragrid[®] 22XT geogrid is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Miragrid 22XT geogrid is used as soil reinforcement in MSE structures such as segmental retaining walls, precast modular block walls, wire faced walls, geosynthetic wrapped faced walls and steepened slopes. Miragrid 22XT is also used in MSE stabilized platforms for voids bridging, embankments on soft soils, landfill veneer stability, reducing differential settlement and for foundation seismic stability.

TenCate Geosynthetics Americas is accredited by Geosynthetic Accreditation Institute – Laboratory Accreditation Program ([GAI-LAP](#)).

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE
			MD
Tensile Strength @ Ultimate	ASTM D6637 (Method B)	lbs/ft (kN/m)	20559 (300.0)
Tensile Strength @ 5% strain	ASTM D6637 (Method B)	lbs/ft (kN/m)	6700 (97.8)
Mass/Unit Area ¹	(ASTM D5261)	oz/yd ² (g/m ²)	28.2 (956)
			MINIMUM ROLL VALUE
Creep Rupture Strength ²	ASTM D5262/D6992	lbs/ft (kN/m)	14277 (208.3)
Long Term Design Strength ³		lbs/ft (kN/m)	12361 (180.4)
PHYSICAL PROPERTIES		UNIT	ROLL CHARACTERISTIC
Roll Dimensions ⁴ (width x length)		ft (m)	12 x 200 (3.6 x 61)
Roll Area		yd ² (m ²)	267 (220)
Estimated Roll Weight		lbs (kg)	470 (213)
Label Roll Color			WHITE

¹ Typical Value

² 75-year design life based on NTPEP Report [REGEO-2016-01-069](#).

³ Long Term Design Strength for sand, silt, clay. $RF_{CR} = 1.44$; $RF_{ID} = 1.05$; $RF_D = 1.1$ (Installation damage reduction factor for other soils available upon request).

⁴ Special order roll lengths are available upon request

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FGS000105
ETQR19



MYERS[®]
MODEL SRM4
4/10 HORSEPOWER
RESIDENTIAL SEWAGE PUMP



MYERS® MODEL SRM4 Residential Sewage Pump

The Right Choice

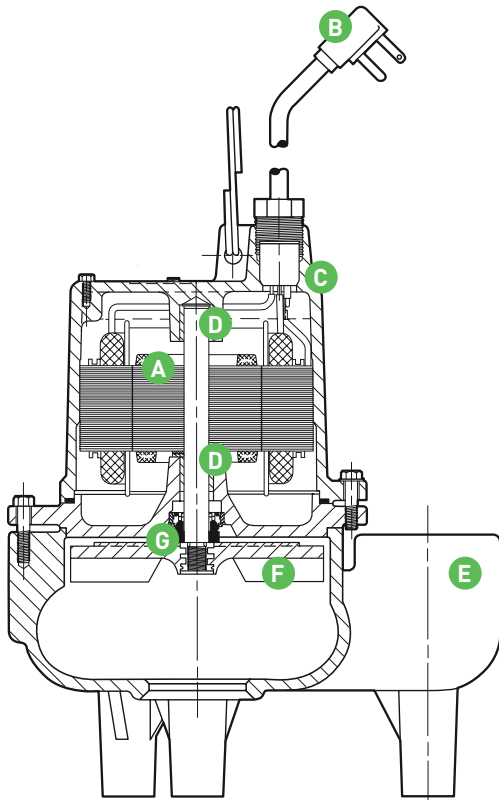
The SRM4 solids handling pump is the most reliable 4/10 horsepower residential sewage pump available today. The SRM4 is a plumbers/contractors dream! Its recessed impeller design allows 2" solids to pass freely through the volute without the chance of jamming the impeller. The SRM4 series pump has a national field-proven record of reliability. Look to your Myers distributor for the answer to your residential sewage handling needs ... and across the counter will be the Myers mini solids handling, the SRM4. It works for you! For more information, call your Myers distributor today, or the Myers Ohio sales office at 419-289-6898.



Product Capabilities		
Capacities To	95 gpm	360 lpm
Heads To	18 ft. 19 ft. shutoff	5.5 m 5.8 m
Pump Down Range Float Switch	7 to 14 in.	178 to 356 mm
Solids Handling Capacity	2 in.	50.8 mm
Liquids Handling	raw sewage, effluent, drain water	
Intermittent Liquid Temp.	up to 140°F	up to 60°C
Motor Electrical Data	4/10 HP shaded pole 1650 RPM	
Electrical	115V, 12A or 230V, 6A, 1Ø, 60 Hz.	
Acceptable pH Range	6 - 9	
Discharge, NPT	2 in.	50.8 mm
Min. Sump Diameter		
Simplex	18 in.	457 mm
Duplex	30 in.	762 mm

Note: Consult factory for applications outside these recommendations.

Pump Features and Applications



A. 4/10 HP Motor

Pressed in place and oil-filled for best alignment and heat transfer. Built-in overload protection.

B. Power Cord

Quick-disconnect watertight fitting.

C. Motor Housing

Heavy cast iron for efficient heat transfer.

D. Dual Thrust Washers, Sleeve Bearings

Oil lubricated, enhance smooth operation and extend pump life..

E. Cast Iron Volute

Passes 2" diameter solids.

F. Recessed Impeller

Operates out of volute passage, allowing maximum flow of liquids and solids.

G. Mechanical Shaft Seal

Carbon and ceramic faces, body is stationary, prevents string or trash from winding on seal..

Mechanical Float Switch

Mercury-free, 90° angle operation. (Piggyback models only).

Durable Motor Will Deliver Many Years Of Reliable Service.

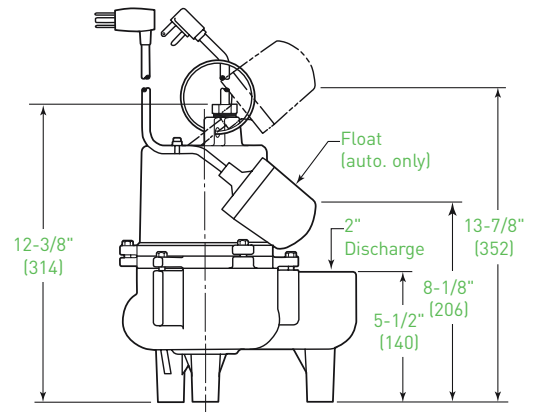
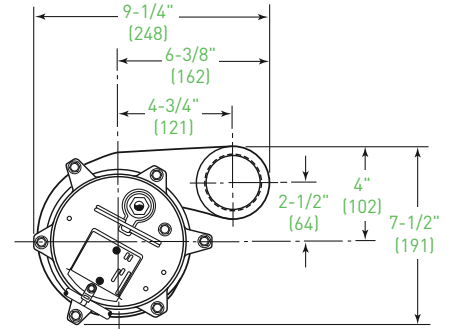
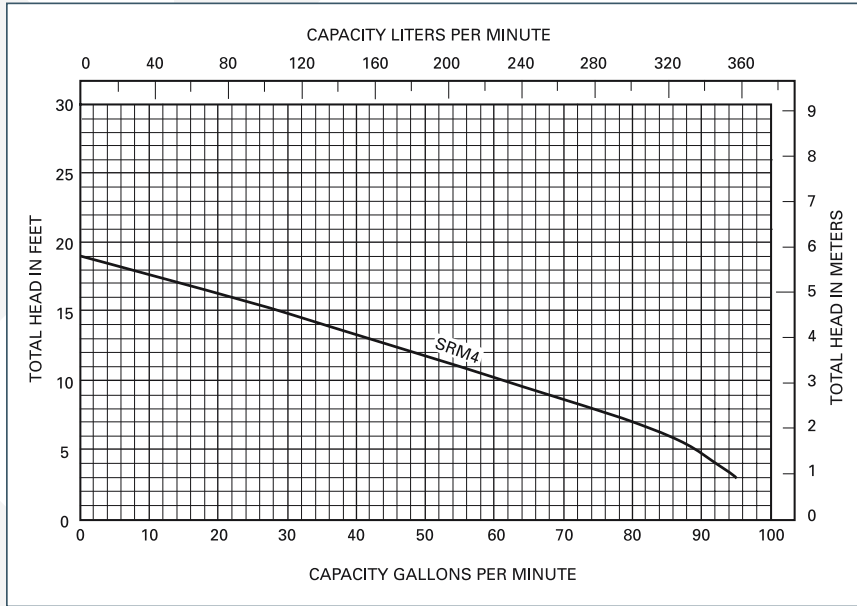
- Oil-filled motor for maximum heat dissipation and continuous bearing lubrication.
- Overload protected shaded pole motor eliminates starting switches.
- Recessed vortex impeller provides minimal radial loading for long bearing life.

The SRM4P Is Engineered For Many Years Of Maintenance-Free Operation.

- Wide-angle piggy-back float switch for maximum draw down. (Automatic models.)
- Pump can be operated manually by unplugging piggy-back switch and plugging pump directly into outlet (Automatic models).
- Recessed vortex impeller operates completely out of volute and provides free flow through passage for solids and liquids.

Performance Data and Dimensions [Dimensions in mm]

1650 RPM



740 EAST 9TH STREET,
ASHLAND, OHIO 44805
WWW.FEMYERS.COM

269 TRILLIUM DRIVE, KITCHENER,
ONTARIO, CANADA N2G 4W5
WWW.FEMYERS.COM

Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.
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January 13, 2023

David T. Bray, PLS
President
Caputo & Wick LTD
1150 Pawtucket Ave.
Rumford, RI 02916-1897
Phone: (401) 434-8880

RE: Burlingame State Park and Camp Ground, Charlestown, RI

Dear Mr. Bray:

This letter will confirm that you have been trained and certified to design GST™ Leaching Systems by Geomatrix Systems, LLC ("Geomatrix") in the State of Rhode Island.

This letter also confirms that Geomatrix has reviewed the design of the GST Leaching System proposed for installation at Burlingame State Park and Camp Ground, Charlestown, RI and found the site and design to be suitable and in compliance with the approved design manuals for the aforementioned product.

If you have any questions, please contact me.

Sincerely,
GEOMATRIX SYSTEMS, LLC

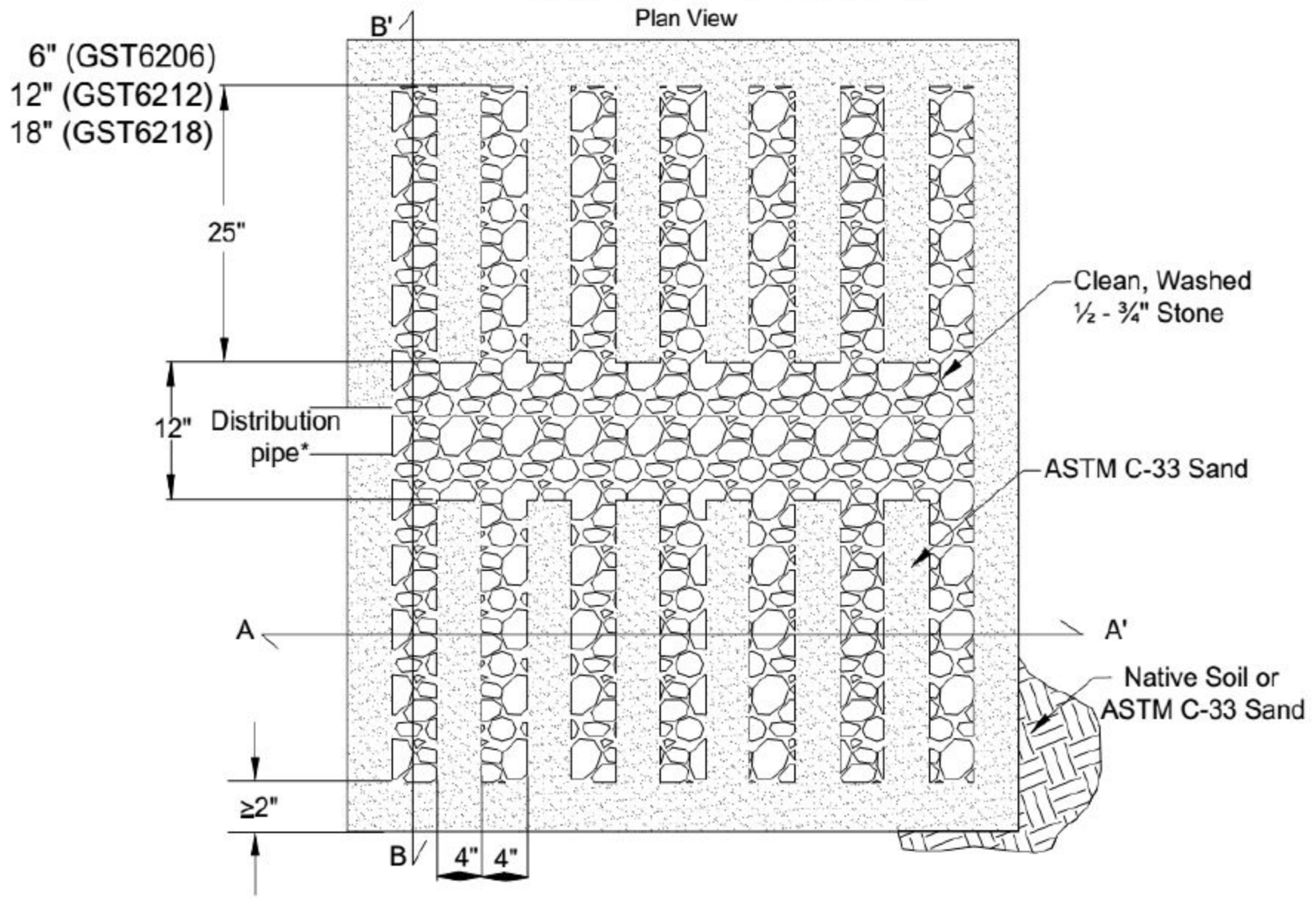
A handwritten signature in black ink that reads "David Jewett". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

David Jewett

Geomatrix Systems, LLC
114 Mill Rock Road East - Old Saybrook, CT 06475
Phone: 860-510-0730 – Fax: 860-510-0735

GST Schematics

GST™ LEACHING SYSTEM



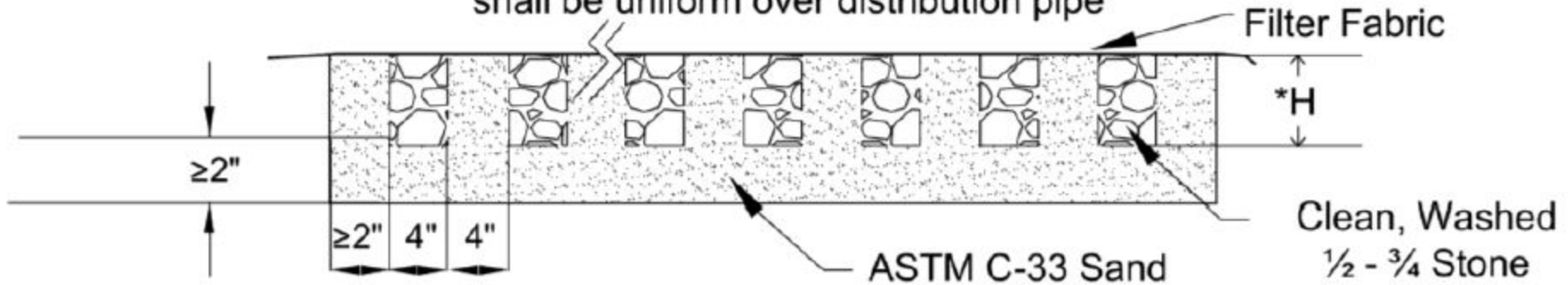
* Distribution pipe for gravity systems shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the Design, Use and Maintenance of Pressurized Drainfields.

GEOMATRIX GST™ LEACHING SYSTEM

A-A' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



*H= 6" (GST6206)

12" (GST6212)

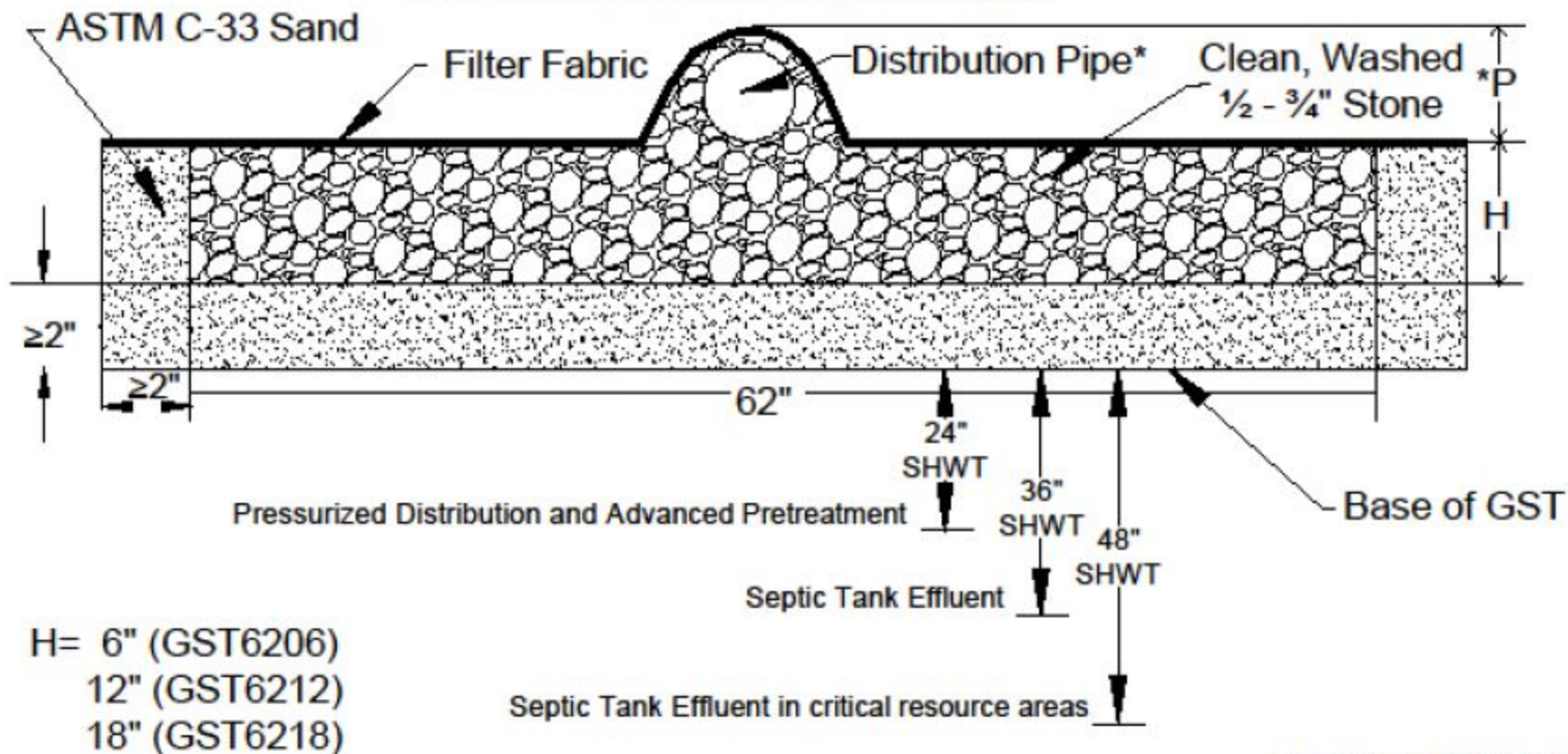
18" (GST6218)

GST™ LEACHING SYSTEM

B-B' CROSS SECTION

Finished Grade shall be pitched to sheet flow
stormwater away from system

Cover material depth shall be 6-30" and
shall be uniform over distribution pipe



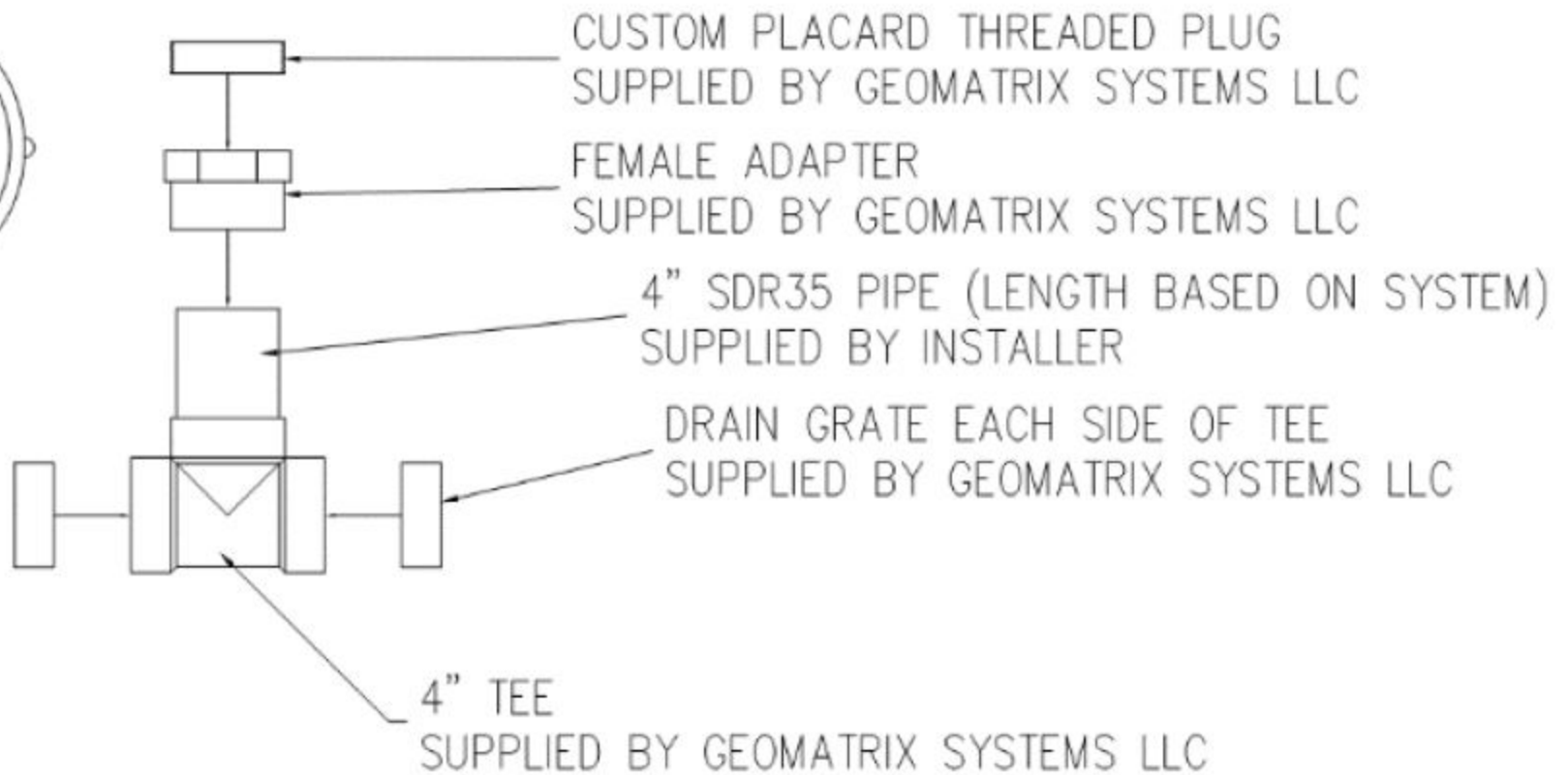
* Distribution pipe for gravity applications shall comply with RIDEM OWTS Rule 6.34C
Distribution pipe for pressure applications shall comply with RIDEM Guidelines for the
Design, Use and Maintenance of Pressurized Drainfields

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patents: www.geomatrixsystems.com

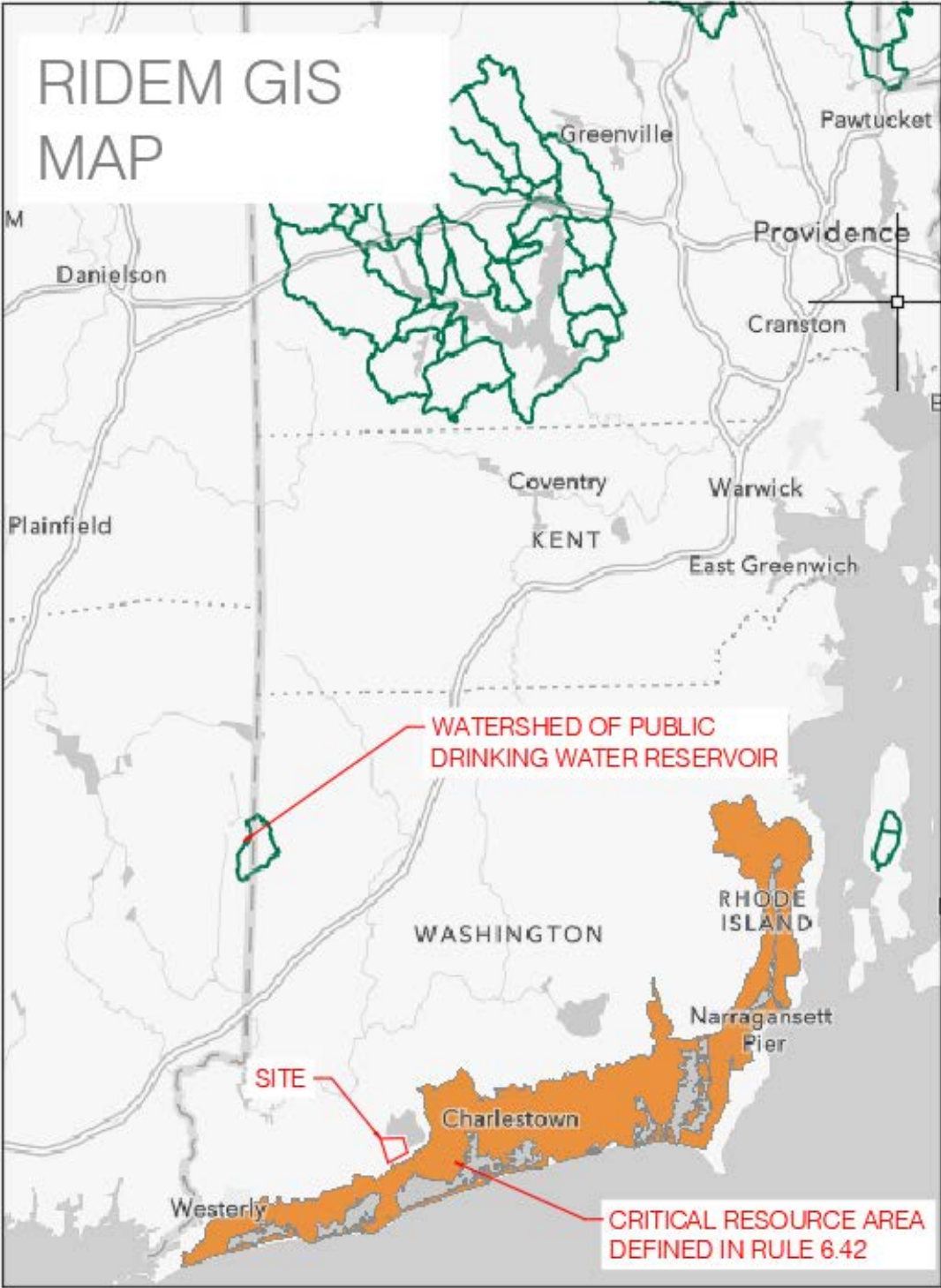
GST LEACHING SYSTEM
B-B' Cross Section
Geomatrix Systems, LLC., Old Saybrook, CT
860-510-0730

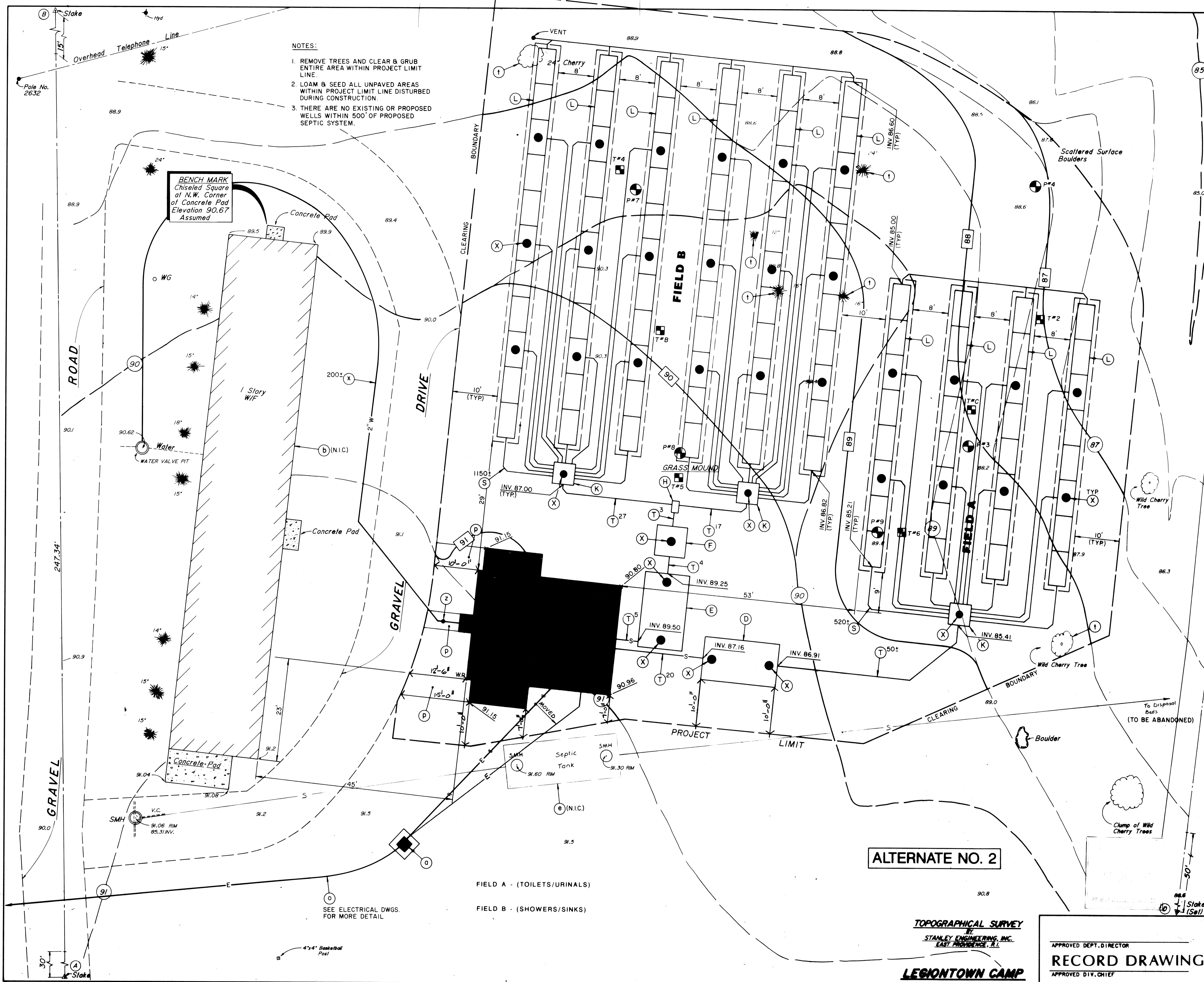
SCALE	None	REV.	0
DATE	9-4-2018	ACAD No.	040 GLS B-B'.DWG
DRAWN BY:	ERP	SHEET	3 Of 3

GEOMATRIX GST™ LEACHING SYSTEM INSPECTION PORT DETAIL

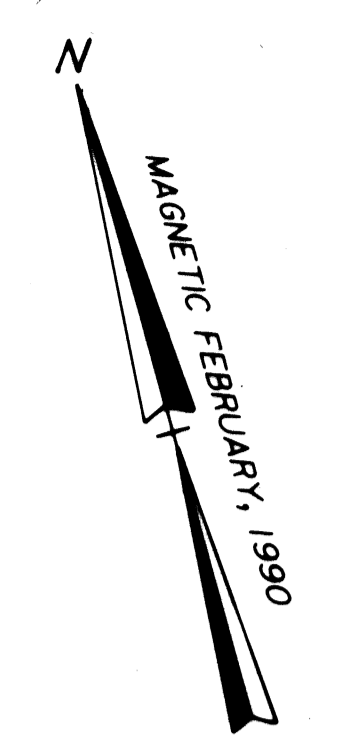


GST LEACHING SYSTEM			
Inspection Port Detail			
Geomatrix Systems, LLC., Old Saybrook, CT			
860-510-0730			
SCALE	None	REV.	A
DATE	6/2/2015	ACAD No.	GSTIP.DWG
DRAWN BY:	ERP	SHEET	1 OF 1

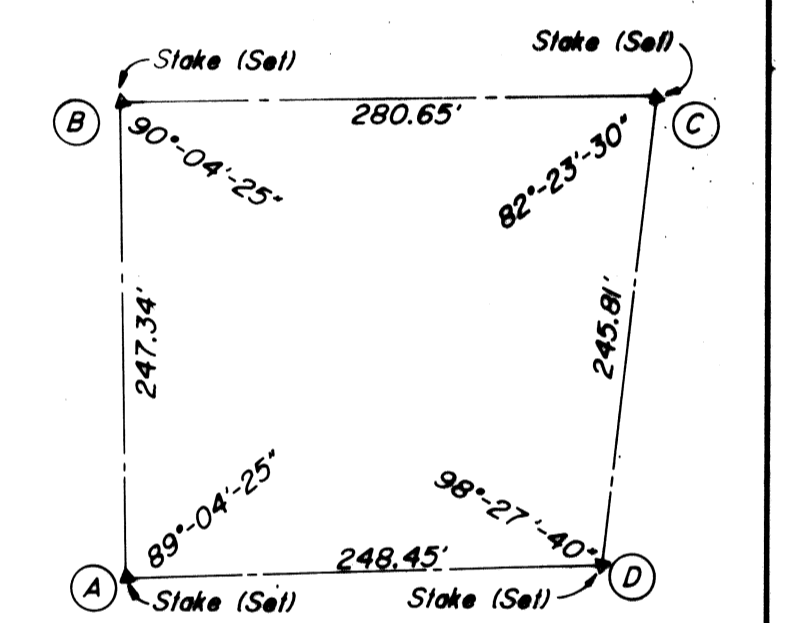




- NOTES:**
1. REMOVE TREES AND CLEAR & GRUB ENTIRE AREA WITHIN PROJECT LIMIT LINE.
 2. LOAM & SEED ALL UNPAVED AREAS WITHIN PROJECT LIMIT LINE DISTURBED DURING CONSTRUCTION.
 3. THERE ARE NO EXISTING OR PROPOSED WELLS WITHIN 500' OF PROPOSED SEPTIC SYSTEM.



- LEGEND:**
- 90 — EXISTING CONTOURS
 - SURVEY TRAVERSE LINE
 - ☼ — SPRUCE TREE
 - SMH — SEWER MANHOLE
 - WG — WATER GATE
 - Δ SIK. (Soil) — STAKE (Soil)



ROBERT HAIG ASSOCIATES
ARCHITECTS-PLANNERS-ENGINEERS
EAST PROVIDENCE, RI TAUNTON, MA

REVISIONS			
DATE	ITEM	CHECK	BY

MAINTENANCE BUILDING AND TOILET/SHOWER FACILITIES
BURLINGAME STATE PARK
CHARLESTOWN, RI

STATE OF RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
DIVISION OF PLANNING & DEVELOPMENT

SITE PLAN - LEGIONTOWN

DRAWN BY: M.W.	DATE: JULY 1991	C1.5
CHECKED BY: M.W.	SCALE: 1"=10'	7 OF 40

ALTERNATE NO. 2

TOPOGRAPHICAL SURVEY
STANLEY ENGINEERING, INC.
EAST PROVIDENCE, R.I.
LEGIONTOWN CAMP

APPROVED DEPT. DIRECTOR
RECORD DRAWING
APPROVED DIV. CHIEF

