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Addendum #1

August 7, 2025

Re: **Addendum No. 1**
Sandy Plains Public Safety Station
15224 Creedmoor Road
Wake Forrest, NC 27587
ADW Job No. 23029
Wake County Bid #25-073

These clarifications constitute Addendum No. 1 and considered part of the Bid Documents. General Contractor shall see that their sub-contractors are in full receipt of the information contained herein.

General Clarifications:

1.) See attached attendance sheet from the non-mandatory pre-bid meeting held on Wednesday, July 30, 2025 at 2:00 pm. at the Wake County Public Safety Center, 330 Salisbury Street, Raleigh, NC, Room C170.

2.) See attached waste water bidding documents which includes additional information for bidders including potential sub-contractors as well as waste water specifications & cut sheets in addition to the drawings which were also included in the bid set.

3.) AWI certification is required for this project and can't be waived.

4.) AISC certification is required for this project and can't be waived.

5.) A cast-metal show base is required for flagpoles per specification section 10 75 00. A ground sleeve model flagpole is not allowed.

6.) This is not a Build America, Buy America Act (BABAA) project, so BABAA requirements are not required for this project. Also, there are no Davis Bacon requirements for this project.

7.) All window sills are to be solid surface SSF-2 without apron in lieu of wood sills & stools per the finish legend on sheet A700.

8.) **All bidders are to make sure they allow themselves enough time on bid day to park and get through Wake County Security at the entrances to the Justice Center.**

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General RFI questions:

1.) Drawing E400:
The current diagram shows the final PV interconnection point at the MDP, which is fed by the generator. Since PV systems cannot backfeed into a generator, we recommend making the final PV connection at the line side of ATS#1. This approach will prevent backfeed to the generator and eliminate the need for a shutdown relay/function.
Please confirm if this is acceptable.

Response: System shall remain a load side connection to the MDP due to additional code required infrastructure needed near the ATS in the electrical room for a lineside connection. Please provide the shutdown function and all necessary infrastructure for the inverters when the generator kicks on per the PV performance specification.

2.) Drawing E500:
The MDP panel board is rated at 600A, and the main circuit breaker (MCB) is also rated at 600A. Based on this, only a 120A backfeed is allowed, so a 300A PV breaker cannot be installed in the MDP. We recommend final PV connection at the line side of the ATS#1.

Response: System to remain a load side connection. MDP riser and panel schedules to be coordinated to show an MDP with an 800A breaker and a 1000A bus.

3.) Drawings E500 & E400:
On the electrical riser diagram (E400), the MDP is shown as an 800A MLO panel, while on the panel board schedule (E500), it is listed as having a 600A main rating.
Please confirm the correct rating for the MDP panel.

Response: System to remain a load side connection. MDP riser and panel schedules to be coordinated to show an MDP with an 800A breaker and a 1000A bus.

4.) Drawing E120
We propose installing the PV panels in portrait orientation to reduce racking costs and roof loading. Please confirm if this is acceptable.

Response: This configuration is acceptable as long as performance based required of the PV system are still met.

5.) Drawing E400:
Please advise the NEMA rating for the 300A PV AC disconnect and 300A PV panel.

Response: NEMA 4X per Wake County standards and PV specifications.

6.) Drawing E400
Please clarify the following:

- Who is responsible for providing and installing the conduits and conductors from the inverters to the **Building Automation System (BAS)**?
- We understand this scope falls under the electrical or controls contractor. Please confirm if our understanding is correct.

  Response: There is no BAS in the building. The online cloud platform can be utilized from the inverter manufacturer to monitor the production and array status. A hardwired CAT 6 or cellular card at the first inverter can achieve this. Any conduit and wire for this system will be by the PV contractor.

7.) Please confirm whether **prevailing wage / Davis Bacon / BABA** requirements apply to this project.

Response: There are no prevailing wage, Davis Bacon, or BABAA requirements for this project.

8.) Photovoltaic Specs Section 263100 Section 2.10
Please confirm the purpose of the revenue-grade meter (RGM). Is it required solely for production monitoring, or is consumption monitoring also required?

If consumption monitoring is needed, it will be only for ATS#1.

Additionally, since we are using Chint CPS inverters, please confirm whether the **CPS FlexOM 4G Revenue-Grade Meter** is acceptable for this purpose.

Response: Purpose of a revenue grade meter is to provide production information outside of a cloud platform. It is not required unless the client wants it. If the client is okay viewing array information on a cloud dashboard, this meter is not required. This meter is for production only. A consumption NET METER shall be provided by the utility company, coordinated by the contractor when submitting the interconnection agreement.

9.) Drawing E400:
Is the entire scope of the photovoltaic system included under Alternate #2, or does any portion fall under the base bid?
Response: Yes, the entire scope/installation of the photovoltaic system falls under Alternate #2.

10.) Drawing E120
We understand that the lightning protection system for the photovoltaic system falls under the electrical contractor's scope of work. Please confirm if this understanding is correct.
Response: Yes, EC shall provide the lightning protection system.

Specifications:

1.) See attached section 00 70 00 that has the updated General Conditions.

2.) Section 01 23 00 Alternates: Change alternate #3 to read as follows:

   a. ALTERNATE NO. 3: Owner preferred alternate for all solar voltaic equipment and start-up services, including, but not limited to, solar panels, power optimizers, combiners, and inverters with SolarEdge Technologies, Inc. being the Owner's preferred manufacturer.

3.) Section 03 00 00 Cast-in-Place Concrete: Part 2.1 E., item 1-Class A products: Add Viper II 15-mil "Class A" Vapor Barrier by ISI Building Products as an acceptable manufacturer & product.

4.) Section 03 20 00 Concrete Reinforcing: Delete Part 2.1 –Performance Requirements in its entirety. Delegated design is not required on this project for a thermal break insulated connection system.

5.) Section 06 22 00 Millwork: See attached revised section 06 22 00. Part 2.3: Delete the reference to Certified wood. Certified FSC wood is not required on this project.

6.) Section 10 26 13:
   b. Section 2.1, change basis of design product from CR-1 to read as CG-1.
   c. Section 2.1, item 2, Change product number from FS-20N to Acrovyn 40000 Corner Guard.

7.) Section 26 32 13 Engine Generators: See attached revised section 26 32 13.

8.) Section 26 51 19 LED Interior lighting: See attached revised section 26 51 19.

9.) Section 26 56 19 LED Exterior Lighting: See attached revised section 26 56 19.

10.) Section 28 31 11 Digital Addressable Fire Alarm System: See attached revised section 28 31 11.

Drawings:

Architectural:

1.) Sheet A003: Door #107E swing has been reversed and a magnetic hold open device has been added and tied to the fire alarm system. Use door hardware set 8.1 for this door below and in the attached section 08 71 01 revised door hardware schedule. The door type, frame type & rating remain the same. See revised electrical sheet E100 attached for power & connection to the fire alarm system for this door.

Set: 8.1

	Hinge	TA2714	US26D	MK
1	Exit Device	12 8815 ETJ	US32D	SA
1	Surface Closer	PR7500	689	NO
1	Kick Plate	K1050 8" high CSK	US32D	RO
1	Electromagnetic Holder	990 SERIES	689	RF
1	Set Door Seals	S88BL		PE
1	Hardware	SEE NOTE BELOW		OT

NOTE: DOOR TO BE TIED INTO BUILDING'S FIRE ALARM SYSTEM.

2.) Sheet A100: Door #107E swing has been reversed and a magnetic hold open device has been added and tied to the fire alarm system. See above for new door hardware set 8.1 & attached section 08 71 01 door hardware schedule. The door type, frame type & rating remain the same. See revised electrical sheet E100 attached for power & connection to the fire alarm system for this door.

3.) Sheet A101: Dimensions & wall types have been updated for revised door #107E.

4.) Sheet A401: See attached revised sheet A401: Details 2 & 4 have been revised to show a solid surface window sill without an apron.

5.) Sheet A600: See attached revised sheet A600 for new hardware set 8.1 at door #107E.

6.) Sheet A700: See attached revised sheet A700. Corner guard basis of design to be CG-1 listed in the finish schedule. Corner guard CG-1-2” wing and CG-2-3” wing have been deleted from the project and is not used. CG-1 basis of design to be CG-1: Inpro Corner Guard – High Impact, 160BN Surface Mounted, Color: 0154 Clam Shell, 2” wing, bottom is set at 7” above finish floor. The top is to align with the top of the interior door frames and not exceed the frame.

7.) Sheet A701: See attached revised sheet A701 for CG-1 surface mounted corner guard. CG-2 has been deleted.

Fire protection:

1.) See attached revised sheet FP101 for relocation of FDC connection.

2.) See attached revised sheet FP200 detail 1 for revised FDC connection layout.

Plumbing:

1.) Sheet: P201: See attached revised sheet P201 for **v**ent for floor drain in Outdoor Storage 143 added.

Mechanical:

1.) See attached revised sheet M101 for revised note #8 at bunkroom ductwork penetrating bunkroom walls.

2.) See attached revised sheet M400 for detail 8-wall mounted fire damper detail.

3.) Sheet M400: Fire damper has been added.

4.) Sheet M500: Refrigerant types and refrigerant limit calculation have been added to schedule.

Electrical:

1.) Sheet: E010: Added EPO location on generator per fire Marshall comment.

2.) Sheet: E100:

a. Added power to door holder in corridor 107 for Door #107E.

b. Updated washer receptacle in room 113 to coordinate with GFCI requirements. GFCI protection is now at breaker in lieu of receptacle.

3.) Sheet: E200: Relocated exit sign for corridor 107 per door #107E swing change.

4.) Sheet: E300 Updated electrical room layout due accommodate EPO and actual size of panel MDP.

5.) Sheet: E400:

a. A note has been added to comply with section 110.24 Available Fault Current. A) Field Marking – Service equipment at other than dwelling units shall be legibly marked in the field with the available fault current. The field marking(s) shall include the date the fault current calculation was performed and be of sufficient durability to withstand the environment involved. The calculations shall be documented and made available to those authorized to design, install, inspect, maintain, or operate the system.

b. Updated various panel ratings, conduit, and wire sizes to coordinate with panel schedules

c. Updated notes for generator per fire Marshall comments

6.) Sheet: E500: Updated panel schedules based on GFCI requirements, mechanical changes, and panel rating coordination

7.) Sheet: FA 100: Added door holder for door #107E connection to fire alarm system.

End of Addendum #1

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Pre-Bid Meeting for the Sandy Plains Public Safety Station

ATTENDANCE LIST

LOCATION: Wake County Public Safety Center, 330 Salisbury Street, Raleigh, NC, Room C170.

ADW#: **23029**

DATE: **July 30, 2:00 pm**

☒ Pre-Bid Meeting ☐ Special Mtg. ☐ Pre-Final

☐ Monthly Conf. ☐ Job Check ☐ Final

NAME	COMPANY	EMAIL	PHONE
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Engineers and Soil Scientists

Agri-Waste Technology, Inc.
501 N Salem Street, Suite 203, Apex, NC 27502
agriwaste.com | 919.859.0669

June 16, 2025

ATTN: Wake County Facilities Design & Construction
c/o Mark Forestieri, Director
336 Fayeteville Street
Raleigh, NC 27601

SUBJECT: Engineered Option Permit
Released for Bid
Sandy Plains Fire Station – WWTS
15224 Creedmoor Rd, Wake Forest, NC 27587
Wake County PIN: 0894000183

Dear Mark Forestieri,

Enclosed please find the **"Released for Bid"** design package for the wastewater system to serve the fire station at 15224 Creedmoor Rd, Wake Forest, NC 27587 (Wake County PIN: 0894000183). This wastewater system is permitted through the *Engineered Option Permit*. Because you have selected the private permitting route, the system is completely dependent on the work completed by the soil scientist and engineer. The county health department bears no responsibility for the system. To ensure a smooth transition into the construction phase of this project, below are the next steps:

1. The "Released for Bid" design package can be sent to potential installers to get quotes for the system installation. With this being an Engineered Option Permit, the engineer may assist in the installer selection based on the specifications set forth in the design package. We are happy to aid in facilitating bids with potential installers on your behalf. Below are a few AWT Recommended installers in your area:

Creech's Plumbing & Septic
Stacy Creech
(252) 262-2708
stacycreech@creechsplumbing.com

Full Circle Environmental
Zach Woody
(919) 492-5000
zach@fullcircleenv.com

McFarland Septic, Inc.
Waylon McFarland
(919) 383-1015
mcfarlandseptic@gmail.com

The Water Specialist
Jim Sparrow
(919) 241-4950
jim@thewaterspecialist.com

Chris Milko Grading & Septic
Chris Milko
(919) 730-1361
chris.milko@yahoo.com

T & G Backhoe, Inc.
Drew Hinshaw
(336) 944-1445
rdhinshaw96@gmail.com

*Please note: Alternative installers may be used, but ultimately must be approved by AWT. In the event a non-recommended installer is used to install the system, additional construction oversight fees will apply.

2. Once an installer is selected, a pre-construction meeting with the engineer, soil scientist, septic installer, builder (optional, but strongly recommended), and owner (optional) is required prior to any construction or clearing of the designated septic areas. **Please note, the soil in the primary and repair drainfield areas is very fragile and can be easily compacted.** To protect these sensitive areas from potential disturbance, the designated drainfield area should be clearly marked and/or fenced off so no disturbance from construction activities can occur.

    - AWT will establish with the installer the required times an AWT representative is to be present to oversee system installation.
    - Prior to clearing the drainfield and installation of the drip tubing, the soil scientist must approve the site conditions (dry period).

3. This system will require an operator to maintain the system. An Operator in Responsible Charge (ORC) must be contacted to visit twice a year to inspect the system and provide the necessary ongoing maintenance. AWT can be the contracted ORC of the system if desired – a separate contract will be sent for this service.

4. Upon completion of the system installation and successful system start up, an Authorization to Operate "ATO" Meeting will be scheduled. The engineer, soil scientist, septic installer, and owner are required to attend the meeting. The county representative is also invited to attend. The ATO meeting is a formality to familiarize the owner with system components, confirm system operation, ensure ongoing maintenance of the system is understood, and ultimately provide all documentation to the county to file. Once the final ATO package is sent to the county, this allows for the issuance of the Certificate of Occupancy.

If you have any questions or concerns, please feel free to contact me at 919-859-0669 or via email at kdavidson@agriwaste.com.

Regards;

Kevin P. Davidson, P.E.
VP of Engineering

Engineers and Soil Scientists

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501 N Salem Street, Suite 203, Apex, NC 27502
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Sandy Plains Fire Station – WWTS
15224 Creedmoor Rd, Wake Forest, NC 27587
Wake County PIN: 0894000183

Plans and Specifications for Wastewater Treatment System

FINAL DESIGN
RELEASED FOR BID
NOT RELEASED FOR CONSTRUCTION

Date: June 16, 2025

Consultants: Kevin Davidson, P.E.
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Plans and Specifications for Wastewater System

1. Narrative Description of System
2. Wastewater System Calculations
   - Design and Tank Sizing
   - Storage/Dosing Tank Sizing
   - Elevations
   - Buoyancy
   - Primary Dripfield Layout
   - Repair Dripfield Layout
   - Drip Design
   - Pump Sizing
   - Pump and Haul Calculations
3. Wastewater System Drawings

WW-1	Cover Sheet
WW-2	Property Layout
WW-3	System Layout
WW-4	Component Layout
WW-5	Primary Drainfield
WW-6	Primary Drainfield Details
WW-7	Repair Drainfield
WW-8	Tank Details
WW-9	Dripfield Details
WW-10	System Profile
WW-11	Manifold Details
WW-12	Pump and Haul Details
WW-13	Electrical Plan
WW-14	Excavation Safety

4. Wastewater System Specifications
5. Design Basis – Component Selection
   - Tank Sheets
   - Access Riser Adapters, Tank Risers, Riser Lids
   - External Splice Box
   - Safety Nets
   - Effluent Filter
   - AdvanTex AX-25RT Treatment Pod
   - System Pumps
   - Control Panel
   - Float Switch Assemblies
   - Dripline
   - Spin Filter
   - Solenoid Valve
   - Flow Meter
6. Inspection Documentation

1. Narrative Description of Wastewater System

Engineers and Soil Scientists

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Narrative Description of Subsurface Drip System with TS-II Pretreatment

The designed Subsurface Drip System with Pretreatment considers the following components:

- Septic Tank with Effluent Filter
- Recirculation Tank (integrated in AX-25 Unit)
- AdvanTex AX25-RT Treatment Pod
- UV Disinfection
- Pump Tank
- Headworks Boxes
- Control Panel
- Subsurface Dripfield
- Pump and Haul Tank

Due to the advanced technology in this system, a Certified Operator must be contracted to maintain this system.

Septic Tank

A 1,500-gallon septic tank will serve the facility. The septic tank will be outfitted with an 8-in. Orenco Biotube effluent filter on the outlet end. Orenco Access Risers (24 in.) will be installed on both the inlet and outlet ends of the septic tank. To facilitate the riser installation, riser adapters will be cast into the septic tank during tank construction. All tank risers shall contain an inner lid or approved safety device. Rubber boots (4 in.) shall be cast into the inlet and outlet ends of the septic tank. Waste that exits the septic tank will flow via gravity to the AdvanTex recirculating treatment unit.

AdvanTex AX25-RT Treatment Pod

The treatment component of the system is an AdvanTex AX25-RT treatment pod. The pod is an integrated unit that combines recirculation and treatment into a single, sealed unit. Liquid from the septic tank will flow by gravity to the inlet of the treatment pod and into the recirculation tank portion of the AX-RT unit. Liquid from the recirculation tank will be periodically applied across the filter fabric. Wastewater will be sprayed over the textile sheets. The wastewater percolates down through the textile sheets and is distributed between the recirculation chamber and discharge chamber by means of the tank baffle. The treated wastewater will exit the AX-RT unit by gravity to the pump tank.

The recirculation pump is controlled by a system of three (3) floats that operate the recirculation pump in a Timed Dose arrangement. Float 1 (lowest elevation) is a Redundant Off float. Float 2 is a Peak Enable Float. Float 3 acts as a High Water Alarm. Under normal operation the Redundant Off float will be engaged thereby activating the timer in the control panel. At the pre-set interval the pump will engage and distribute effluent over the textile fabric ("On" cycle). Following this period, the pump will turn off for a designated time ("Off" cycle)". During periods of high water in the recirculation portion of the tank, the Peak Enable float will engage and reduce the pre-set "Off" time and thereby send increased flow across the fabric. If the water level in the recirculation tank does not decrease, the High Water Alarm will activate.

Anti-flotation beams or a concrete ring around the mid-flange will be installed to prevent flotation of the pod during high water table conditions. The pod and accessories will be installed on a bed of gravel.

UV Disinfection

Disinfection for the system will be accomplished using a single bulb UV system integrated into the inlet riser of the pump (field dosing) tank. The UV light should operate for approximately one year prior to needing to be replaced. If the UV light burns out or loses sufficient intensity (below a set threshold), an alarm will activate and disable the system pump. An alarm light on the control panel will also illuminate. When the alarm is activated, water use should be reduced until the alarm condition ha been addressed.

Pump (Field Dosing) Tank

A new 1,775-gallon pump tank will be installed for this system. As treated effluent leaves the AX-RT unit, the effluent will be stored in the pump tank. Periodically, the effluent will be pumped from the tank to the dripfield. Orenco Access Risers (24 in.) will be installed on both the inlet and outlet ends of the tank. To facilitate the riser installation, riser adapters will be cast into the pump tank.

Flow to the dripfield is controlled by the floats in the pump tank and the specific timer settings programmed into the control panel. There is a 3-float system in the pump tank. Float 1 (lowest elevation) is a Redundant Off float. Float 2 is a Timer Enable float. Float 3 is a Peak Enable and High Water Alarm float. Under normal operation the Redundant Off and Timer Enable floats will be engaged thereby activating the timer in the control panel. At the pre-set interval, the pump will engage and send water to the dripfield ("On" cycle). Following this period, the pump will turn off for a designated time ("Off" cycle)". During periods of high water in the pump tank, the Peak Enable float will engage and reduce the pre-set "Off" time and thereby send increased flow to the dripfield. If the water level in the pump tank does not decrease, the High Water Alarm will activate.

Headworks Boxes
The headworks boxes contain irrigation components including a spin filter, flowmeter, and solenoid valves. The headworks boxes will be placed on a gravel beds (on the pump tank if space allows).

The spin filter collects small debris from the treated water before it is sent to the dripfield. At pre-set intervals the spin filter is flushed of the collected debris. This flushed water is sent back to the septic tank. Similarly, on a set basis, the "field return valve" (located in the headworks box) opens thereby allowing the field driplines to be flushed. This flushed water also returns to the septic tank.

Control Panel
One control panel will be installed with this wastewater system. The panel will control operation of the recirculation pump, UV system, field discharge pump, and solenoid valves within the headworks boxes. This panel will be connected to an internet connection that will notify the operator of system operation.

Dripfield
The treated effluent is pumped to a four-zone subsurface drip field. The field consists of supply and return lines as well as a minimum of 2,500 feet of dripline To account for "blanking" during the installation of the drip lines, the primary field layout and design account for 3,404 of dripline (36.2% blanking). The dripline is installed at a 6-in. depth and placed along elevation contours. Emitters are spaced every 2 feet on the dripline. Each emitter has a 0.6 gph flowrate. Air/vacuum relief valves are located on the supply and return manifolds to allow the system to properly operate.

Construction Inspections
During the installation of the system, construction inspection(s) will be conducted by the certifying engineer or his designated representative. These inspections will help to ensure the system is installed to meet the intended design and to document the system components. At the completion of the installation a final inspection will be completed by the certifying engineer. At this time, the system installer will also provide the certifying engineer with documentation of the installation as well as an installer certification indicating the system was installed to meet the intent of the design.

Testing and Start-Up Procedures
At the final inspection (after system installation is complete), the different components will be tested to ensure they are operating as intended. The system will be placed into operation and using the flow meter and pressure check points, system operating parameters will be recorded. The measured values will be compared to the system design and the installation to document the baseline parameters of the installed system.

Operation and Maintenance

Per the regulatory requirements and based on the system classification, this system will require a certified operator. A copy of the contract with the certified operator will be submitted to the local health department prior to receiving the operations permit. A contract must be maintained throughout the life of the system. The system will require quarterly inspections for the first year. Inspections may be reduced to twice a year if the wastewater system is incompliance with all OP conditions after the first year. At each inspection, the operator will inspect the treatment unit and the dripfield. The system will be manually operated and tested to ensure the system is operating as intended. The operator will also perform the required maintenance activities (clean filters, check pumps, check drainfield). Additionally, the operator will collect wastewater samples per the regulatory requirements.

Pump and Haul Tank & Alarm

A 2,500-gallon traffic-rated pump and haul tank will serve the facility and provide storage for the industrial waste that flows from the floor drains in the apparatus bay. The pump and haul tank will be outfitted with Orenco Access Risers (24 in.) on both the inlet and outlet ends of the tank. To facilitate the riser installation, riser adapters will be cast into the tank during tank construction. All tank risers shall contain an inner lid or approved safety device. A rubber boot (4 in.) shall be cast into the inlet end of the tank.

The tank will be pumped by a contract hauler bi-annually. The tank will be equipped with a single High-Water Alarm float that is controlled by an alarm panel. When the High-Water Alarm Float is engaged, an audible and visible alarm will activate in the panel and signal that it is time to have the tank pumped.

2. Wastewater System Calculations

Wastewater Treatment System Design Calculations

Design, Tank, and Treatment Sizing

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

SEPTIC TANK SIZING

Daily Flow Estimate

# of Units	Units	Flow/Unit (gpd/unit)	Flow/Day (gpd)
1	Fire Station	600	600
		TOTAL DAILY FLOW (Q) =	**600 gpd**

Septic Tank Volume/Size (based on maximum daily flow estimate)

For dwelling units greater than five bedrooms places of business, or places of public assembly,

DDF	Min. Volume (gal)
Q≤600	V = 2Q
600 < Q < 1,500	V = 1.17Q + 500
1,500≤Q≤4,500	V = 0.75Q + 1,125
Q > 4,500	V = Q

Required Minimum Tank Size **1,200 gal**
per 15A NCAC 18E .0801 (a)

Septic Tank Volume/Size (based on AdvanTex Innovative Approval)

Flow (GPD)	Min. Volume (gal)
500	1,000
501 - 600	1,500
601 - 750	2,000
751 - 1000	2,500
1001 - 1500	3,750
1501 - 2000	5,000
2001 - 2500	6,250
2501 - 3000	7,500

Required Minimum Tank Size: **1,500 gal.**
(per Advantex Approval)
Tank Size Provided: **1,500 gal.**

Tank Model: **ShoafSepticTS 1500 STB**
STB-390 **Basis of Design*

RECIRCULATION TANK SIZING and ADVANTEX PODS

Recirculating Tank Volume/Size (based on maximum daily flow estimate)

Flow (GPD)	Min. Volume (gal)	AX Units	AX-RT Unit
500	1,000	1-AX-20	AX-20 RT
501 - 600	1,000	2-AX-20	AX-25 RT
601 - 750	1,000	2-AX-20	
751 - 1000	1,500	2-AX-20	
1001 - 1500	2,000	3-AX-20	
1501 - 2000	2,500	1-AX-100	
2001 - 2500	3,000	2-AX-100	
2501 - 3000	3,500	2-AX-100	

Required Minimum Tank Size: **1,000 gal.**
Tank Size Provided: **Integrated**
AX Unit Required: **AX-25 RT**

RECIRCULATION PUMP SETTINGS AX-25 RT

Timer Settings

Required Doses/Day	96	cycles/day
Recirculation Ratio	2.8	:1
Design Flow	600	gpd
Total Flow to Pod	1,680	gpd
Dose Flowrate to Pod	21	gpm
Return Flowrate to ST	6	gpm
Retun Flow	480	gpd
Total Flow to Pump	2,160	gpd
# of Pumps	1	
Pump Flowrate	27.0	gpm
# of Cycles/day	**96**	**cycles/day**
Cycle Volume	**22.5**	**gallons**
Cycle Run time	**0.8**	**min**
Cycle Off Time	**14.2**	**min**

PUMP TANK SIZING

Required Minimum Tank Size **1,500 gal**
per 15A NCAC 18E .0802 (a)

Tank Size Provided: **1,775 gal**

Tank Model: **ShoafPumpTS 1775 PT**
PT-352 **Basis of Design*

Wastewater Treatment System Design Calculations
Working Volume and Emergency Storage

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Pump/Storage Tank

Working Volume Needed:	600	gal	
Dose Volume:	76		

Emergency Storage Volume

Tank Size (nominal)	1,775	gal	
Basis of Design	Shoaf		
Avg. Gal / Inch	28.17	gal/in.	*(from tank manufacturer)*
Interior Top of Tank	63.0	in.	*(interior dimensions)*
Length	120.0	in.	
Width	60.0	in.	
Low Water Alarm (LWA)	22	in.	*(min. depth required 18")*
Dose Drawdown	2.7	in.	
Timer Enable (TE)	25	in.	
High Water Alarm Level (HWA)	40	in.	

Working Volume & Storage Time

Pump Submergence & Dose Volume	696	gal
Storage Volume	648	gal
Estimated Storage Time in Tank	**1.08**	**days**

Note: Storage time must be greater than 1 day

Wastewater Treatment System Design Calculations

Elevations

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

***Elevations based on GIS data**
***Confirm all elevations in field prior to installation**

Specifications

Septic Tank	**TS 1500 STB**		**AdvanTex RT Pod**	**AX-25 RT**		**Pump Tank**	**TS 1775 PT**	
Length	126.00	in.	*Length*	102.00	in.	*Length*	126.00	in.
	10.50	ft.		8.50	ft.		10.50	ft.
Width	66.00	in.	*Width*	64.25	in.	*Width*	66.00	in.
	5.50	ft.		5.35	ft.		5.50	ft.
External Height	70.00	in.	*External Height*	72.00	in.	*External Height*	70.00	in.
	5.83	ft.		6.00	ft.		5.83	ft.
Bottom of 4" Inlet	11.00	in.	*Bottom of 4" Inlet*	28.00	in.	*Bottom of 3" Inlet Invert*	3.00	in.
**from Top of Tank*	0.92	ft.	**from Top of RT*	2.33	ft.	**Above Top of Tank*	0.25	ft.
Bottom of 4" Outlet	13.00	in.	*Bottom of 4" Outlet*	37.00	in.	**Inlet located in Tank Riser*		
**from Top of Tank*	1.08	ft.	**from Top of RT*	3.08	ft.			

Elevations

Stubout (Assumed)	371.50	ft.						
Septic Tank			**AdvanTex RT Pod**	AX-25 RT		**Pump Tank**		
DL Pipe Length to ST Inlet	85.00	ft.	*DL Pipe Length to RT Inlet*	8.00	ft.	*DL Pipe Length to PT Inlet*	14.00	ft.
Ground Surface at Low Side of ST	359.50	ft.	*Ground Surface at High Side of RT*	359.00	ft.	*Ground Surface at Low Side of PT*	358.50	ft.
Cover over Low Side of ST	12.00	in.	*Exposed Height of RT*	3.00	in.	*Cover over Low Side of PT*	33.00	in.
	1.00	ft.		0.25	ft.		2.75	ft.
Exterior Top of Tank	358.50	ft.	*Exterior Top of RT*	359.25	ft.	*Exterior Top of Tank*	355.75	ft.
Inlet Invert	357.58	ft.	*Inlet Invert*	356.92	ft.	*Inlet Invert*	356.00	ft.
Slope of DL Pipe	16.37%		*Slope of DL Pipe*	6.25%		*Slope of DL Pipe*	1.19%	
**minimum 2% slope*			**minimum 1% slope*			**minimum 1% slope*		
Outlet Invert	357.42	ft.	*Outlet Invert*	356.17	ft.			
Bottom of Excavation	352.17	ft.	*Bottom of Excavation*	352.75	ft.	*Bottom of Excavation*	349.42	ft.
**beneath 6" gravel base*			**beneath 6" gravel base*			**beneath 6" gravel base*		

Wastewater Treatment System Design Calculations

Septic Tank Buoyancy

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Tank Size (nominal) 1,500 gallons

Properties/Assumptions:

Min. liquid level to be maintained in tank at all times after initial installation.

Assume groundwater table is equal to or higher than top of chamber.
(Buoyancy is the same as long as water table is higher than top of tank.)

Effluent Density	62.4	lb/ft^3 (Specific Weight of Water)
Concrete Density	142.56	lb/ft^3
Soil Bulk Density	1.25	*(typical value)*
Soil Cover Over Tank	1.00	ft (min.)

Tank Dimensions (from supplier):

	Exterior		*Interior*	
Length	10.50	ft	10.00	ft
Width	5.50	ft	5.00	ft
Total Tank Depth	5.83	ft	5.25	ft
Permanent Liquid Depth in Tank	0	in.		
Area of Riser Openings	6.28	ft^2		
Tank Weight (est.)	13,000	lb. (based on manufacturer)		

Buoyancy Force Calculation:

Buoyancy Force = Specific Weight of Water x Displaced Volume

Buoyancy Force	**21,021**	**lb**

Weight Calculation:

Tank Weight	13,000	lb
Water Weight in Tank	0	lb
Soil Weight Over Tank	4,008	lb
Soil Tension Force	5,258	lb
Total Weight	**22,266**	**lb**

Note: Total weight must be greater than buoyancy force so that tank will not float during high water table conditions.

Wastewater Treatment System Design Calculations

AdvanTex RT Pod Buoyancy

Project: Sandy Plains Fire Station - WWTS
Address: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Properties/Assumptions:

RT Model = AX25 Gravity

All calculations are performed assuming completely submerged conditions, with no liquid in the unit.

Effluent Density =	62.4	lb/ft^3 (Specific Weight of Water)
Net Beam Density =	67.55	lb/ft^3
Net Soil Density =	67.6	lb/ft^3
Unit Weight =	908	lb (based on manufacturer)

Supplemental Ballast Evaluation (Anti-Buoyancy Beam):

Depth from top of beam to tank bottom =	3.00	in
Tank exposure length =	3.00	in
Burial depth to beam =	5.50	ft
Width of beam =	0.69	ft
	8.25	in

Buoyancy Force Calculation:

Buoyancy Force =	**12,475**	**lb (based on manufacturer)**

Weight Calculation:

Tank Weight =	908	lb
Soil Weight on Beam =	12,458	lb
Weight of Beam =	129.2	lb
Total Weight =	**13,495**	**lb**

Note: Total weight must be greater than buoyancy force so that tank will not float during high water table conditions.

Specified Anti-Flotation Beam Dimensions

Beam Length =	**89 in**	7.42 ft
Beam Width =	**8.25 in**	0.69 ft
Beam Height =	**2.25 in**	0.19 ft

Wastewater Treatment System Design Calculations

Pump Tank Buoyancy

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Tank Size (nominal) 1,775 gallons

Properties/Assumptions:

Min. liquid level to be maintained in tank at all times after initial installation.

Assume groundwater table is equal to or higher than top of chamber.
(Buoyancy is the same as long as water table is higher than top of tank.)

Effluent Density	62.4	lb/ft^3 (Specific Weight of Water)
Concrete Density	142.56	lb/ft^3
Soil Bulk Density	1.25	*(typical value)*
Soil Cover Over Tank	1.50	ft (min.)

Tank Dimensions (from supplier):

	Exterior		*Interior*	
Length	10.50	ft	10.00	ft
Width	5.50	ft	5.00	ft
Total Tank Depth	5.83	ft	5.25	ft
Permanent Liquid Depth in Tank	0	in.		
Area of Riser Openings	6.28	ft^2		
Headworks	6.28	ft^3		
Tank Weight (est.)	13,000	lb (based on manufacturer)		

Buoyancy Force Calculation:

Buoyancy Force = Specific Weight of Water x Displaced Volume

Tank Displacement	336.9	ft^3
Buoyancy Force	**21,021**	**lb.**

Weight Calculation:

Tank Weight	13,000	lb
Water Weight in Tank	0	lb
Soil Weight Over Tank	5,279	lb
Soil Tension Force	5,258	lb
Total Weight	**23,537**	**lb**

Note: Total weight must be greater than buoyancy force so that tank will not float during high water table conditions.

Dripfield Sizing - Primary

Daily Design Flow:	600	gal/day
L.T.A.R. (from L.S.S.):	0.12	gal/day/ft^2
Dripline Spacing:	2	ft
Dripline Required:	2500	ft
Total Layout Length:	3404	ft
Effective Drainfield Area:	6808	ft^2
Available for Blanking:	904	ft
	36.2%	

Primary Dripfield Layout

Line	Type	Flag Color	Layout Line Length Available (ft)	Zone	Lateral	Run Length (ft)	Lateral Length (ft)	Zone Length (ft)
1	**Layout Line**	**Purple**	90	**1**	1	**90**		
2	Interpolated Line		98			**98**	188	
3	Interpolated Line		100		2	**100**		
4	**Layout Line**	**Pink**	101			**100**	200	
5	Interpolated Line		99		3	**98**		
6	Interpolated Line		97			**96**	194	
7	Interpolated Line		95		4	**94**		
8	**Layout Line**	**Red**	93			**92**	186	**768**
9	Interpolated Line		91	**2**	1	**90**		
10	Interpolated Line		89			**88**	178	
11	**Layout Line**	**Blue**	87		2	**86**		
12	Interpolated Line		83			**82**	168	
13	Interpolated Line		80		3	**80**		
14	**Layout Line**	**Orange**	76			**76**		
15	Interpolated Line		70			**70**		
16	Interpolated Line		63			**62**	288	
17	Interpolated Line		56		4	**56**		
18	**Layout Line**	**Purple**	49			**48**		
19	Interpolated Line		54			**54**		
20	Interpolated Line		59			**58**	216	**850**
21	**Layout Line**	**White**	64	**3**	1	**64**		
22	Interpolated Line		66			**66**		
23	Interpolated Line		69			**68**		
24	Interpolated Line		71			**70**	268	
25	**Layout Line**	**Pink**	73		2	**72**		
26	Interpolated Line		75			**74**		
27	Interpolated Line		77			**76**		
28	**Layout Line**	**Blue**	78			**78**	300	
29	Interpolated Line		79		3	**78**		
30	Interpolated Line		68			**68**		
31	**Layout Line**	**Red**	67			**66**		
32	Interpolated Line		70			**70**	282	**850**
33	Interpolated Line		74	**4**	1	**74**		
34	Interpolated Line		78			**78**		
35	**Interpolated Line**	**Orange**	82			**80**		
36	Interpolated Line		81			**80**	312	
37	Interpolated Line		81		2	**78**		
38	Interpolated Line		80			**78**		
39	**Layout Line**	**White**	78			**78**		
40	Interpolated Line		79			**78**	312	
41	Interpolated Line		80		3	**78**		
42	**Layout Line**	**Purple**	80			**78**		
43	Interpolated Line		79			**78**		
44	Interpolated Line		78			**78**	312	**936**
		TOTAL:	3,437			**3,404**		

Wastewater Treatment System Design Calculations

Repair Dripfield Layout

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Dripfield Sizing - Repair

Daily Design Flow:	600	gal/day	
L.T.A.R. (from L.S.S.):	0.12	gal/day/ft^2	
Dripline Spacing:	2	ft	
Dripline Required:	2500	ft	
Total Layout Length:	3340	ft	
Effective Drainfield Area:	6680	ft^2	
Available for Blanking:	840	ft	33.6%

Repair Dripfield Layout

Line	Type	Flag Color	Layout Line Length (ft)	Zone	Lateral	Run Length (ft)	Lateral Length (ft)	Zone Length (ft)
45	**Layout Line**	**Pink**	77	**1**	1	**76**		
46	Interpolated Line		81			**80**	156	
47	Interpolated Line		85		2	**84**		
48	Interpolated Line		89			**88**	172	
49	**Layout Line**	**Blue**	94		3	**94**		
50	Interpolated Line		93			**92**	186	
51	Interpolated Line		92		4	**92**		
52	**Layout Line**	**Red**	92			**92**	184	
53	Interpolated Line		93		5	**92**		
54	Interpolated Line		93			**92**	184	**882**
55	Interpolated Line		94	**2**	1	**94**		
56	**Layout Line**	**Orange**	95			**94**	188	
57	Interpolated Line		97		2	**96**		
58	Interpolated Line		98			**98**	194	
59	**Layout Line**	**White**	96		3	**96**		
60	Interpolated Line		94			**94**	190	
61	Interpolated Line		91		4	**90**		
62	Interpolated Line		88			**88**	178	
63	**Layout Line**	**Purple**	86		5	**86**		
64	Interpolated Line		87			**86**	172	**922**
65	Interpolated Line		88	**3**	1	**88**		
66	Interpolated Line		89			**88**	176	
67	**Layout Line**	**Pink**	90		2	**90**		
68	Interpolated Line		94			**94**	184	
69	Interpolated Line		96		3	**96**		
70	Interpolated Line		98			**98**	194	
71	**Layout Line**	**Blue**	100		4	**100**		
72	Interpolated Line		95			**94**	194	**748**
73	Interpolated Line		89	**4**	1	**88**		
74	Interpolated Line		82			**82**	170	
75	**Layout Line**	**Red**	76		2	**76**		
76	Interpolated Line		76			**76**		
77	Interpolated Line		76		3	**76**		
78	Interpolated Line		77			**76**	304	
79	**Layout Line**	**Orange**	78		4	**78**		
80	Interpolated Line		71			**70**		
81	Interpolated Line		55			**54**		
82	**Layout Line**	**White**	42			**42**		
83	Interpolated Line		36			**36**		
84	Interpolated Line		34			**34**	314	**788**
85	Interpolated Line		26					
86	**Layout Line**	**Purple**	18					
		TOTAL:	**3,401**			**3,340**		

Wastewater Treatment System Design Calculations
Field Flow

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Total Field

Total quantity of effluent to be disposed per day	600	gallons / day
Hydraulic Loading Rate	0.120	gallons / sq.ft. / day
Minimum Dispersal Field Area	5000	sq.ft.

Flow Per Zone

Number of Zones 4 zone(s)

	Zone 1	Zone 2	Zone 3	Zone 4	
Dispersal area per zone	1,536	1,700	1,700	1,872	sq.ft.
Spacing between lines	2.0	2.0	2.0	2.0	ft.
Spacing between emitters	2.0	2.0	2.0	2.0	ft.
Total linear feet per zone	768	850	850	936	ft. per zone
Total number of emitters per zone	384	425	425	468	emitters per zone
Dripline Type	**Netafim**	**Netafim**	**Netafim**	**Netafim**	
Pressure at beginning of zone	26	39	41	44	psi
Feet of Head at the beginning of zone	60.1	90.1	94.7	101.6	ft.
Flow rate per emitter	0.61	0.61	0.61	0.61	gph
Dose flow per zone	**3.90**	**4.32**	**4.32**	**4.76**	**gpm**
Min. Flushing Velocity (Normal Operation)	2	2	2	2	ft/sec
Min. Flushing Velocity (Maintenance Operation)	2	2	2	2	ft/sec
Flush flow required at the end of each dripline	1.54	1.54	1.54	1.54	gpm
Length of longest dripline lateral	200	288	300	312	ft.
Flow required to Dose longest dripline lateral	1.02	1.46	1.53	1.59	gpm
Laterals per zone	4	4	3	3	laterals
Total flow for flushing velocity in all lines	6.30	7.68	4.86	4.61	gpm
Total flow per zone (flushing + dosing)	**10.21**	**12.00**	**9.18**	**9.36**	**gpm**

Dosing

Number of doses per day per zone	2.17	doses			
Timer ON. Pump run time per dose per zone	16:00	min:sec			
Timer OFF. Pump off time between doses per zone	2:28	hr:min			
Pump run time per day per zone	0:34	hr:min			
Number of doses per day for all zones	8.67	doses / day			
Time for field to pressurize	0:00:30	hr:min:sec			
Filter flush timer	0:00:20	hr:min:sec			
Field flush timer	0:01:00	hr:min:sec			
Field flush counter	10	cycles			
Time required to complete all functions per day	**2:34**	**hr:min**			
Dose volume per zone	**62**		**69**	**69**	**76** **gallons per dose**
Length of Draining Supply Line	40	67	107	147	
Volume	1.74	2.88	4.63	6.35	
Length of Draining Supply Feeder Lines	52	63	45	104	ft
Volume	0.77	0.93	0.67	1.54	gallons
Length of Draining Return Line	0	0	0	0	
Volume	0.00	0.00	0.00	0.00	
Length of Draining Return Feeder Lines	56	72	80	113	ft
Volume	0.83	1.06	1.18	1.67	gallons
Volume in dripline per zone	9.48	10.49	10.49	11.55	gallons
Total Recharge Volume	**51**	**57**	**59**	**67**	**gallons**

Note: Zones are analyzed individually. The more extreme demands are used for pump selection.

Wastewater Treatment System Design Calculations
Pump Sizing **Zone 1**

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Field Flow Summary

Number of Zones	4	zones
Zone to Calculate	Zone 1	
Number of Laterals in Zone	4	laterals
Flow Required to dose field	3.90	gpm
Flow required to flush field	6.30	gpm
Flow required to dose & flush field	10.21	gpm
Velocity in Supply Line During Dosing Cycle	1.51	fps
*must be minimum of 1.2 fps		

	Flushing Condition		Dosing Condition	
	(ft.)	(psi)	(ft.)	(psi)
Losses through Return Line				
Common Return pipe Diameter	1"		1"	
Length of return line	45		0	
Equivalent length of fittings	5		0	
Elevation Change	4.5		0.0	
Pressure loss in 100 ft of Common Return pipe	2.59	1.12	0.0	0.0
Total Pressure Loss Common Return pipe	5.78		0.00	
Return Feeder Line Diameter	1/2"		1/2"	
Length of Longest Return Feeder Line along Zone	22		0.0	
Pressure Loss in 100 ft. of Zone Return Feeder pipe	2.70	1.17	0.00	
Total Pressure Loss Return Feeder Line	0.65		0.00	
Total pressure loss from end of zone back to tank	6.43	2.79	0.00	0.0
Minimum Pressure Specified Returning to Tank	4.62	2.0	0.0	0.0
Losses through Dripline				
Length of longest dripline lateral in zone	200		200	
Minimum dosing pressure required at end of dripline	16.17	7.00	16.17	7.00
Loss through dripline during dose/flush	38.18	16.53	3.18	1.38
Min. Pressure Required at Beginning of Dripfield				
Calculated Pressure	58.97	25.53	**19.35**	8.38
Specified Pressure (from Field Flow)	**60.06**	26.00		
Losses through Headworks				
Recommended Filter (Jain Irrigation Spin Filter)	4EH-1			
Selected Filter	4EH-1			
Filter Pressure Loss	7.63	3.30	1.86	0.81
Recommended Zone Valve (Netafim Solenoid)	1.0" Solenoid			
Selected Zone Valve	1.0" Solenoid			
Zone Valve Pressure Loss	6.93	3.00	6.93	3.00
Recommended Flow Meter (Master Meter)	3/4" Meter			
Selected Flow Meter	5/8" Meter			
Flow Meter Pressure Loss	5.12	2.22	0.70	0.30
Other Pressure Losses	0	0	0	0
Total loss through Headworks components	**19.68**	8.52	**9.49**	4.11
Losses through Supply Line				
Zone Supply pipe Diameter	1"		1"	
Length of Zone Supply pipe from PT to Manifold	41		41	
Equivalent length of fittings	4.1		4.1	
Pressure Loss in 100 ft. of Zone Supply pipe	6.32	2.74	1.07	0.46
Total Pressure Loss Zone Supply pipe	2.85		0.48	
Supply Feeder Line Diameter	1/2"		1/2"	
Length of Longest Supply Feeder Line Along Zone	17		17	
Pressure Loss in 100 ft. of Zone Supply Feeder Pipe	6.58	2.85	1.11	0.48
Total Pressure Loss Supply Feeder Line	1.23		0.21	
Elevation Change (Pump to tank outlet)	7.0		7	
Elevation Change (Tank outlet to Start of Zone)	0.0		0	
Total Supply Line Head Loss from Pump to Zone	**11.08**	4.80	**7.69**	3.33
Total Dynamic Head (TDH)	**90.8 ft**		**36.5 ft**	
Pump Capacity - Flow Rate	**10.2 gpm**		**3.9 gpm**	

Pressure Regulator (Dosing Condition)

Total Dynamic Head Loss (from PT to Start of Zone)	7.48	ft
TDH of Selected Pump at Dose Flow	145	ft
TDH at Start of Zone	137.52	ft
=	59.53	psi
Is Pressure Regulator Required?	**NO**	
Required Pressure Regulator Size	-	inch

**Note: TDH at pressure regulator (start of zone) under dosing conditions must be less than or equal to maximum inlet regulator pressure*

Wastewater Treatment System Design Calculations
Pump Sizing **Zone 2**

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Field Flow Summary

Number of Zones	4	zones
Zone to Calculate	Zone 2	
Number of Laterals in Zone	4	laterals
Flow Required to dose field	4.32	gpm
Flow required to flush field	7.68	gpm
Flow required to dose & flush field	12.00	gpm
Velocity in Supply Line During Dosing Cycle	1.67	fps
*must be minimum of 1.2 fps		

	Flushing Condition		Dosing Condition	
	(ft.)	(psi)	(ft.)	(psi)
Losses through Return Line				
Common Return pipe Diameter	1"		1"	
Length of return line	71		0	
Equivalent length of fittings	7		0	
Elevation Change	7.0		0.0	
Pressure loss in 100 ft of Common Return pipe	3.73	1.61	0.0	0.0
Total Pressure Loss Common Return pipe	9.91		0.00	
Return Feeder Line Diameter	1/2"		1/2"	
Length of Longest Return Feeder Line along Zone	34		0.0	
Pressure Loss in 100 ft. of Zone Return Feeder pipe	3.88	1.68	0.00	
Total Pressure Loss Return Feeder Line	1.45		0.00	
Total pressure loss from end of zone back to tank	11.36	4.92	0.00	0.0
Minimum Pressure Specified Returning to Tank	4.62	2.0	0.0	0.0
Losses through Dripline				
Length of longest dripline lateral in zone	288		288	
Minimum dosing pressure required at end of dripline	16.17	7.00	16.17	7.00
Loss through dripline during dose/flush	68.22	29.53	9.20	3.98
Min. Pressure Required at Beginning of Dripfield				
Calculated Pressure	89.01	38.53	**25.37**	10.98
Specified Pressure (from Field Flow)	**90.09**	39.00		
Losses through Headworks				
Recommended Filter (Jain Irrigation Spin Filter)	4EH-1			
Selected Filter	4EH-1			
Filter Pressure Loss	10.06	4.35	2.11	0.91
Recommended Zone Valve (Netafim Solenoid)	1.0" Solenoid			
Selected Zone Valve	1.0" Solenoid			
Zone Valve Pressure Loss	6.93	3.00	6.93	3.00
Recommended Flow Meter (Master Meter)	3/4" Meter			
Selected Flow Meter	5/8" Meter			
Flow Meter Pressure Loss	7.09	3.07	0.87	0.38
Other Pressure Losses	0	0	0	0
Total loss through Headworks components	**24.08**	10.42	**9.91**	4.29
Losses through Supply Line				
Zone Supply pipe Diameter	1"		1"	
Length of Zone Supply pipe from PT to Manifold	67		67	
Equivalent length of fittings	6.7		6.7	
Pressure Loss in 100 ft. of Zone Supply pipe	8.52	3.69	1.29	0.56
Total Pressure Loss Zone Supply pipe	6.28		0.95	
Supply Feeder Line Diameter	1/2"		1/2"	
Length of Longest Supply Feeder Line Along Zone	32		32	
Pressure Loss in 100 ft. of Zone Supply Feeder Pipe	8.88	3.84	1.34	0.58
Total Pressure Loss Supply Feeder Line	3.13		0.47	
Elevation Change (Pump to tank outlet)	7.0		7	
Elevation Change (Tank outlet to Start of Zone)	0.0		0	
Total Supply Line Head Loss from Pump to Zone	**16.41**	7.10	**8.42**	3.64
Total Dynamic Head (TDH)	**130.6 ft**		**43.7 ft**	
Pump Capacity - Flow Rate	**12.0 gpm**		**4.3 gpm**	

Pressure Regulator (Dosing Condition)

Total Dynamic Head Loss (from PT to Start of Zone)	7.95	ft
TDH of Selected Pump at Dose Flow	145	ft
TDH at Start of Zone	137.05	ft
=	59.33	psi
Is Pressure Regulator Required?	**NO**	
Required Pressure Regulator Size	-	inch

**Note: TDH at pressure regulator (start of zone) under dosing conditions must be less than or equal to maximum inlet regulator pressure*

Wastewater Treatment System Design Calculations
Pump Sizing **Zone 3**

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Field Flow Summary

Number of Zones	4	zones
Zone to Calculate	Zone 3	
Number of Laterals in Zone	3	laterals
Flow Required to dose field	4.32	gpm
Flow required to flush field	4.86	gpm
Flow required to dose & flush field	9.18	gpm
Velocity in Supply Line During Dosing Cycle	1.67	fps
*must be minimum of 1.2 fps		

	Flushing Condition		Dosing Condition	
	(ft.)	(psi)	(ft.)	(psi)
Losses through Return Line				
Common Return pipe Diameter	1"		1"	
Length of return line	104		0	
Equivalent length of fittings	10		0	
Elevation Change	10.0		0.0	
Pressure loss in 100 ft of Common Return pipe	1.60	0.69	0.0	0.0
Total Pressure Loss Common Return pipe	11.83		0.00	
Return Feeder Line Diameter	1/2"		1/2"	
Length of Longest Return Feeder Line along Zone	31		0.0	
Pressure Loss in 100 ft. of Zone Return Feeder pipe	2.84	1.23	0.00	
Total Pressure Loss Return Feeder Line	0.97		0.00	
Total pressure loss from end of zone back to tank	12.80	5.54	0.00	0.0
Minimum Pressure Specified Returning to Tank	4.62	2.0	0.0	0.0
Losses through Dripline				
Length of longest dripline lateral in zone	300		300	
Minimum dosing pressure required at end of dripline	16.17	7.00	16.17	7.00
Loss through dripline during dose/flush	73.10	31.64	10.37	4.49
Min. Pressure Required at Beginning of Dripfield				
Calculated Pressure	93.89	40.64	**26.54**	11.49
Specified Pressure (from Field Flow)	**94.71**	41.00		
Losses through Headworks				
Recommended Filter (Jain Irrigation Spin Filter)	4EH-1			
Selected Filter	4EH-1			
Filter Pressure Loss	6.40	2.77	2.11	0.91
Recommended Zone Valve (Netafim Solenoid)	1.0" Solenoid			
Selected Zone Valve	1.0" Solenoid			
Zone Valve Pressure Loss	6.93	3.00	6.93	3.00
Recommended Flow Meter (Master Meter)	3/4" Meter			
Selected Flow Meter	5/8" Meter			
Flow Meter Pressure Loss	4.13	1.79	0.87	0.38
Other Pressure Losses	0	0	0	0
Total loss through Headworks components	**17.46**	7.56	**9.91**	4.29
Losses through Supply Line				
Zone Supply pipe Diameter	1"		1"	
Length of Zone Supply pipe from PT to Manifold	107		107	
Equivalent length of fittings	10.7		10.7	
Pressure Loss in 100 ft. of Zone Supply pipe	5.19	2.25	1.29	0.56
Total Pressure Loss Zone Supply pipe	6.11		1.51	
Supply Feeder Line Diameter	1/2"		1/2"	
Length of Longest Supply Feeder Line Along Zone	21		21	
Pressure Loss in 100 ft. of Zone Supply Feeder Pipe	9.22	3.99	2.28	0.99
Total Pressure Loss Supply Feeder Line	2.13		0.53	
Elevation Change (Pump to tank outlet)	7.0		7	
Elevation Change (Tank outlet to Start of Zone)	0.0		0	
Total Supply Line Head Loss from Pump to Zone	**15.24**	6.60	**9.04**	3.91
Total Dynamic Head (TDH)	**127.4 ft**		**45.5 ft**	
Pump Capacity - Flow Rate	**9.2 gpm**		**4.3 gpm**	

Pressure Regulator (Dosing Condition)

Total Dynamic Head Loss (from PT to Start of Zone)	8.51	ft
TDH of Selected Pump at Dose Flow	145	ft
TDH at Start of Zone	136.49	ft
=	59.09	psi
Is Pressure Regulator Required?	**NO**	
Required Pressure Regulator Size	-	inch

**Note: TDH at pressure regulator (start of zone) under dosing conditions must be less than or equal to maximum inlet regulator pressure*

Wastewater Treatment System Design Calculations
Pump Sizing **Zone 4**

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Field Flow Summary

Number of Zones	4	zones
Zone to Calculate	Zone 4	
Number of Laterals in Zone	3	laterals
Flow Required to dose field	4.76	gpm
Flow required to flush field	4.61	gpm
Flow required to dose & flush field	9.36	gpm
Velocity in Supply Line During Dosing Cycle	1.84	fps
*must be minimum of 1.2 fps		

	Flushing Condition		Dosing Condition	
	(ft.)	(psi)	(ft.)	(psi)
Losses through Return Line				
Common Return pipe Diameter	1"		1"	
Length of return line	147		0	
Equivalent length of fittings	15		0	
Elevation Change	13.5		0.0	
Pressure loss in 100 ft of Common Return pipe	1.45	0.63	0.0	0.0
Total Pressure Loss Common Return pipe	15.84		0.00	
Return Feeder Line Diameter	1/2"		1/2"	
Length of Longest Return Feeder Line along Zone	41		0.0	
Pressure Loss in 100 ft. of Zone Return Feeder pipe	2.57	1.11	0.00	
Total Pressure Loss Return Feeder Line	1.16		0.00	
Total pressure loss from end of zone back to tank	17.00	7.36	0.00	0.0
Minimum Pressure Specified Returning to Tank	4.62	2.0	0.0	0.0
Losses through Dripline				
Length of longest dripline lateral in zone	312		312	
Minimum dosing pressure required at end of dripline	16.17	7.00	16.17	7.00
Loss through dripline during dose/flush	78.17	33.84	11.63	5.03
Min. Pressure Required at Beginning of Dripfield				
Calculated Pressure	99.79	43.20	**27.80**	12.03
Specified Pressure (from Field Flow)	**101.64**	44.00		
Losses through Headworks				
Recommended Filter (Jain Irrigation Spin Filter)	4EH-1			
Selected Filter	4EH-1			
Filter Pressure Loss	6.61	2.86	2.39	1.04
Recommended Zone Valve (Netafim Solenoid)	1.0" Solenoid			
Selected Zone Valve	1.0" Solenoid			
Zone Valve Pressure Loss	6.93	3.00	6.93	3.00
Recommended Flow Meter (Master Meter)	3/4" Meter			
Selected Flow Meter	5/8" Meter			
Flow Meter Pressure Loss	4.30	1.86	1.07	0.46
Other Pressure Losses	0	0	0	0
Total loss through Headworks components	**17.84**	7.72	**10.39**	4.50
Losses through Supply Line				
Zone Supply pipe Diameter	1"		1"	
Length of Zone Supply pipe from PT to Manifold	178		178	
Equivalent length of fittings	17.8		17.8	
Pressure Loss in 100 ft. of Zone Supply pipe	5.39	2.33	1.54	0.67
Total Pressure Loss Zone Supply pipe	10.55		3.01	
Supply Feeder Line Diameter	1/2"		1/2"	
Length of Longest Supply Feeder Line Along Zone	35		35	
Pressure Loss in 100 ft. of Zone Supply Feeder Pipe	9.56	4.14	2.73	1.18
Total Pressure Loss Supply Feeder Line	3.68		1.05	
Elevation Change (Pump to tank outlet)	7.0		7	
Elevation Change (Tank outlet to Start of Zone)	0.0		0	
Total Supply Line Head Loss from Pump to Zone	**21.23**	9.19	**11.06**	4.79
Total Dynamic Head (TDH)	**140.7**	**ft**	**49.3**	**ft**
Pump Capacity - Flow Rate	**9.4**	**gpm**	**4.8**	**gpm**

Pressure Regulator (Dosing Condition)

Total Dynamic Head Loss (from PT to Start of Zone)	10.01	ft
TDH of Selected Pump at Dose Flow	145	ft
TDH at Start of Zone	134.99	ft
=	58.44	psi
Is Pressure Regulator Required?	**NO**	
Required Pressure Regulator Size	-	inch

**Note: TDH at pressure regulator (start of zone) under dosing conditions must be less than or equal to maximum inlet regulator pressure*

Wastewater Treatment System Design Calculations
Pump Selection

Project:	Sandy Plains Fire Station - WWTS
Location:	15224 Creedmoor Rd
	Wake Forest, NC 27587
County:	Wake

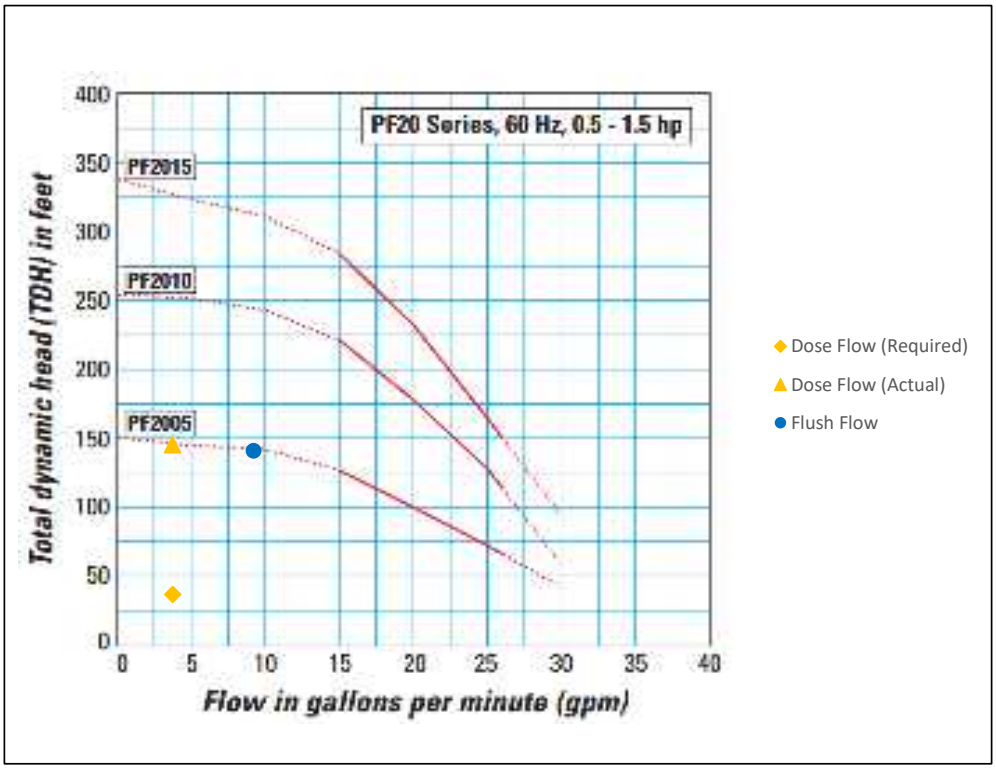
IRRIGATION PUMP SIZING

Pump Selection

Manufacturer:	**Orenco**
Model:	**PF200511**
Horsepower:	**0.50**

Pump Operating Points (from drip spreadsheet)

Operating Conditions	TDH (ft.)	Flow (gpm)	Legend	
Dose Flow (Required)	36.5	3.9	◆	*(single zone, minimum dose flow)*
Dose Flow (Actual)	145.0	3.9	▲	*(minimum dose flow on pump curve)*
Flush Flow	140.7	9.4	●	*(Flush Velocity, maximum conditions)*



Project: Sandy Plains Fire Station - WWTS Startup Date:

Location: 15224 Creedmoor Rd
Wake Forest, NC 27587

County: Wake

Number of zones 4

					PRESSURES	
				MEASURED	Supply	Return
Zone 1	768	linear ft	drip tubing, not including loops			
	384	emitters	expected			
	0.61	gph	flow per emitter			
	3.90	gpm	expected dosing flow			
	4	laterals				
	6.30	gpm	flow need for flushing			
	10.21	gpm	Total Flow Per Zone			
			Calculated Flushing Velocity (fps)	0.00		
Zone 2	850	linear ft	drip tubing, not including loops			
	425	emitters	expected			
	0.61	gph	flow per emitter			
	4.32	gpm	expected dosing flow			
	4	laterals				
	7.68	gpm	flow need for flushing			
	12.00	gpm	Total Flow Per Zone			
			Calculated Flushing Velocity (fps)	0.00		
Zone 3	850	linear ft	drip tubing, not including loops			
	425	emitters	expected			
	0.61	gph	flow per emitter			
	4.32	gpm	expected dosing flow			
	3	laterals				
	4.86	gpm	flow need for flushing			
	9.18	gpm	Total Flow Per Zone			
			Calculated Flushing Velocity (fps)	0.00		
Zone 4	936	linear ft	drip tubing, not including loops			
	468	emitters	expected			
	0.61	gph	flow per emitter			
	4.76	gpm	expected dosing flow			
	3	laterals				
	4.61	gpm	flow need for flushing			
	9.36	gpm	Total Flow Per Zone			
			Calculated Flushing Velocity (fps)	0.00		

Wastewater Treatment System Design Calculations

Pump and Haul Tank

Project:	Sandy Plains Fire Station - WWTS
Location:	15224 Creedmoor Rd
	Wake Forest, NC 27587
County:	Wake

Pump and Haul Tank

Tank Selection	**2,500**	**gallon**	***Shoaf MS 2500 H20 PT***
			PT-496 H20 Traffic Rated
			**Basis of Design*

Wastewater Treatment System Design Calculations

Pump & Haul Tank

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Pump & Haul Tank

Vaccuum Truck Storage Capacity	2,000	gal	

Emergency Storage Volume

Tank Size (nominal)	2,500	gal	***MS 2500 H20 PT (Traffic-Rated)***
Basis of Design	Shoaf		
Avg. Gal / Inch	44.64	gal/in.	*(from tank manufacturer)*
Interior Top of Tank	56.0	in.	*(from interior Tank floor)*
Length	155.0	in.	
Width	66.0	in.	
High Water Alarm Level (HWA)	45	in.	

Working Volume & Storage Time

Storage Volume in Tank	**500**	**gal**

Wastewater Treatment System Design Calculations
Elevations

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

***Elevations based on GIS data**
***Confirm all elevations in field prior to installation**

Specifications			Elevations		
Pump & Haul Tank	**MS 2500 H20 PT TR**		*Stubout (Assumed)*	371.50	ft.
Length	167.00	in.			
	13.92	ft.			
Width	78.00	in.	*DL Pipe Length to Tank Inlet*	14.00	ft.
	6.50	ft.	*Ground Surface at Low Side of Tank*	373.00	ft.
External Height	70.00	in.	*Cover over Low Side of Tank*	12.00	in.
	5.83	ft.		1.00	ft.
Bottom of 4" Inlet	16.00	in.	*Exterior Top of Tank*	372.00	ft.
**from Top of Tank*	1.33	ft.	*Inlet Invert*	370.67	ft.
			Slope of DL Pipe	5.95%	
			**minimum 2% slope*		
			Bottom of Excavation	365.67	ft.
			**beneath 6" gravel base*		

Wastewater Treatment System Design Calculations

Pump and Haul Tank Buoyancy

Project: Sandy Plains Fire Station - WWTS
Location: 15224 Creedmoor Rd
Wake Forest, NC 27587
County: Wake

Tank Size (nominal) 2,500 gallons

Properties/Assumptions:

Min. liquid level to be maintained in tank at all times after initial installation.

Assume groundwater table is equal to or higher than top of chamber.
(Buoyancy is the same as long as water table is higher than top of tank.)

Effluent Density	62.4	lb/ft^3 (Specific Weight of Water)
Concrete Density	142.56	lb/ft^3
Soil Bulk Density	1.25	*(typical value)*
Soil Cover Over Tank	1.00	ft (min.)

Tank Dimensions (from supplier):

	Exterior		*Interior*	
Length	13.92	ft	12.92	ft
Width	6.50	ft	5.50	ft
Total Tank Depth	5.83	ft	4.67	ft
Permanent Liquid Depth in Tank	0	in.		
Area of Riser Openings	6.28	ft^2		
Tank Weight (est.)	32,000	lb (based on manufacturer)		

Buoyancy Force Calculation:

Buoyancy Force = Specific Weight of Water x Displaced Volume

Tank Displacement	527.7	ft^3
Buoyancy Force	**32,927**	**lb.**

Weight Calculation:

Tank Weight	32,000	lb
Water Weight in Tank	0	lb
Soil Weight Over Tank	6,555	lb
Soil Tension Force	6,709	lb
Total Weight	**45,265**	**lb**

Note: Total weight must be greater than buoyancy force so that tank will not float during high water table conditions.

3. Wastewater System Drawings

Large scale drawings are attached with this package. For reference purposes, small versions of the drawings (not to scale) are included in this package.

Sandy Plains Fire Station - WWTS

Project Location:
15224 Creedmoor Rd
Wake Forest, NC 27587
Wake County
PIN: 0894000183

Client Information:
Wake County c/o Mike Forestieri, Wake County Facilities Design & Construction Director
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Raleigh, NC 27601
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Project Consultants:
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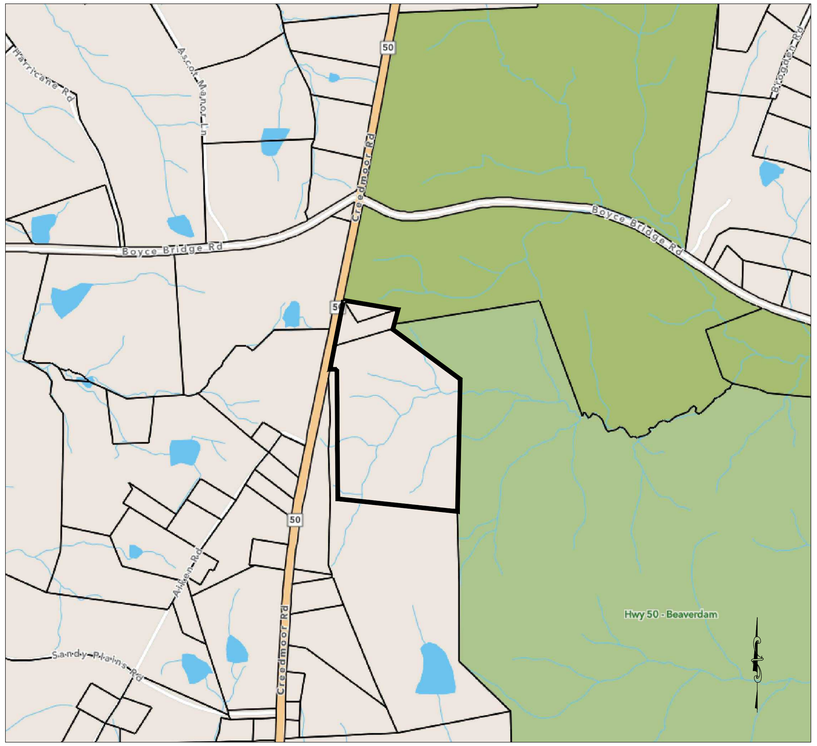
Agri-Waste Technology, Inc.
501 N. Salem Street, Suite 203
Apex, NC 27502
(919) 859-0669
(919) 233-1970 Fax

System Overview:
Engineered Option Permit
Subsurface Drip with Pretreatment (600 GPD)
Design Standard TS-II
AdvanTex Pretreatment



VICINITY MAP

Sheet Index

WW-1	Cover Sheet
WW-2	Property Layout
WW-3	System Layout
WW-4	Component Layout
WW-5	Primary Drainfield
WW-6	Primary Drainfield Details
WW-7	Repair Drainfield
WW-8	Tank Details
WW-9	Dripfield Details
WW-10	System Profile
WW-11	Manifold Details
WW-12	Pump and Haul Details
WW-13	Electrical Plan
WW-14	Excavation Safety

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NORTH CAROLINA PROFESSIONAL SEAL 024582 ENGINEER KEVIN DODGE DAVIDSON
6/16/2025

SANDY PLAINS FIRE STATION

15244 Creedmoor Road
Wake Forest, NC

Final Design - Not Released For Construction

DATE 06-23-25
ADW PROJECT NO 23029
AWT PROJECT Sandy Plains Fire Station - WWTS
Drawn By: I. Manson
Revised By: K. Davidson

DESCRIPTION:
COVER SHEET

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SHEET NUMBER
WW-1

Boundary information from Survey by McKim & Creed.
Site information from Site Plan by ADW Architects.
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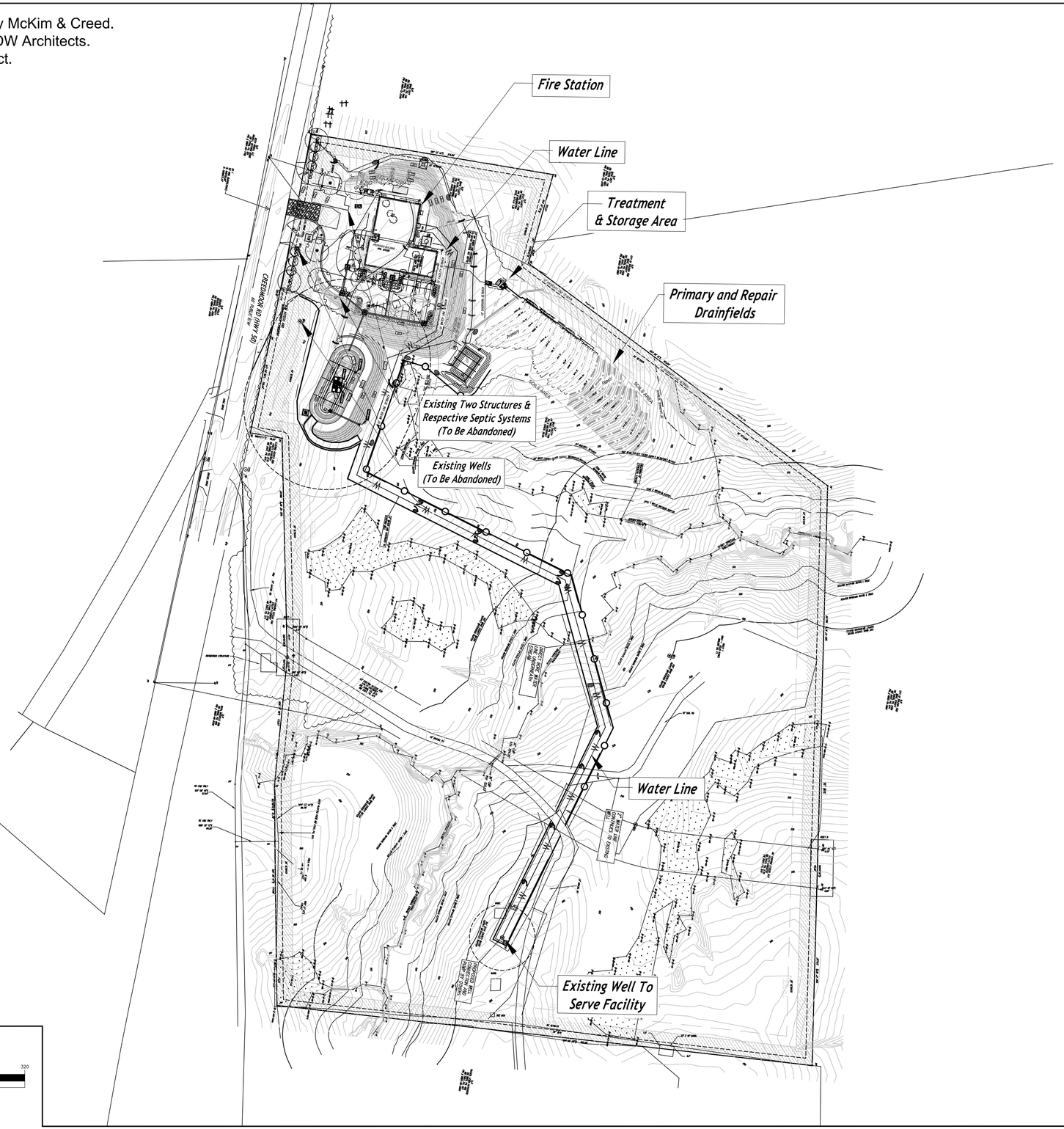

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

Scaled for 36"x24" output

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Drawn By: I. Manson
Revised By: K. Davidson

DESCRIPTION:
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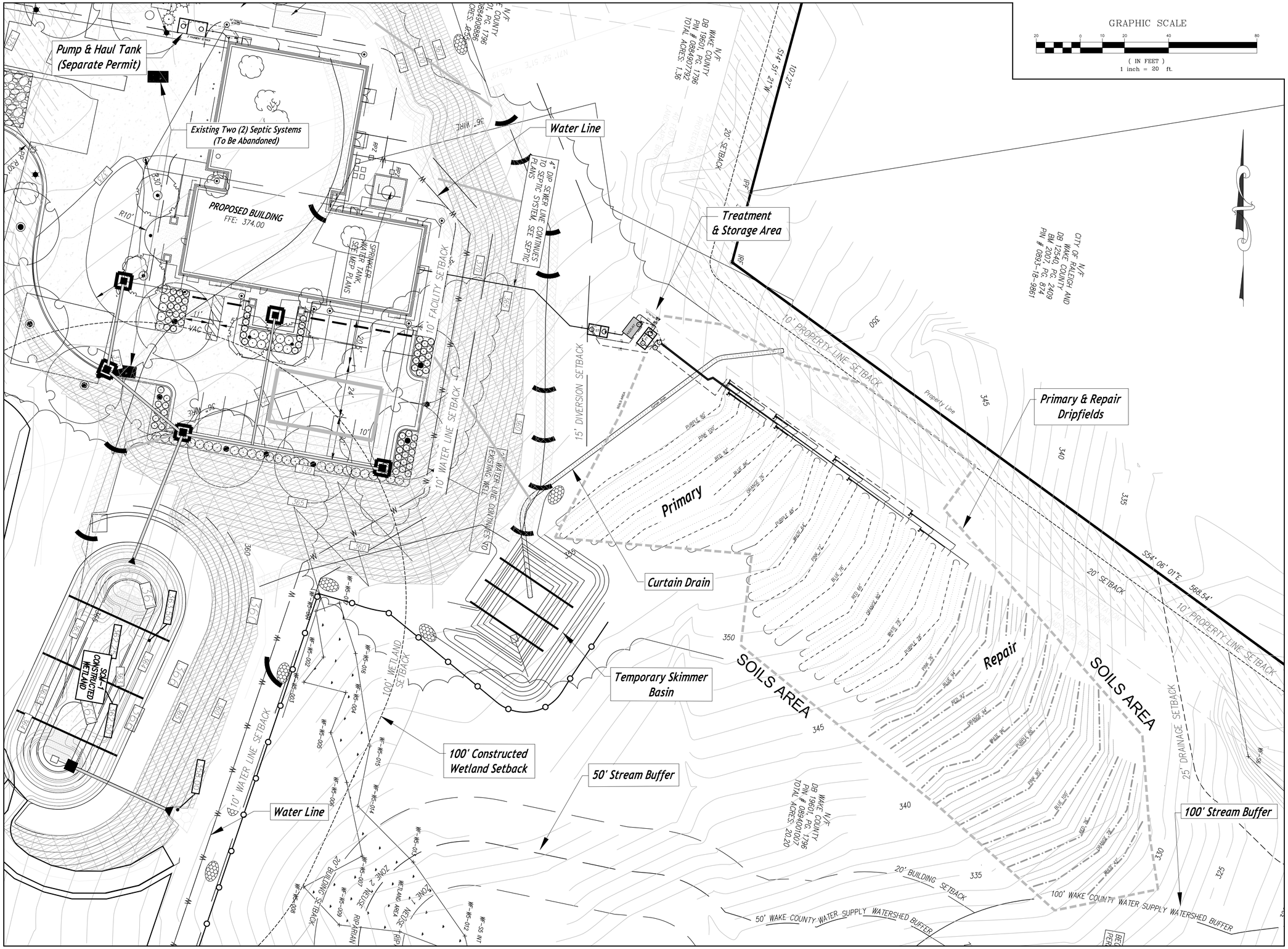
WW-2



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SANDY PLAINS FIRE STATION

15244 Creedmoor Road
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DATE	06-23-25
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AWT PROJECT	Sandy Plains Fire Station - WWTS
Drawn By:	I. Manson
Revised By:	K. Davidson

DESCRIPTION:

SYSTEM LAYOUT

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SHEET NUMBER

WW-3

Line Legend

Label	Name	Size	Type
AFDL	AdvanTex Filter Drain Line	2.0"	SCH 40 PVC
DL	Drain Line	4.0"	SCH 40 PVC
ERL	Effluent Return Line	1.0"	SCH 40 PVC
FRL	Field Return Line	1.0"	SCH 40 PVC
FSL	Field Supply Line	1.0"	SCH 40 PVC
HSL	Headworks Supply Line	1.25"	SCH 40 PVC
HL	Headworks Line	1.0"	SCH 40 PVC
STRL	Septic Tank Return Line	1.0"	SCH 40 PVC

Component Legend

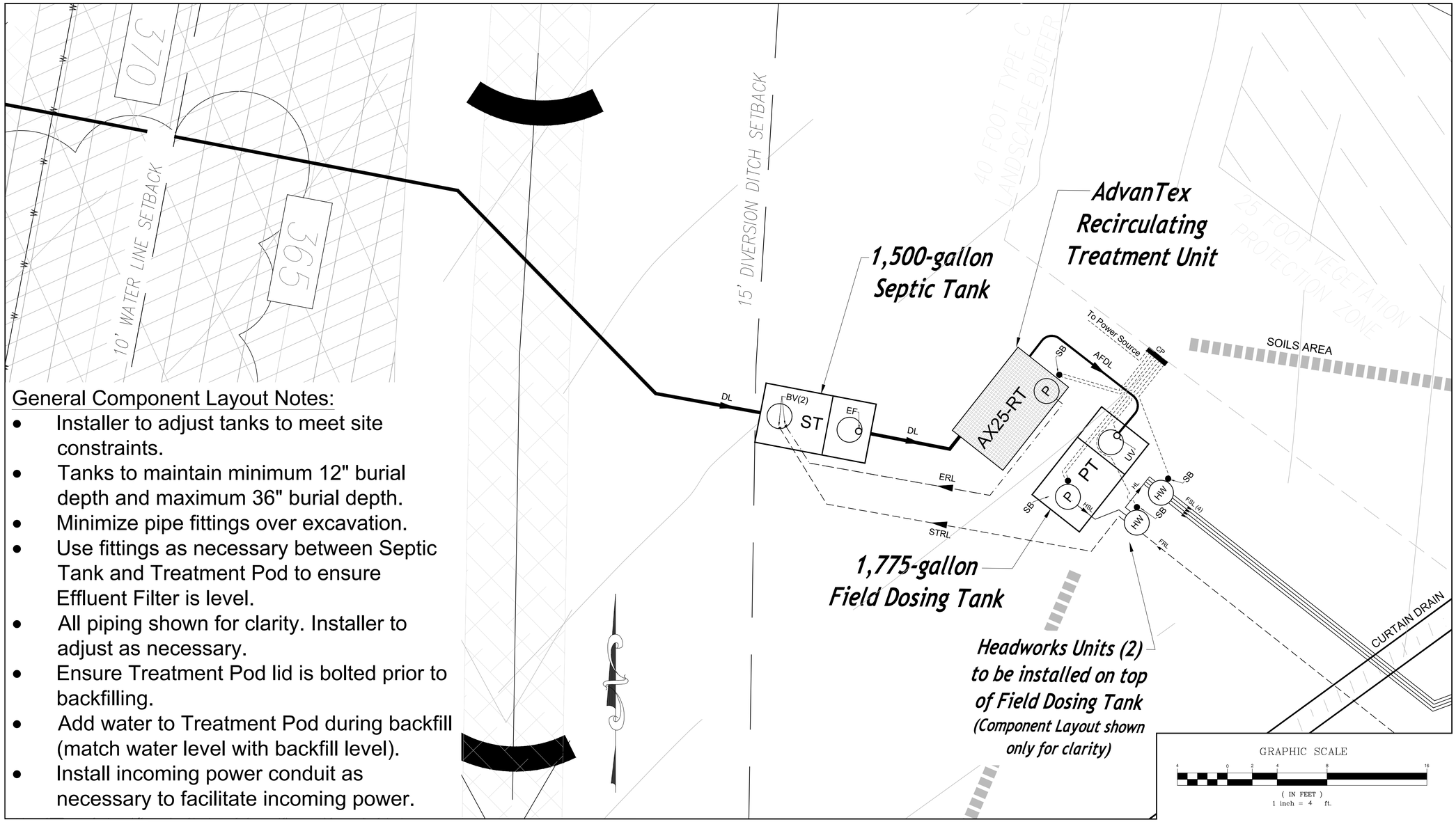
Label	Name	Label	Name
ARV	Air/Vacuum Relief Valve	HW	Head Works
A/RT	AdvanTex Unit	P	Pump
BV	Ball Valve	PT	Pump Tank
CO	Cleanout	RT	Recirculation Tank
CP	Control Panel	SB	Splice Box
CV	Check Valve	ST	Septic Tank
EF	Effluent Filter	UV	UV Disinfection

Dosing Settings

Number of Doses Per Day/Zone	2.17 doses
Timer ON	16 min.
Timer OFF	2 hrs: 28 min.

Recirculation Timer Settings

Number of Cycles Per Day	96
Cycle Volume	22.5 gallons
Cycle Run time	0.8 minutes
Cycle Off Time	14.2 minutes



General Component Layout Notes:

- Installer to adjust tanks to meet site constraints.
- Tanks to maintain minimum 12" burial depth and maximum 36" burial depth.
- Minimize pipe fittings over excavation.
- Use fittings as necessary between Septic Tank and Treatment Pod to ensure Effluent Filter is level.
- All piping shown for clarity. Installer to adjust as necessary.
- Ensure Treatment Pod lid is bolted prior to backfilling.
- Add water to Treatment Pod during backfill (match water level with backfill level).
- Install incoming power conduit as necessary to facilitate incoming power.

1 COMPONENT LAYOUT
WW-4

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6/16/2025

SANDY PLAINS FIRE STATION

15244 Creedmoor Road
Wake Forest, NC

Final Design - Not Released For Construction

DATE	06-23-25
ADW PROJECT NO	23029
AWT PROJECT	Sandy Plains Fire Station - WWTS
Drawn By:	I. Manson
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DESCRIPTION:
COMPONENT LAYOUT

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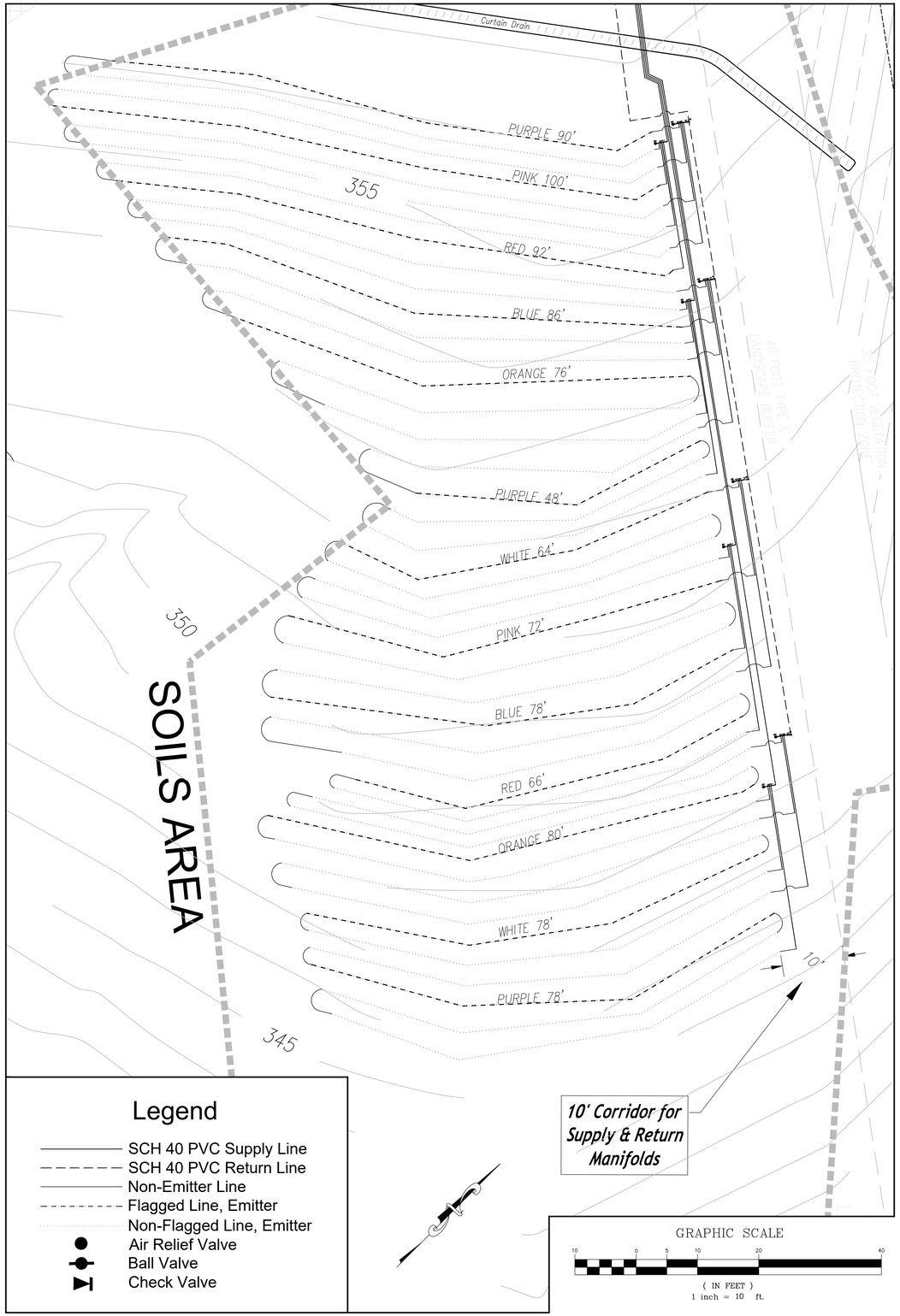
SHEET NUMBER
WW-4

Scaled for 36"x24" output



1 WW-5 PRIMARY DRAINFIELD LAYOUT

General Drainfield Notes:

1. Clear all trees less than 4" in diameter (measured at a height 3' from soil surface) from the drainfield.
2. Vegetation that will re-grow from a cut stump shall be stumped or pulled from the ground. Stumps shall not be pushed over.
3. Drainfield area shall be cleared of all leaves, pine straw, debris, etc. The accumulated material shall be removed from the drainfield.
4. Drip lines shall be installed to a depth of 6". If trenched in, loose soil shall be cleared from the trench bottom.
5. Manifold supply and return lines shall be installed with a minimum of 18" cover.
6. Drip tubing shall be hand laid into the trench if a trencher is used.
7. A minimum of 2,500' of emitter tubing is required. 3,404' is demonstrated, allowing for 36.2% blanking. Install all lines as shown. The trenches shall be backfilled appropriately so no low areas are present.
8. Apply lime over the drainfield area as needed. Seed fine fescue over the drainfield at the rate recommended by the seed manufacturer. Hand rake the seed into the soil surface. Straw the disturbed seeded area at the rate of 1.5-2 bales per 1,000 sq. ft.

Dripfield Sizing - Primary

Daily Design Flow:	600	gal/day	
L.T.A.R. (from L.S.S.):	0.12	gal/day/ft2	
Dripline Spacing:	2	ft	
Dripline Required:	2500	ft	
Total Layout Length:	3404	ft	
Effective Drainfield Area:	6808	ft2	
Available for Blanking:	904	ft	36.2%

Primary Dripfield Layout

Line	Type	Flag Color	Layout Line Length Available(ft)	Zone	Lateral	Run Length(ft)	Lateral Length (ft)	Zone Length(ft)
1	Layout Line	Purple	90	1	1	90		
2	Interpolated Line		98			98	188	
3	Interpolated Line		100		2	100		
4	Layout Line	Pink	101			100	200	
5	Interpolated Line		99		3	98		
6	Interpolated Line		97			96	194	
7	Interpolated Line		95		4	94		
8	Layout Line	Red	93			92	186	768
9	Interpolated Line		91	2	1	90		
10	Interpolated Line		89			88	178	
11	Layout Line	Blue	87		2	86		
12	Interpolated Line		83			82	168	
13	Interpolated Line		80		3	80		
14	Layout Line	Orange	76			76		
15	Interpolated Line		70			70		
16	Interpolated Line		63			62	288	
17	Interpolated Line		56		4	56		
18	Layout Line	Purple	49			48		
19	Interpolated Line		54			54		
20	Interpolated Line		59			58	216	850
21	Layout Line	White	64	3	1	64		
22	Interpolated Line		66			66		
23	Interpolated Line		69			68		
24	Interpolated Line		71			70	268	
25	Layout Line	Pink	73		2	72		
26	Interpolated Line		75			74		
27	Interpolated Line		77			76		
28	Layout Line	Blue	78			78	300	
29	Interpolated Line		79		3	78		
30	Interpolated Line		68			68		
31	Layout Line	Red	67			66		
32	Interpolated Line		70			70	282	850
33	Interpolated Line		74	4	1	74		
34	Interpolated Line		78			78		
35	Interpolated Line	Orange	82			80		
36	Interpolated Line		81			80	312	
37	Interpolated Line		81		2	78		
38	Interpolated Line		80			78		
39	Layout Line	White	78			78		
40	Interpolated Line		79			78	312	
41	Interpolated Line		80		3	78		
42	Layout Line	Purple	80			78		
43	Interpolated Line		79			78		
44	Interpolated Line		78			78	312	936
		TOTAL:	3,437			3,404		

2 WW-5 PRIMARY DRAINFIELD SUMMARY

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NORTH CAROLINA PROFESSIONAL SEAL 024582 ENGINEER KEVIN CODGE DAVIDSON
6/16/2025

SANDY PLAINS FIRE STATION

15244 Creedmoor Road
Wake Forest, NC

Final Design -
Not Released For Construction

DATE 06-23-25
ADW PROJECT NO 23029
AWT PROJECT Sandy Plains Fire Station - WWTS
Drawn By: I. Manson
Revised By: K. Davidson

DESCRIPTION:
PRIMARY DRAINFIELD

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SHEET NUMBER
WW-5

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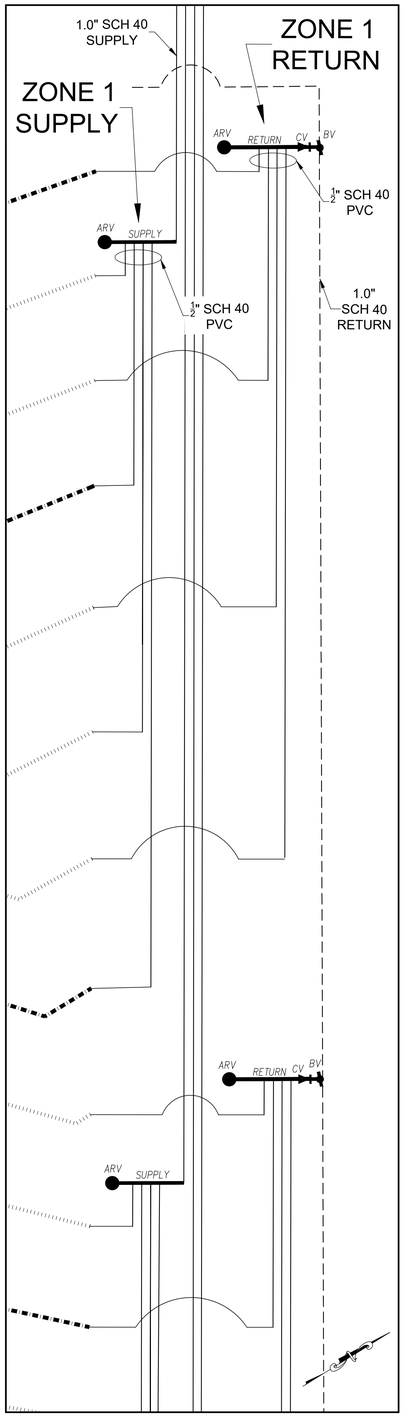
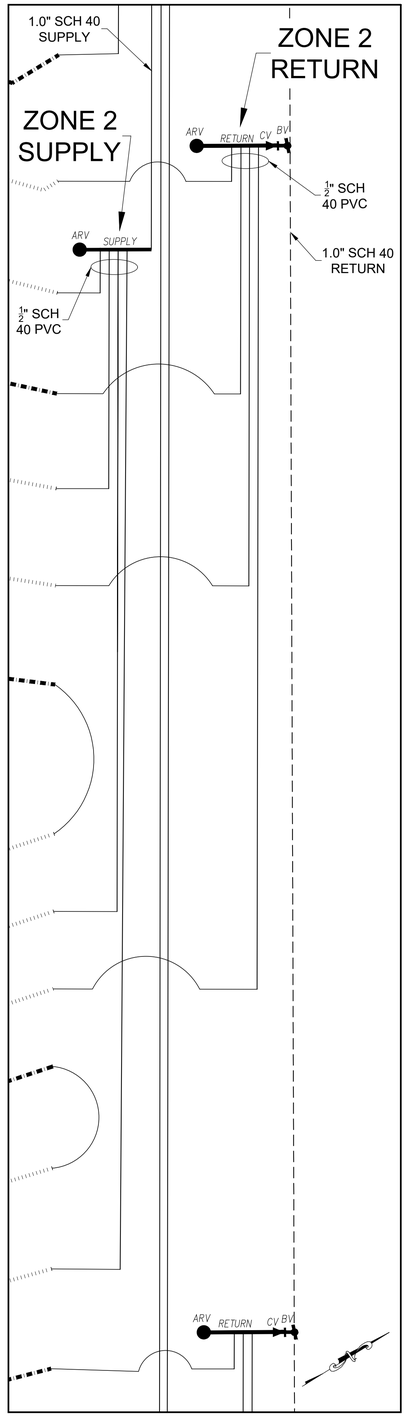


GRAPHIC SCALE

2 0 1 2 4 8

(IN FEET)
1 inch = 2 ft.

1 WW-6 ZONE 1 MANIFOLD DETAIL

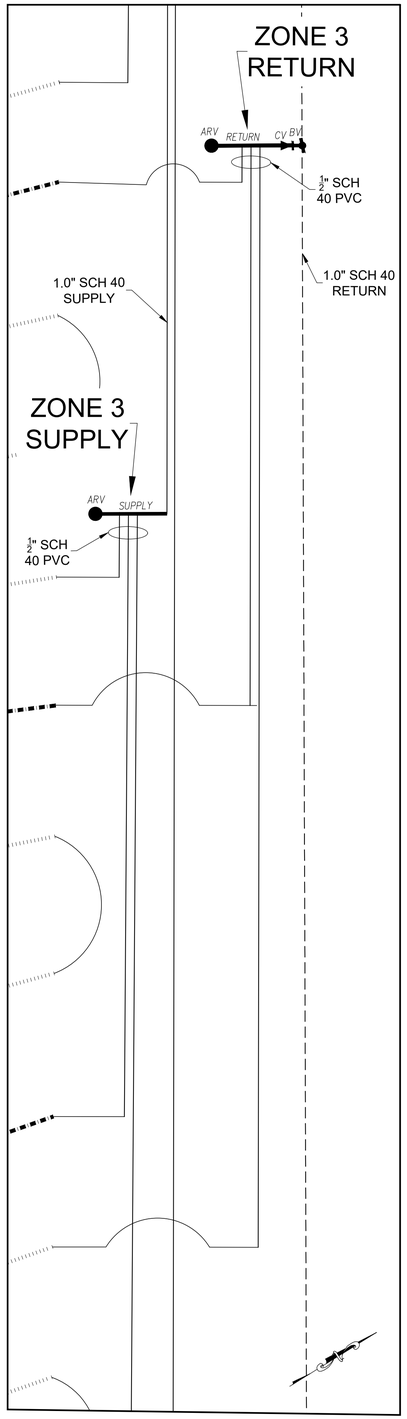


GRAPHIC SCALE

2 0 1 2 4 8

(IN FEET)
1 inch = 2 ft.

2 WW-6 ZONE 2 MANIFOLD DETAIL

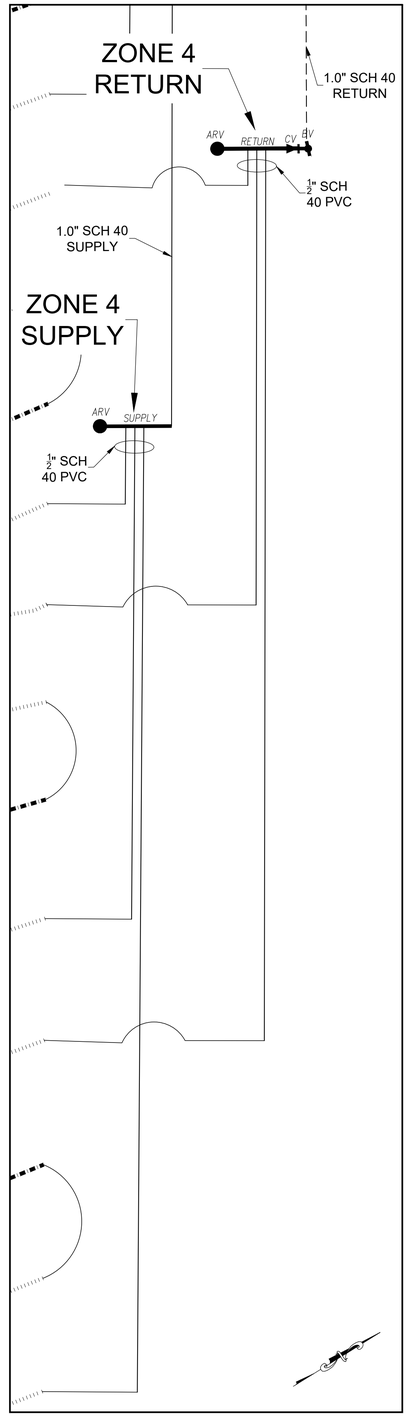


GRAPHIC SCALE

2 0 1 2 4 8

(IN FEET)
1 inch = 2 ft.

3 WW-6 ZONE 3 MANIFOLD DETAIL



GRAPHIC SCALE

2 0 1 2 4 8

(IN FEET)
1 inch = 2 ft.

4 WW-6 ZONE 4 MANIFOLD DETAIL

Supply/Return Lines and Manifold:

- Manifold and air relief valve at highest elevation of each zone.
- Ball valve to be installed after check valve on return manifold at top of each zone.
- All valves in boxes.
- Minimum 18" cover over supply/return lines.
- Maintain 40' Landscape Buffer from Property Line

Number of zones 4

Zone 1	768	linear ft	drip tubing, not including loops
	384	emitters	expected
	0.61	gph	flow per emitter
	3.90	gpm	expected dosing flow
	4	laterals	
	6.30	gpm	flow need for flushing
	10.21	gpm	Total Flow Per Zone
			Calculated Flushing Velocity (fps)
Zone 2	850	linear ft	drip tubing, not including loops
	425	emitters	expected
	0.61	gph	flow per emitter
	4.32	gpm	expected dosing flow
	4	laterals	
	7.68	gpm	flow need for flushing
	12.00	gpm	Total Flow Per Zone
			Calculated Flushing Velocity (fps)
Zone 3	850	linear ft	drip tubing, not including loops
	425	emitters	expected
	0.61	gph	flow per emitter
	4.32	gpm	expected dosing flow
	3	laterals	
	4.86	gpm	flow need for flushing
	9.18	gpm	Total Flow Per Zone
			Calculated Flushing Velocity (fps)
Zone 4	936	linear ft	drip tubing, not including loops
	468	emitters	expected
	0.61	gph	flow per emitter
	4.76	gpm	expected dosing flow
	3	laterals	
	4.61	gpm	flow need for flushing
	9.36	gpm	Total Flow Per Zone
			Calculated Flushing Velocity (fps)

5 WW-6 EXPECTED FLOWS

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919-859-0669
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NORTH CAROLINA PROFESSIONAL SEAL 024582 ENGINEER KEVIN DODGE DAVIDSON
6/16/2025

SANDY PLAINS FIRE STATION

15244 Creedmoor Road
Wake Forest, NC

Final Design - Not Released For Construction

DATE 06-23-25
ADW PROJECT NO 23029
AWT PROJECT Sandy Plains Fire Station - WWTS
Drawn By: I. Manson
Revised By: K. Davidson

DESCRIPTION:

PRIMARY DRAINFIELD DETAILS

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SHEET NUMBER
WW-6

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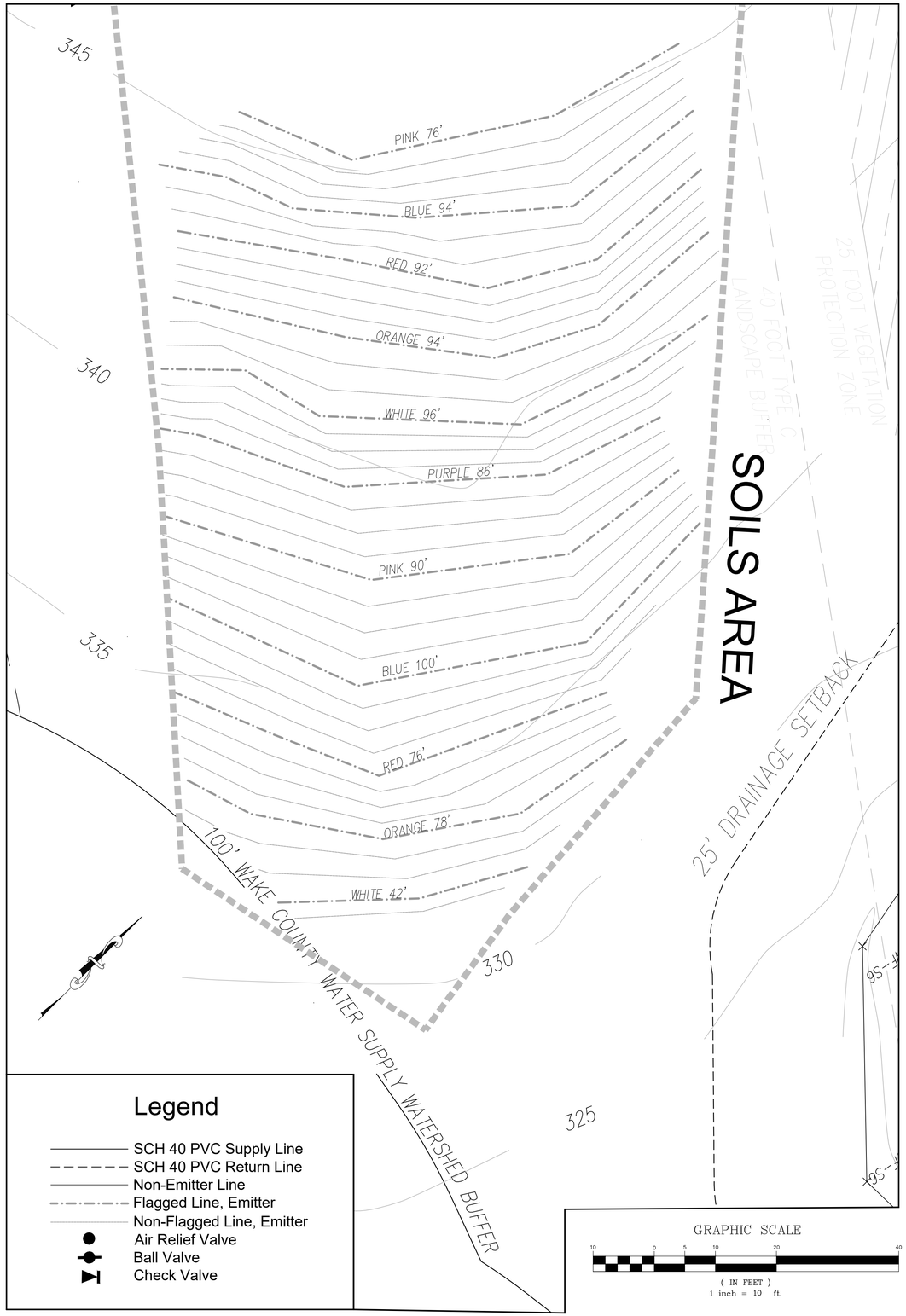

1 WW-7 REPAIR DRAINFIELD LAYOUT

General Drainfield Notes:

1. Clear all trees less than 4" in diameter (measured at a height 3' from soil surface) from the drainfield.
2. Vegetation that will re-grow from a cut stump shall be stumped or pulled from the ground. Stumps shall not be pushed over.
3. Drainfield area shall be cleared of all leaves, pine straw, debris, etc. The accumulated material shall be removed from the drainfield.
4. Drip lines shall be installed to a depth of 6". If trenched in, loose soil shall be cleared from the trench bottom.
5. Manifold supply and return lines shall be installed with a minimum of 18" cover.
6. Drip tubing shall be hand laid into the trench if a trencher is used.
7. A minimum of 2,500' of emitter tubing is required. 3,340' is demonstrated, allowing for 33.6% blanking. Install all lines as shown. The trenches shall be backfilled appropriately so no low areas are present.
8. Apply lime over the drainfield area as needed. Seed fine fescue over the drainfield at the rate recommended by the seed manufacturer. Hand rake the seed into the soil surface. Straw the disturbed seeded area at the rate of 1.5-2 bales per 1000 sq. ft.

Dripfield Sizing - Repair

Daily Design Flow:	600	gal/day	
L.T.A.R. (from L.S.S.):	0.12	gal/day/ft2	
Dripline Spacing:	2	ft	
Dripline Required:	2500	ft	
Total Layout Length:	3340	ft	
Effective Drainfield Area:	6680	ft2	
Available for Blanking:	840	ft	33.6%

Repair Dripfield Layout

Line	Type	Flag Color	Layout Line Length(ft)	Zone	Lateral	Run Length(ft)	Lateral Length (ft)	Zone Length(ft)
45	Layout Line	Pink	77	1	1	76		
46	Interpolated Line		81			80	156	
47	Interpolated Line		85		2	84		
48	Interpolated Line		89			88	172	
49	Layout Line	Blue	94		3	94		
50	Interpolated Line		93			92	186	
51	Interpolated Line		92		4	92		
52	Layout Line	Red	92			92	184	
53	Interpolated Line		93		5	92		
54	Interpolated Line		93			92	184	882
55	Interpolated Line		94	2	1	94		
56	Layout Line	Orange	95			94	188	
57	Interpolated Line		97		2	96		
58	Interpolated Line		98			98	194	
59	Layout Line	White	96		3	96		
60	Interpolated Line		94			94	190	
61	Interpolated Line		91		4	90		
62	Interpolated Line		88			88	178	
63	Layout Line	Purple	86		5	86		
64	Interpolated Line		87			86	172	922
65	Interpolated Line		88	3	1	88		
66	Interpolated Line		89			88	176	
67	Layout Line	Pink	90		2	90		
68	Interpolated Line		94			94	184	
69	Interpolated Line		96		3	96		
70	Interpolated Line		98			98	194	
71	Layout Line	Blue	100		4	100		
72	Interpolated Line		95			94	194	748
73	Interpolated Line		89	4	1	88		
74	Interpolated Line		82			82	170	
75	Layout Line	Red	76		2	76		
76	Interpolated Line		76			76		
77	Interpolated Line		76		3	76		
78	Interpolated Line		77			76	304	
79	Layout Line	Orange	78		4	78		
80	Interpolated Line		71			70		
81	Interpolated Line		55			54		
82	Layout Line	White	42			42		
83	Interpolated Line		36			36		
84	Interpolated Line		34			34	314	788
85	Interpolated Line		26					
86	Layout Line	Purple	18					
		TOTAL:	3,401			3,340		

2 WW-7 REPAIR DRAINFIELD SUMMARY

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NORTH CAROLINA PROFESSIONAL SEAL 024582 ENGINEER KEVIN DODGE DAVIDSON
6/16/2025

SANDY PLAINS FIRE STATION

15244 Creedmoor Road
Wake Forest, NC

Final Design - Not Released For Construction

DATE 06-23-25
ADW PROJECT NO 23029

REVISIONS
DRAWN BY: I. Manson (AWT)
Drawn By: I. Manson
Revised By: K. Davidson

DESCRIPTION:
REPAIR DRAINFIELD

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SHEET NUMBER
WW-7

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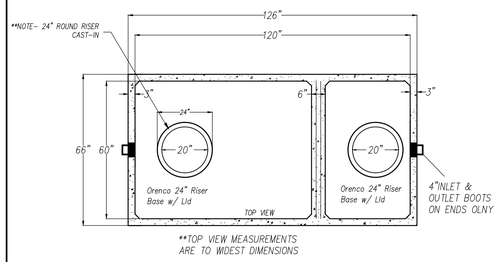


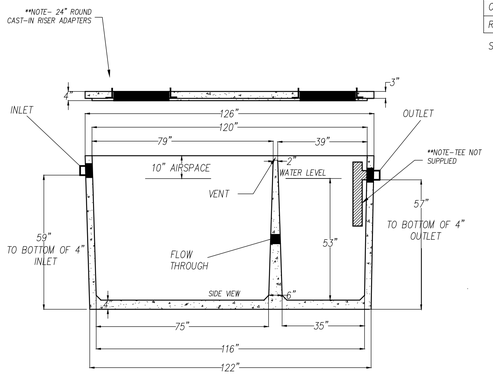
**TOP VIEW MEASUREMENTS ARE TO WIDEST DIMENSIONS

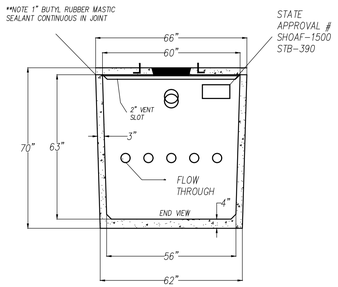
SHOAF PRECAST SEPTIC INC.
4130 WEST US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826

MODEL: TS 1500 STB
NON TRAFFIC
1500 Gallon Septic Tank

WWW.SHOAFPRECAST.COM
SHOAF-1,500 SEPTIC TANK
STB-390 NON TRAFFIC
LIQUID CAPACITY-1,517 GALLONS/AIRSPACE-10"
TANK HEIGHT-70"
BOTTOM OF TANK TO CENTER OF INLET-61"
BOTTOM OF TANK TO CENTER OF OUTLET-59"
LENGTH TO WIDTH RATIO-2 TO 1
SIZE OF INLET & OUTLET-3" OR 4" PIPE
TYPE OF INLET & OUTLET-POLYLOCK OR EQUAL (MEETS ASTM C-923)
CONCRETE PSI-4000; TANK WEIGHT- 13,000 LBS.
REINFORCEMENT PER STATE CODE

SCALE - N.T.S.





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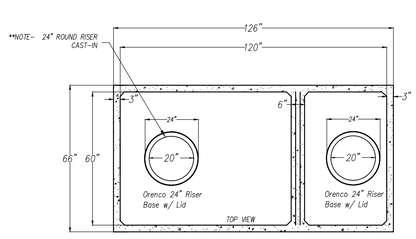
1 WW-8 SEPTIC TANK DETAIL (or equivalent)



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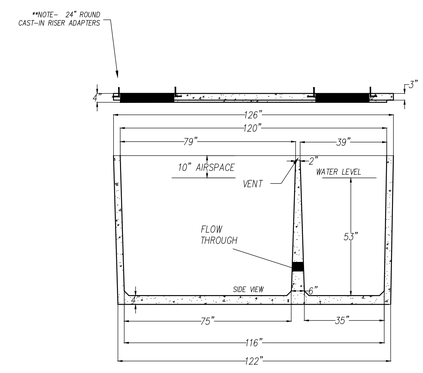
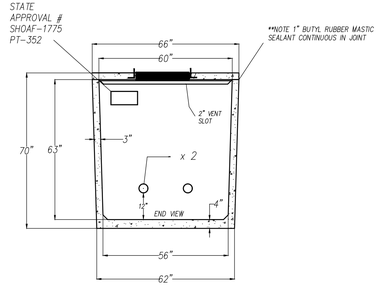
SHOAF PRECAST, INC.
4130 W US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826

MODEL: TS 1775 PT
NON TRAFFIC
1775 Gallon Pump Tank

SHOAF-1,775 PUMP TANK
PT-352 NON TRAFFIC
LIQUID CAPACITY-1,775 GALLONS INCLUDING 10" AIRSPACE
GALLONS PER INCH-28.17 (AVERAGE)
TANK HEIGHT-70"
BOTTOM OF TANK TO CENTER OF INLET-59"
BOTTOM OF TANK TO CENTER OF OUTLET-61"
LENGTH TO WIDTH RATIO-2 TO 1
SIZE OF INLET & OUTLET-3" OR 4" PIPE
TYPE OF INLET & OUTLET-POLYLOCK OR EQUAL (MEETS ASTM C-923)
CONCRETE PSI-4000; TANK WEIGHT- 13,000 LBS.
REINFORCEMENT PER STATE CODE

SCALE - N.T.S.





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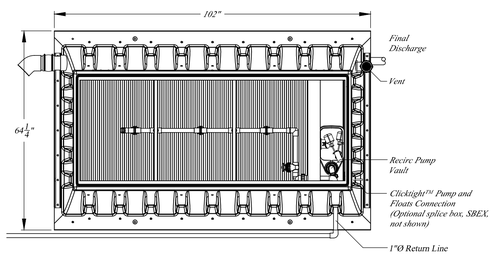
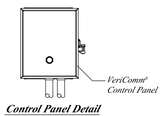
2 WW-8 PUMP TANK DETAIL (or equivalent)

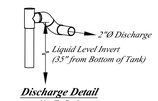
AX25RT Treatment System - Gravity Discharge



AX25 Recirc. Tank - Top View

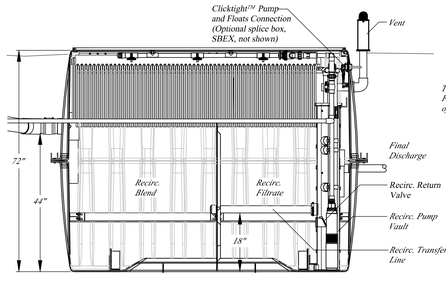


Control Panel Detail
Not To Scale

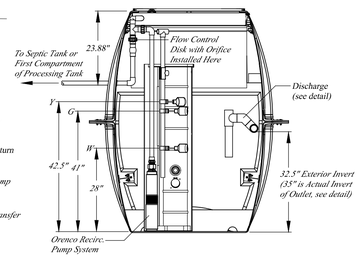


Discharge Detail
Not To Scale

Float Functions	
Y	High Level Alarm
G	Override Timer ON/OFF
W	LLA/RO



AX25 Recirc. Tank - Side View



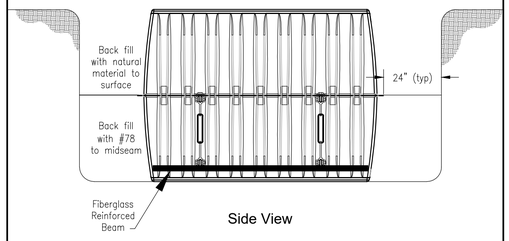
Discharge Chamber - End View

NTS

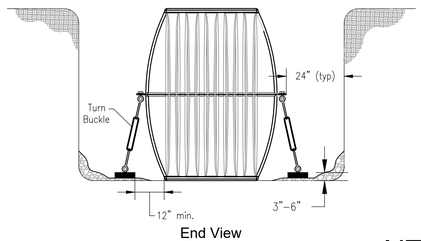
3 WW-8 AXRT ADVANTEX TREATMENT SYSTEM

*Treatment Unit Notes:

- Ensure lid is bolted shut prior to backfilling Treatment Pod
- Add water to Treatment Pod during Backfill (Match water level to backfill level).
- Make sure vent line is sloped back a min. of $\frac{1}{4}$ inch per foot so that it can drain back into the unit
- Make sure the vent's top is a min. of 3" above final grade.



Side View

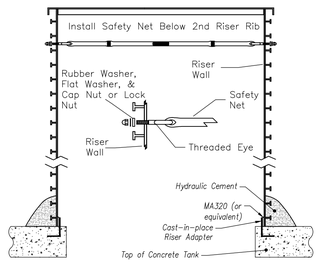


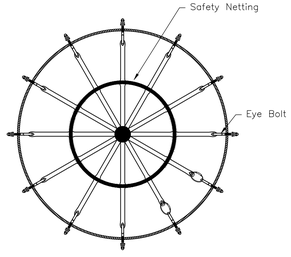
End View

NTS

4 WW-8 ANTI-BUOYANCY INSTALLATION

Install Safety Net in Each Access Riser that does not contain an Inner Lid





NOTE: Install 4 Ring Clamps if 8" (or larger) Filter is Used

RISER INSTALLATION INSTRUCTIONS:

1. Prep Adapter Channel & Riser
   - 1.1. Roughen the bonding surfaces of the adapter and riser with sandpaper.
   - 1.2. Use a clean cloth and acetone or alcohol to clean the bonding surfaces of the adapter and riser. The bonding surfaces must be clean and dry for a good fit and watertight joint. Let the acetone or alcohol dry completely.
2. Apply Adhesive
   - 2.1. Apply a bead of methacrylate adhesive to the outside of the adapter. One 7-oz packet of MA320 adhesive is typical for one 24" riser.
3. Install Riser
   - 3.1. If the riser has penetrations, align the riser correctly.
   - 3.2. Firmly press the riser onto the adapter until the bottom of the riser is resting on the concrete (cast-in-adapters) or the adapter flange (bolted-down adapters). Twist the riser back and forth slightly to fully seat it on to create a good bond.
   - 3.3. Apply a bead of methacrylate adhesive to the inside of the access riser-adapter joint.
   - 3.4. Use a tongue depressor, putty knife, or clean cloth to make a continuous fillet on the inside of the access riser-adapter joint.
   - 3.5. Apply hydraulic cement to bond outer riser wall and top of tank.
4. Ensure safety net and inner lid are in place and secured.

FOR RISER WALL PENETRATIONS	
Grommet Size, Inches (Nominal IPS Pipe Size)	Hole Saw Size, Inches
1/2	1
3/4	1 1/4
1	1 9/16
1 1/4	1 3/4
1 1/2	2 1/8
2	2 3/4
3	3 7/8
4	5

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5 WW-8 SAFETY NET DETAIL

Scaled for 36"x24" output

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6/16/2025

SANDY PLAINS FIRE STATION

15244 Creedmoor Road
Wake Forest, NC

Final Design - Not Released For Construction

DATE 06-23-25
ADW PROJECT NO 23029
AWT PROJECT Sandy Plains Fire Station - WWTS
Drawn By: I. Manson
Revised By: K. Davidson

DESCRIPTION:

TANK DETAILS

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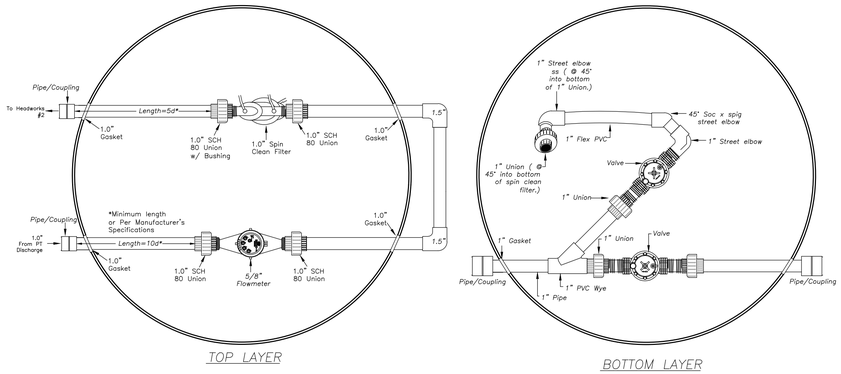
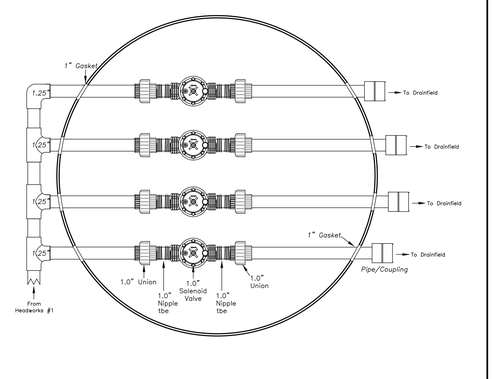
SHEET NUMBER
WW-8



1 WW-9 HEADWORKS 1 UNIT



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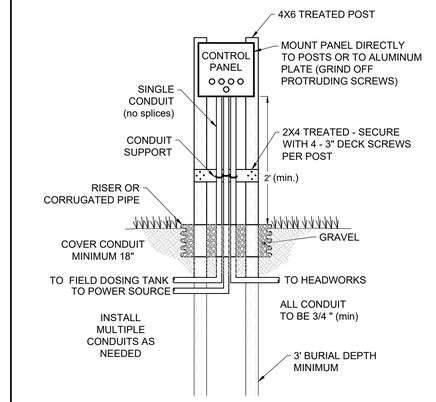
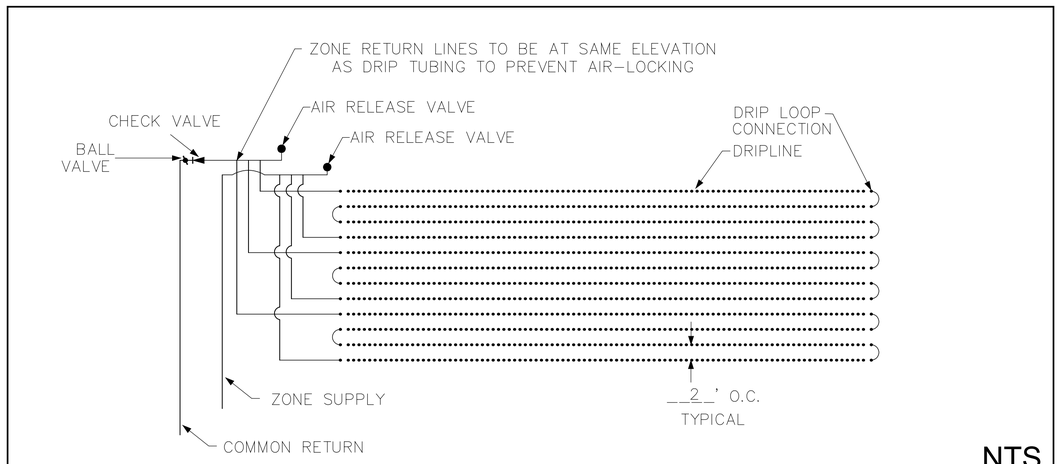
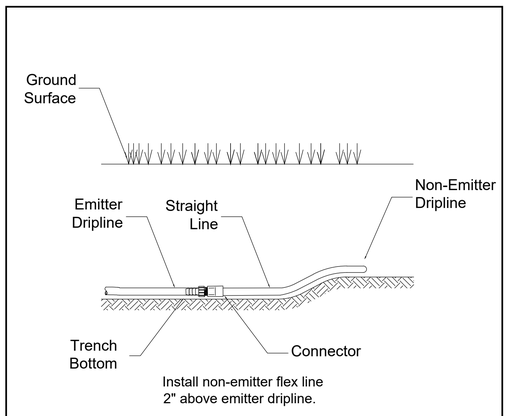


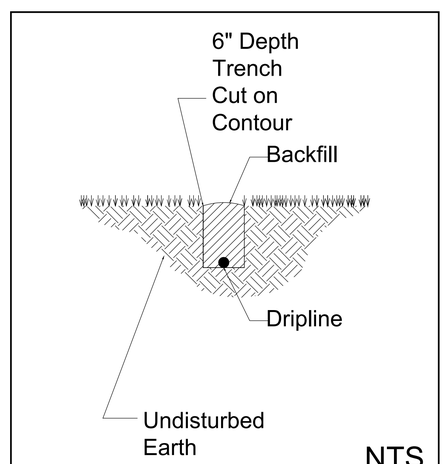
3 WW-9 CONTROL PANEL SUPPORT



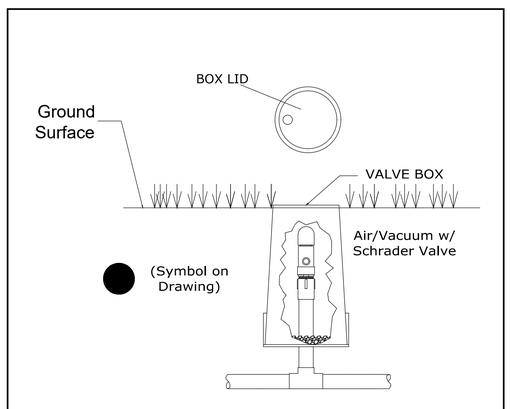
4 WW-9 TYPICAL DRAINFIELD CONFIGURATIION



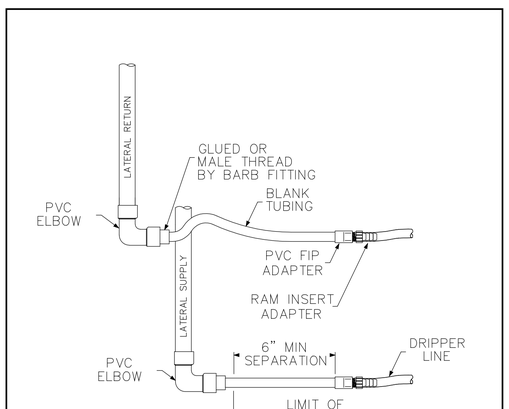
5 WW-9 DRIP LINE CONNECTION DETAIL



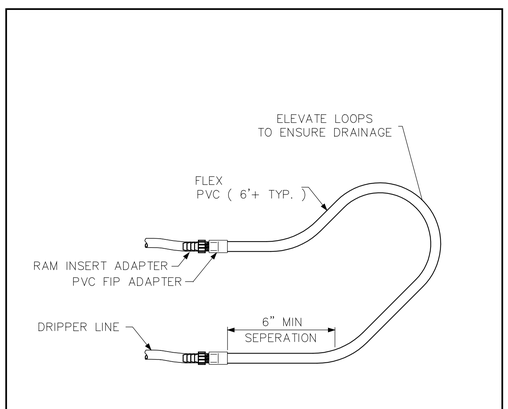
6 WW-9 DRIP LINE INSTALLATION



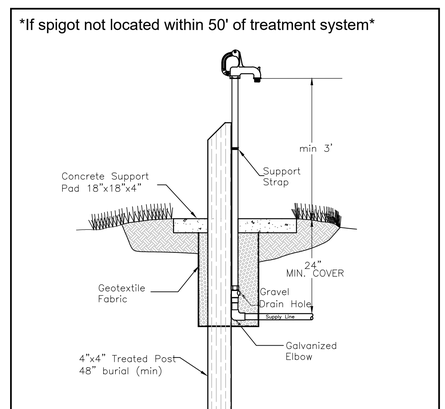
1 WW-9 AIR RELIEF VALVE DETAIL



2 WW-9 SUPPLY AND RETURN LINE CONNECTION DETAIL



3 WW-9 DRIP LINE LOOP DETAIL



4 WW-9 YARD HYDRANT DETAIL

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AWT PROJECT	Sandy Plains Fire Station - WWTS
Drawn By:	I. Manson
Revised By:	K. Davidson

DESCRIPTION:

DRIPFIELD DETAILS

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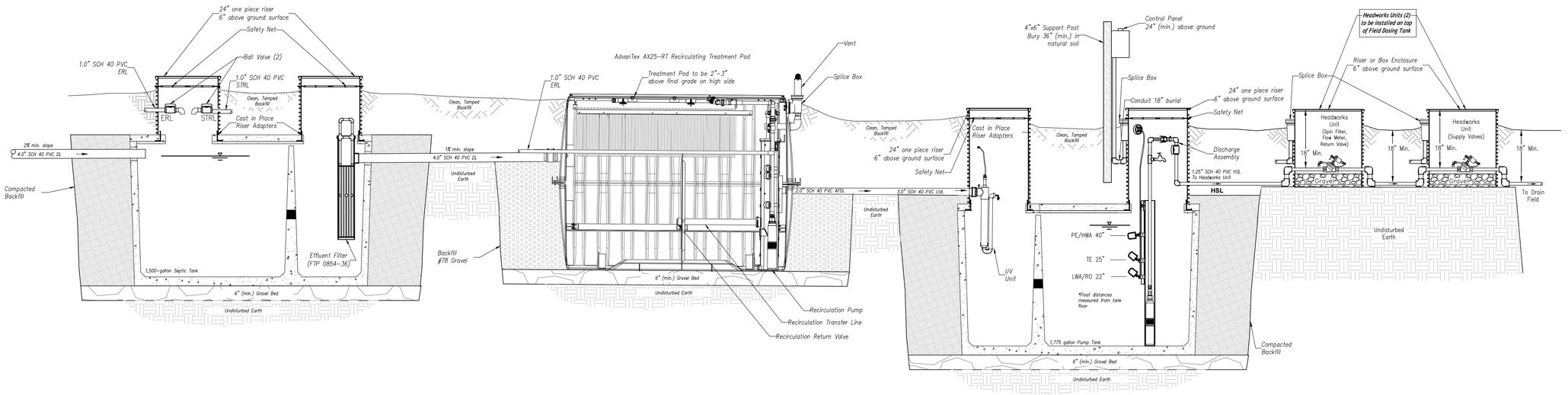

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1 SYSTEM PROFILE VIEW WW-10

*Elevations based on GIS data
*Confirm all elevations in field prior to installation

Specifications					
Septic Tank	TS 1500 STB	AdvanTex RT Pod	AX-25 RT	Pump Tank	TS 1775 PT
Length	126.00 in.	Length	102.00 in.	Length	126.00 in.
	10.50 ft.		8.50 ft.		10.50 ft.
Width	66.00 in.	Width	64.25 in.	Width	66.00 in.
	5.50 ft.		5.35 ft.		5.50 ft.
External Height	70.00 in.	External Height	72.00 in.	External Height	70.00 in.
	5.83 ft.		6.00 ft.		5.83 ft.
Bottom of 4" Inlet	11.00 in.	Bottom of 4" Inlet	28.00 in.	Bottom of 3" Inlet Invert	3.00 in.
*from Top of Tank	0.92 ft.	*from Top of RT	2.33 ft.	*Above Top of Tank	0.25 ft.
Bottom of 4" Outlet	13.00 in.	Bottom of 4" Outlet	37.00 in.	*Inlet located in Tank Riser	
*from Top of Tank	1.08 ft.	*from Top of RT	3.08 ft.		

Elevations					
Stubout (Assumed)	371.50 ft.				
Septic Tank		AdvanTex RT Pod	AX-25 RT	Pump Tank	
DL Pipe Length to ST Inlet	85.00 ft.	DL Pipe Length to RT Inlet	8.00 ft.	DL Pipe Length to PT Inlet	14.00 ft.
Ground Surface at Low Side of ST	359.50 ft.	Ground Surface at High Side of RT	359.00 ft.	Ground Surface at Low Side of PT	358.50 ft.
Cover over Low Side of ST	12.00 in.	Exposed Height of RT	3.00 in.	Cover over Low Side of PT	33.00 in.
	1.00 ft.		0.25 ft.		2.75 ft.
Exterior Top of Tank	358.50 ft.	Exterior Top of RT	359.25 ft.	Exterior Top of Tank	355.75 ft.
Inlet Invert	357.58 ft.	Inlet Invert	356.92 ft.	Inlet Invert	356.00 ft.
Slope of DL Pipe	16.37%	Slope of DL Pipe	6.25%	Slope of DL Pipe	1.19%
*minimum 2% slope		*minimum 1% slope		*minimum 1% slope	
Outlet Invert	357.42 ft.	Outlet Invert	356.17 ft.		
Bottom of Excavation	352.17 ft.	Bottom of Excavation	352.75 ft.	Bottom of Excavation	349.42 ft.
*beneath 6" gravel base		*beneath 6" gravel base		*beneath 6" gravel base	

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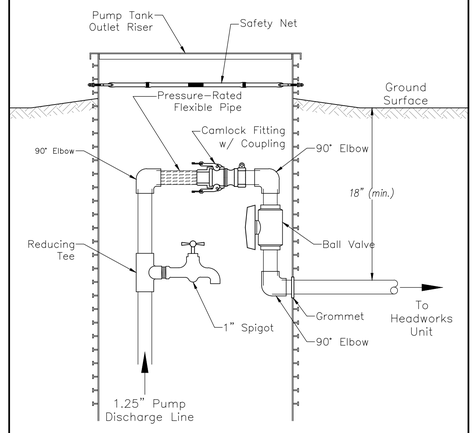
2 ELEVATIONS WW-10



Note: All components to be 1.25" SCH40 PVC except where noted.

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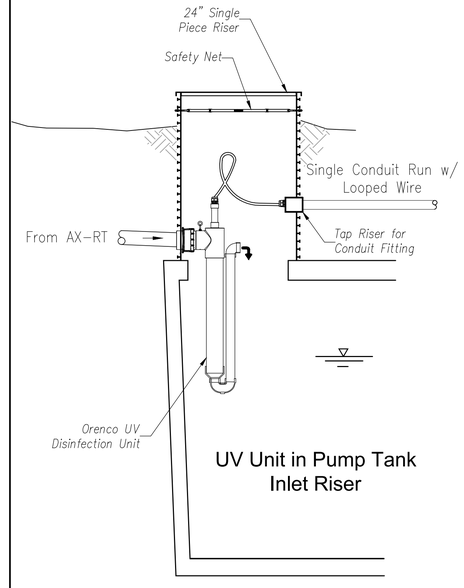
3 PUMP TANK DISCHARGE ASSEMBLY WW-10



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4 UV SYSTEM INSTALLATION DETAIL WW-10

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6/16/2025

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Final Design - Not Released For Construction

DATE 06-23-25
ADW PROJECT NO 23029
AWT PROJECT Sandy Plains Fire Station - WWTS
Drawn By: I. Manson
Revised By: K. Davidson

DESCRIPTION:

SYSTEM PROFILE

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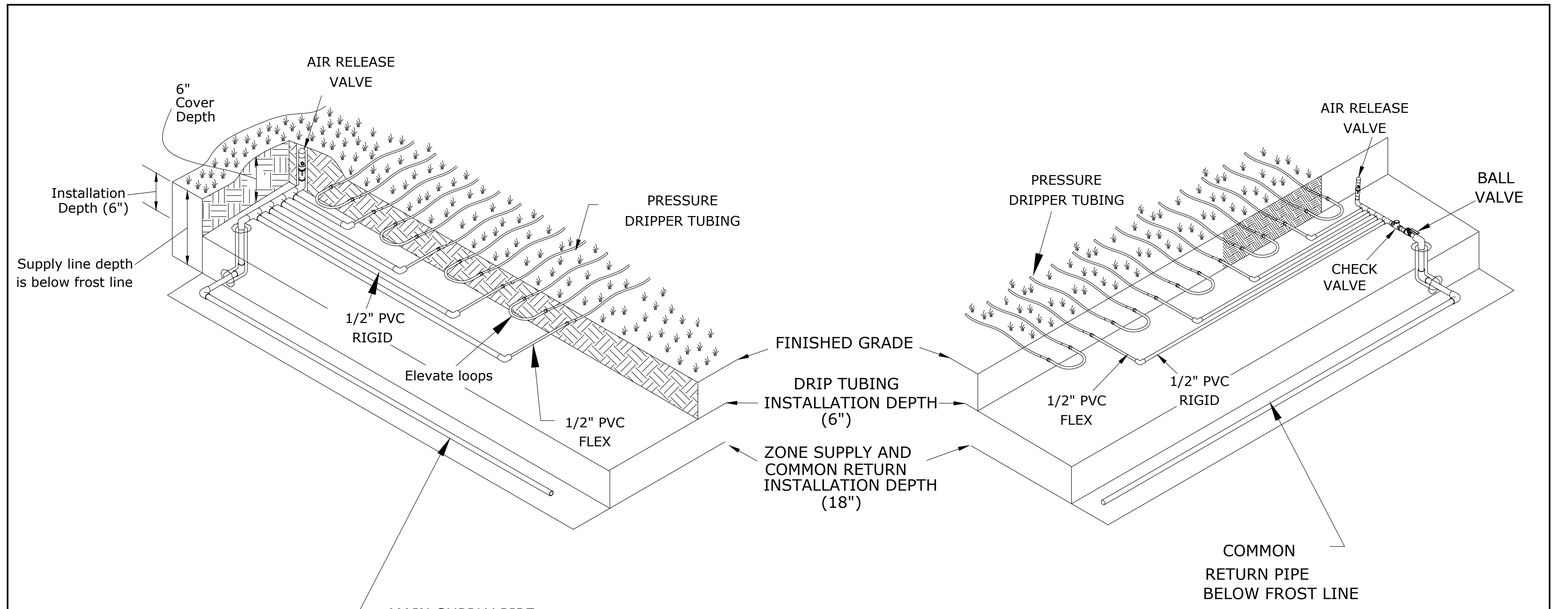
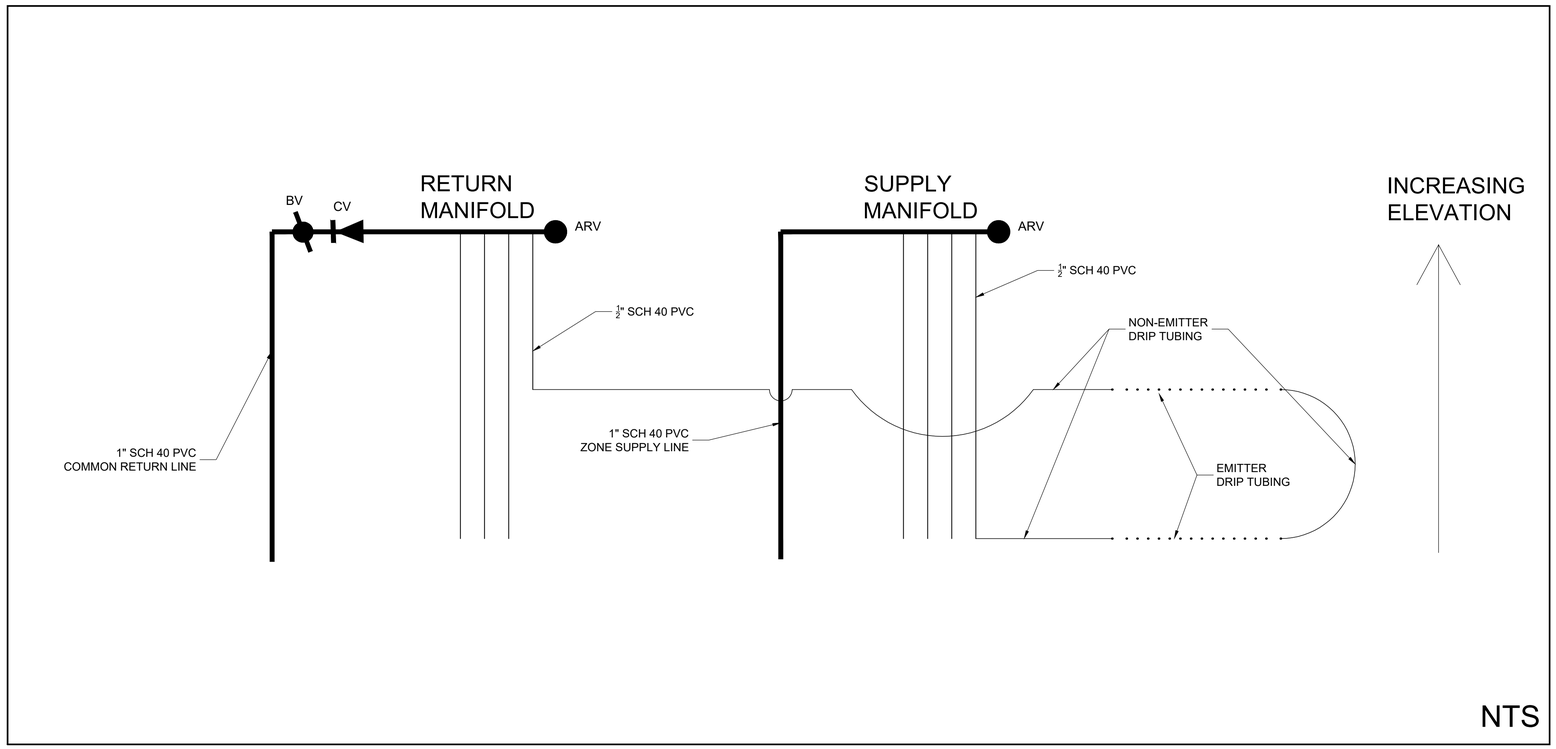


1 WW-11 TYPICAL SUPPLY AND RETURN MANIFOLD CONFIGURATION



2 WW-11 TYPICAL TOP FEED MANIFOLD DISTRIBUTION

NOTES

1. Boundary data taken from survey by McKim & Creed. Site information taken from site plan by ADW Architects.
2. Installation to follow all NC DHHS and Wake County applicable rules and regulations.
3. If actual site conditions vary from those shown on plans, contact Engineer before moving forward.
4. Pre-construction meeting to be held with Certified Installer and L.S.S. prior to any construction activities.
5. Engineer inspection required during system installation and at final completion.
6. Engineer inspection(s), installer certification, and engineer certification of installed system is required.
7. Contractor to abide by all safety regulations during system installation.
8. Upon system completion, Contractor to supply Engineer with documentation of installation and a signed letter indicating system was installed per approved design or noting any deviation from approved design.
9. Treatment system and dripfield to be 50' from any well, 10' from any building foundation, 10' from any water line, 10' from any property line, 25' from any drainage feature, 15' from any diversion ditch, and 100' from constructed wetland. Treatment system and dripfield shall maintain the 40' landscape buffer, the 50' stream buffer, and 100' stream buffer on the subject property. Verification of these setbacks and buffers to be performed by Contractor.
10. Actual installation and placement of treatment system to be overseen by Contractor.
11. Contractor to document system installation with photographs.
12. Contractor shall backfill around all access areas such that storm water is shed away from potential entry points.
13. Invert elevations of all components to be verified in field by Contractor to insure proper operation.
14. Contractor to seed and/or mulch disturbed areas to coincide with existing landscape. Area shall not be left with uncovered soil.
15. Contractor to install phone or Internet line to control panel.
16. All system piping and fittings to be SCH40 PVC (except where noted). All gravity elbows to be long radius or long sweeping type elbows (DWV).
17. New tanks and pod to be set on 6" minimum gravel base. Use #5 or #57 stone for base.
18. Tank(s) shall be backfilled with gravel or tank hole shall be over-excavated a minimum of 2' in all directions to allow for mechanical tamping of backfill.
19. All tank penetrations shall be sealed with a cast-in-place boot with a stainless steel strap.
20. All metal in tanks shall be stainless steel.
21. All tanks to have cast-in-place riser adapter on both ends.
22. Septic Tank to have approved 8" effluent filter.
23. On site vacuum or hydrostatic leak test required on all tanks. Vacuum test at 5 inches of Hg for 5 minutes. Water leak test for one hour duration with water level to the underside of the top of tank. Documentation to be provided to Engineer.
24. All risers to have cast-in-place tank adapters and be single piece riser. Risers shall be secured to cast-in tank adapters per manufacturer's recommendations. Risers to extend 6" above soil surface and be designed and maintained to prevent surface water inflow. Risers to be gasketed and secured with four (4) 1/4" diameter screws.
25. AdvanTex Pod(s) to be placed on gravel bed.
26. Pump discharge piping fittings and valves shall be of compatible corrosion-resistant material.
27. A threaded union (or equivalent type of disconnect) shall be provided in each pump discharge line.
28. All valves shall be readily accessible from the ground surface.
29. Mount Control Panel 24" (min.) above grade.
30. Control panel shall be locked or secured against unauthorized access.
31. All system wiring to be installed in electrical conduit buried to a minimum depth of 18". All wire to be UF or THWN rated.
32. Electrical service from building to be installed by licensed electrician under the building permit.
33. Separate circuits for each pump and alarm/control panel are required (2-120V, 20 amp; 1-120V, 15 amp. All single phase.). Separate conduit required for phone or Internet line.
34. Spigot to be located on outside of building within 50' of septic tank inlet or yard hydrant shall be installed.
35. Sampling spigot to be installed with Pump Tank's discharge pump line. Samples to be collected from UV outlet or pump discharge.

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Revised By: K. Davidson

DESCRIPTION:
MANIFOLD DETAILS

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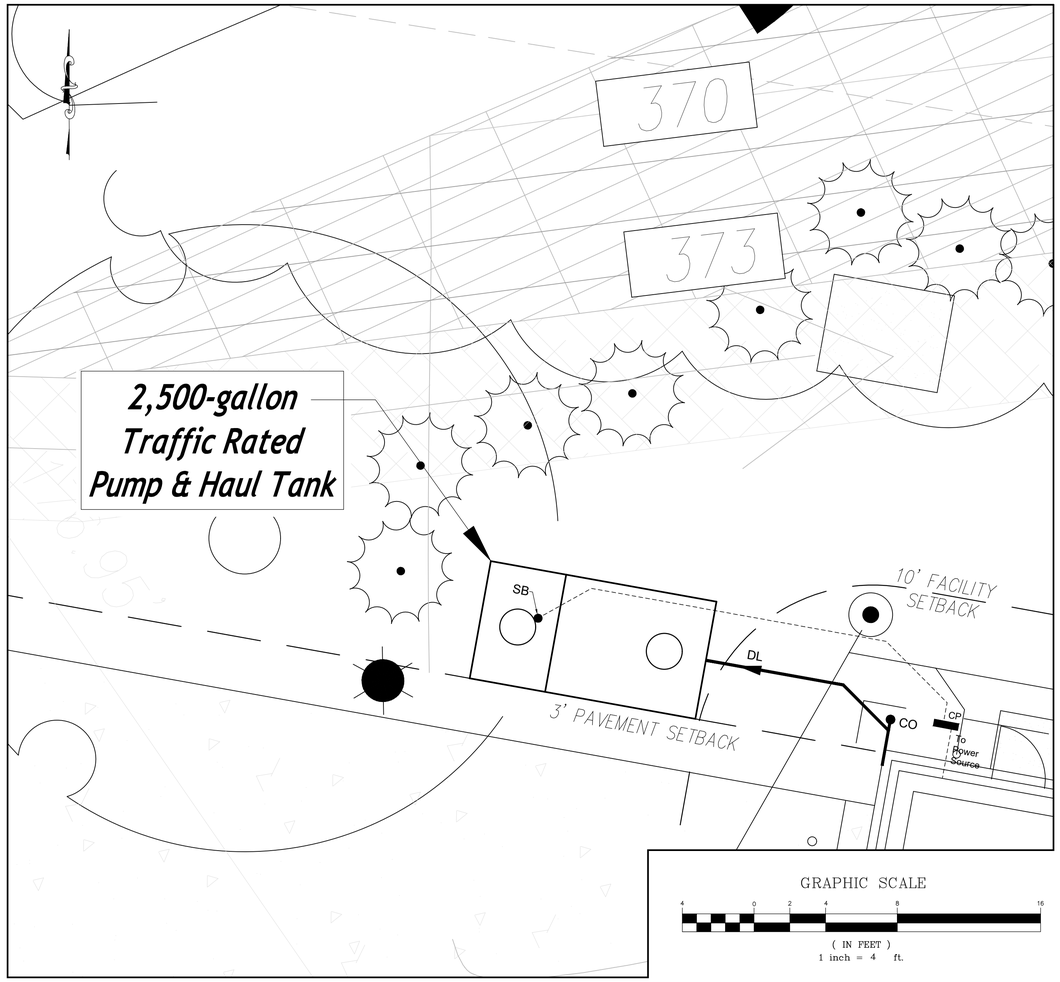
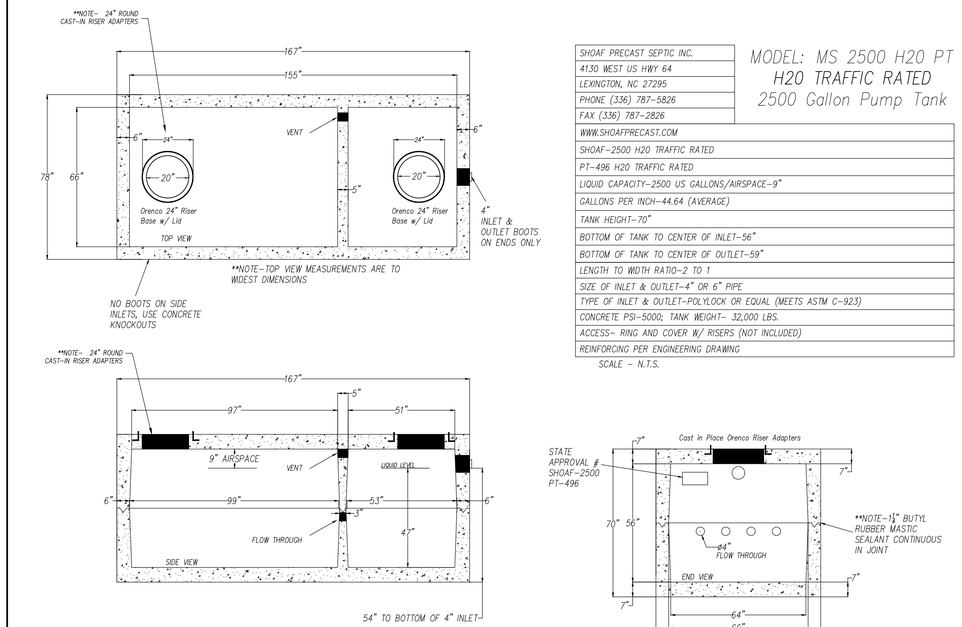


1 WW-12 PUMP & HAUL TANK OVERVIEW



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LEXINGTON, NC 27295	
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FAX (336) 787-2826	
WWW.SHOAFPRECAST.COM	
SHOAF-2500 H20 TRAFFIC RATED	
PT-496 H20 TRAFFIC RATED	
LIQUID CAPACITY-2500 US GALLONS/AIRSPACE-9"	
GALLONS PER INCH-44.64 (AVERAGE)	
TANK HEIGHT-70"	
BOTTOM OF TANK TO CENTER OF INLET-56"	
BOTTOM OF TANK TO CENTER OF OUTLET-59"	
LENGTH TO WIDTH RATIO-2 TO 1	
SIZE OF INLET & OUTLET-4" OR 6" PIPE	
TYPE OF INLET & OUTLET-POLYLOCK OR EQUAL (MEETS ASTM C-923)	
CONCRETE PSI-5000; TANK WEIGHT- 32,000 LBS.	
ACCESS- RING AND COVER W/ RISERS (NOT INCLUDED)	
REINFORCING PER ENGINEERING DRAWING	

MODEL: MS 2500 H20 PT
H20 TRAFFIC RATED
2500 Gallon Pump Tank

SCALE - N.T.S.

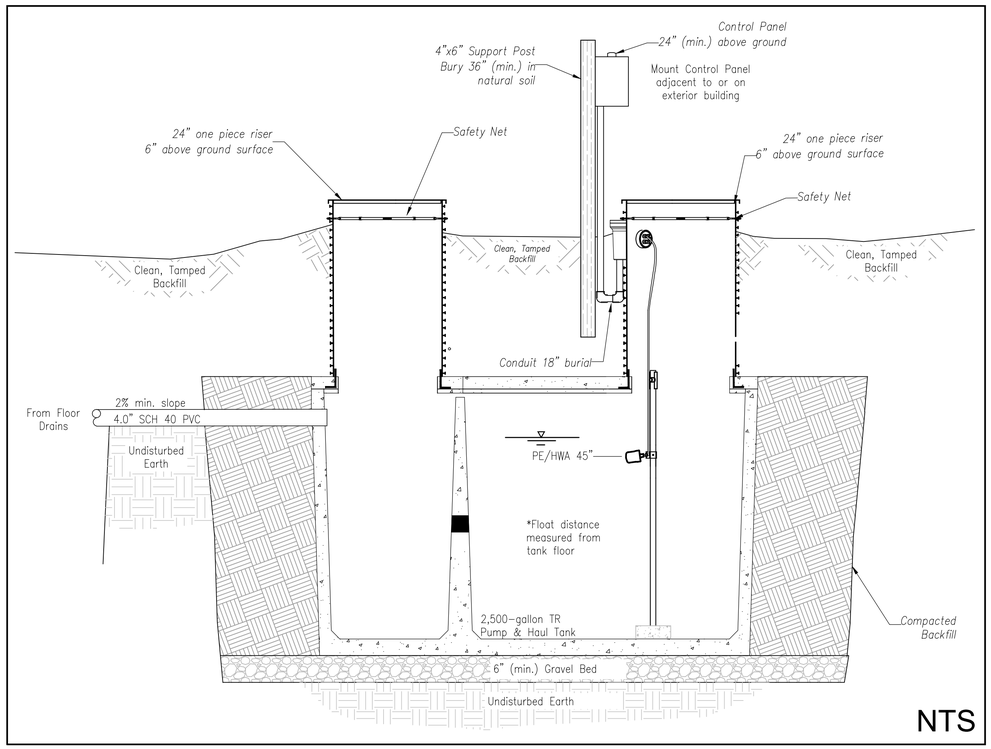
NTS

2 WW-12 PUMP & HAUL TANK (or equivalent)

*Elevations based on GIS data
*Confirm all elevations in field prior to installation

Specifications		Elevations	
Pump & Haul Tank	MS 2500 H20 PT TR	Stubout (Assumed)	371.50 ft.
Length	167.00 in.		
	13.92 ft.		
Width	78.00 in.	DL Pipe Length to Tank Inlet	14.00 ft.
	6.50 ft.	Ground Surface at Low Side of Tank	373.00 ft.
External Height	70.00 in.	Cover over Low Side of Tank	12.00 in.
	5.83 ft.		1.00 ft.
Bottom of 4" Inlet	16.00 in.	Exterior Top of Tank	372.00 ft.
*from Top of Tank	1.33 ft.	Inlet Invert	370.67 ft.
		Slope of DL Pipe	5.95%
		*minimum 2% slope	
		Bottom of Excavation	365.67 ft.
		*beneath 6" gravel base	

3 WW-12 ELEVATIONS



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4 WW-12 PUMP & HAUL TANK PROFILE

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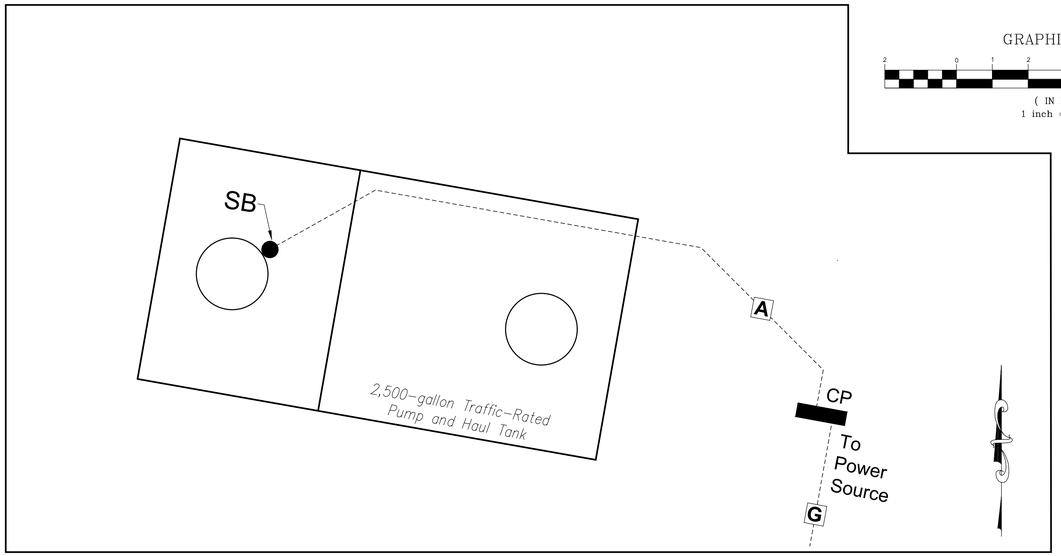


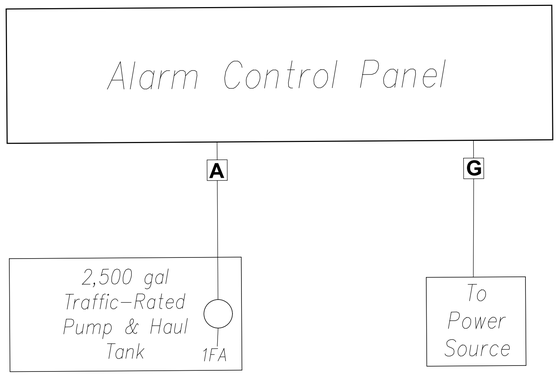
GRAPHIC SCALE

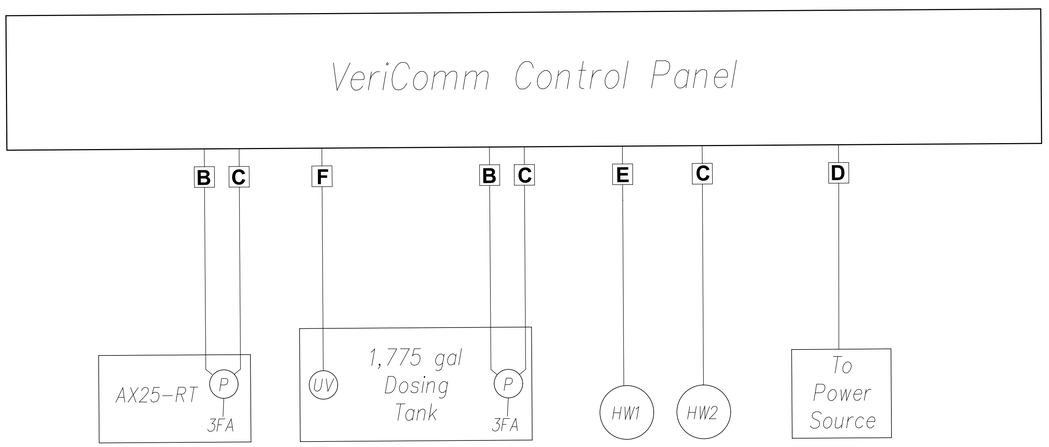
2 0 1 2 4 8

(IN FEET)
1 inch = 2 ft.

1 WW-13 N.T.S. Electrical Plan: Pump and Haul Tank

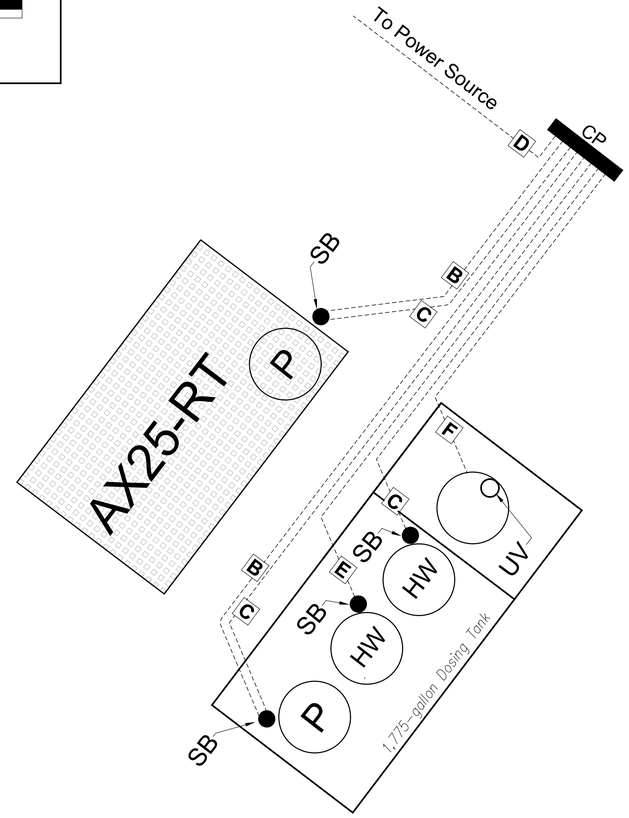
SOURCE: AWT, Inc.





4 WW-13 N.T.S. Conduit Run Diagram

SOURCE: AWT, Inc.



2 WW-13 N.T.S. Electrical Plan

SOURCE: AWT, Inc.

NOTES:
- Qualified Electrician to install wiring.
- All conduit is minimum 3/4" PVC SCH 80.
- Minimum burial depth is 18".
- All conduit to be placed in ductile iron when crossing road.
- All wire to be UF or THWN rated.
- Approximate conduit length: 120', not including power source to control panel

Conduit Sizing / Wire Runs

Line	Conduit Size (in)	#12	#14	#16	Meter/UV Cable
A	0.75	–	2	–	–
B	0.75	3	–	–	–
C	0.75	–	4	–	–
D	2.0	–	–	–	–
E	0.75	–	3	–	–
F	0.5	–	–	–	1
G	1.0	–	–	–	–

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NORTH CAROLINA PROFESSIONAL SEAL 024582 ENGINEER KEVIN DODGE DAVIDSON
6/16/2025

SANDY PLAINS FIRE STATION

15244 Creedmoor Road
Wake Forest, NC

Final Design - Not Released For Construction

DATE 06--23-25
ADW PROJECT NO 23029
AWT PROJECT Sandy Plains Fire Station - WWTS
Drawn By: I. Manson
Revised By: K. Davidson

DESCRIPTION:

ELECTRICAL PLAN

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SHEET NUMBER
WW-13

Scaled for 36"x24" output

Trenching and Excavation Safety

The employer must comply with the trenching and excavation requirements of 29 CFR 1926.651 and 1926.652 or comparable OSHA-approved state plan requirements.

Inspection of Excavations

OSHA standards require that a competent person inspect trenches daily and as conditions change before worker entry to ensure elimination of excavation hazards. A competent person is an individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary, or dangerous to workers, soil types and protective systems required, and who is authorized to take prompt corrective measures to eliminate these hazards and conditions.

Access and Egress

OSHA standards require safe access and egress to all excavations, including ladders, steps, ramps, or other safe means of exit for employees working in trench excavations 4 feet (1.22 meters) or deeper. These devices must be located within 25 feet (7.6 meters) of all workers.

Recommendations

Heavy equipment and trucks should stay as far as possible from the edge of any trench.
Always use pads under stabilizers to minimize ground pressures that could lead to failures.

(b) Definitions

"Cemented soil" means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

"Cohesive soil" means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

"Dry soil" means soil that does not exhibit visible signs of moisture content.

"Fissured" means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

"Granular soil" means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

"Layered system" means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

"Moist soil" means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

"Plastic" means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

"Saturated soil" means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or sheer vane.

"Soil classification system" means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the characteristics of the deposits and the environmental conditions of exposure.

"Stable rock" means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

"Submerged soil" means soil which is underwater or is free seeping.

"Type A" means cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A.

However, no soil is Type A if:

(i) The soil is fissured; or
(ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
(iii) The soil has been previously disturbed; or
(iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
(v) The material is subject to other factors that would require it to be classified as a less stable material.

"Type B" means:

(i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
(ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
(iii) Previously disturbed soils except those which would otherwise be classed as Type C soil.
(iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
(v) Dry rock that is not stable; or
(vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

"Type C" means:

(i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or
(ii) Granular soils including gravel, sand, and loamy sand; or
(iii) Submerged soil or soil from which water is freely seeping; or
(iv) Submerged rock that is not stable, or
(v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

"Unconfined compressive strength" means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

"Wet soil" means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) Requirements

(1) Classification of soil and rock deposits. Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(2) Basis of classification. The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

(3) Visual and manual analyses. The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(4) Layered systems. In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(5) Reclassification. If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) Acceptable visual and manual tests

(1) Visual tests. Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.
(ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
(iii) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.
(v) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.
(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.
(viii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

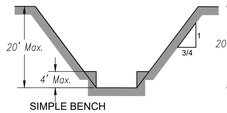
(2) Manual tests. Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(i) Plasticity. Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.
(ii) Dry strength. If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.
(iii) Thumb penetration. The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488 - "Standard Recommended Practice for Description of Soils (Visual - Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences.If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.
(iv) Other strength tests. Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.
(v) Drying test. The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:
(A) If the sample develops cracks as it dries, significant fissures are indicated.
(B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material and the unconfined compressive strength should be determined.
(C) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures.If they pulverize easily into very small fragments, the material is granular.

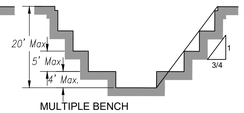
EXCAVATIONS IN TYPE A SOILS

All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of ¾:1.

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of ½:1

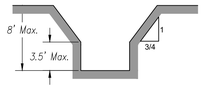


SIMPLE BENCH

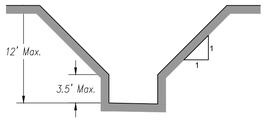


MULTIPLE BENCH

All benched excavations 20 feet or less in depth shall have a maximum allowable slope of ¾:1 and maxium bench dimensions as follows:

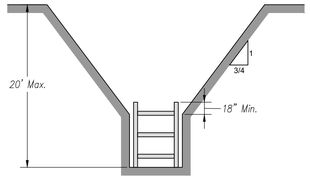


All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3½ feet.



All excavations more than 8 feet but not more than 12 feet in depth with unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3½ feet.

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of ¾:1. The support or shield system must extend at least 18 inches above the top of the vertical side.



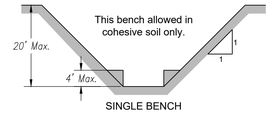
All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under § 1926.652(b).

EXCAVATIONS IN TYPE B SOILS

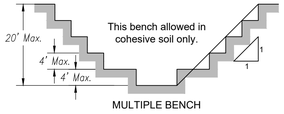
All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

SIMPLE SLOPE

All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maxium bench dimensions as follows:

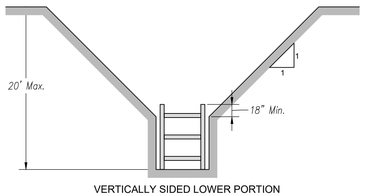


SINGLE BENCH



MULTIPLE BENCH

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 1:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

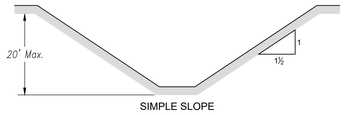


VERTICALLY SIDED LOWER PORTION

All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

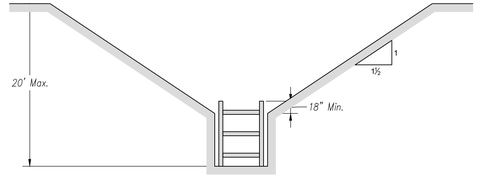
EXCAVATIONS IN TYPE C SOILS

All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



SIMPLE SLOPE

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 1½:1. The support or shield system must extend at least 18 inches above the top of the vertical side.



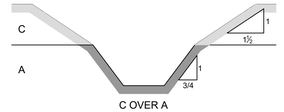
VERTICALLY SIDED LOWER PORTION

All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

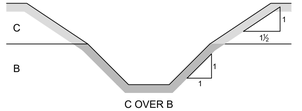
EXCAVATIONS IN LAYERED SOILS

All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.

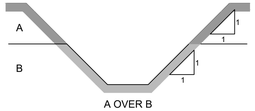
B OVER A



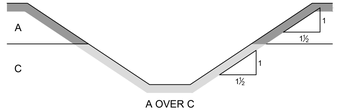
C OVER A



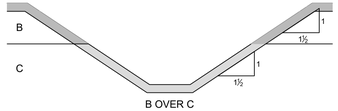
C OVER B



A OVER B



A OVER C



B OVER C

All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

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NORTH CAROLINA PROFESSIONAL SEAL 024582 ENGINEER KEVIN DODGE DAVIDSON
6/16/2025

SANDY PLAINS FIRE STATION

15244 Creedmoor Road
Wake Forest, NC

Final Design - Not Released For Construction

DATE	06-23-25
ADW PROJECT NO	23029
AWT PROJECT	Sandy Plains Fire Station - WWTS
Drawn By:	I. Manson
Revised By:	K. Davidson

DESCRIPTION:

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SHEET NUMBER

WW-14

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4. Wastewater System Specifications

Engineers and Soil Scientists

Agri-Waste Technology, Inc.
501 N Salem Street, Suite 203, Apex, NC 27502
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Wastewater System Specifications
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1.0 General Project Specifications

1.1 Project Description

The purpose of the project is to install a new wastewater treatment system with a subsurface dripfield to serve a new fire station in Wake County. The treatment system will consist of one (1) septic tank, one (1) AdvanTex AX-25RT treatment unit, one (1) UV disinfection unit, one (1) pump (field dosing) tank, two (2) headworks units, one (1) control panel, and one (1) subsurface dripfield.

There will also be one (1) pump and haul (storage) tank that is not part of the wastewater treatment system. Industrial waste from the apparatus bay floor drains will drain to the pump and haul storage tank. The tank will be periodically pumped by a contract hauler. Specifications for the pump and haul tank are included in this package. A separate application will be submitted to NC DWR in order to obtain a pump and haul permit for the facility.

1.2 Site Description

The property is located in Wake County, North Carolina at 15224 Creedmoor Rd, Wake Forest, NC 27587 (Wake County PIN: 0894000183). The setbacks and proposed location of the system and drainfield are shown on the system drawings.

1.3 Adjacent Property

The surrounding area consists of residential lots and undeveloped rural area.

2.0 Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills and other accidental exposure of materials and substances to storm water runoff.

2.1 Housekeeping

The following good housekeeping practices will be followed on site during the construction project.

- An effort will be made to store only enough product required to do the job.
- All materials stored on site will be stored in a neat and orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used before disposing of the container.
- The manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure proper use and disposal of materials on site.

2.2 Hazardous Products

These practices are used to reduce the risks associated with hazardous materials (if any are present):

- Products will be kept in original containers unless they are not re-sealable.
- Original labels and Material Safety Data Sheets (MSDS) will be retained.
- If surplus product must be disposed of, the manufacturer's or local and state recommended methods for proper disposal will be followed.

2.3 Product Safety Practices

The following product safety practices will be followed on site:

2.3.1 Petroleum Products

All on-site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled.

2.3.2 Fertilizers

Fertilizers used will be applied at recommended agronomic rates. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

2.4 Spill Control Practices

The following practices will be followed for spill prevention and cleanup:

- The manufacturer's recommended methods for spill cleanup will be clearly understood and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on site. Equipment and materials will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated, and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.
- The site superintendent responsible for the day-to-day site operations will be the spill prevention and cleanup coordinator. He should designate at least one other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup.

3.0 Site Work

The site shall be maintained in an orderly and clean fashion. Debris should be confined to a common area and removed weekly. The minimum area needed shall be disturbed. Due to the small footprint of the project, a formal erosion and control plan has not been developed. However, the contractor shall follow standard practices to minimize any adverse effects from the installation of the system.

3.1 Construction Roads and Parking

Inspect construction roads and parking areas periodically for condition of surface. Topdress with new gravel as needed. Check areas for erosion and sedimentation after runoff-producing rains. Maintain all vegetation in a healthy, vigorous condition. Sediment-producing areas should be treated immediately.

3.2 Tree Preservation and Protection

Some clearing of trees will be required for the installation of the drain line connecting the facility to the system. Care shall be taken to minimize the disturbed area during installation. Despite precautions, some damage to protected trees may occur. In such cases, repair any damage to the crown, trunk, or root system immediately.

- Repair roots by cutting off the damaged areas and painting them with tree paint. Spread peat moss or moist topsoil over exposed roots.
- Repair damage to bark by trimming around the damaged area as shown in Figure 1 below, taper the cut to provide drainage, and paint with tree paint.
- Cut off all damaged tree limbs above the tree collar at the trunk or main branch. Use three separate cuts as shown in Figure 2 to avoid peeling bark from healthy areas of the tree.

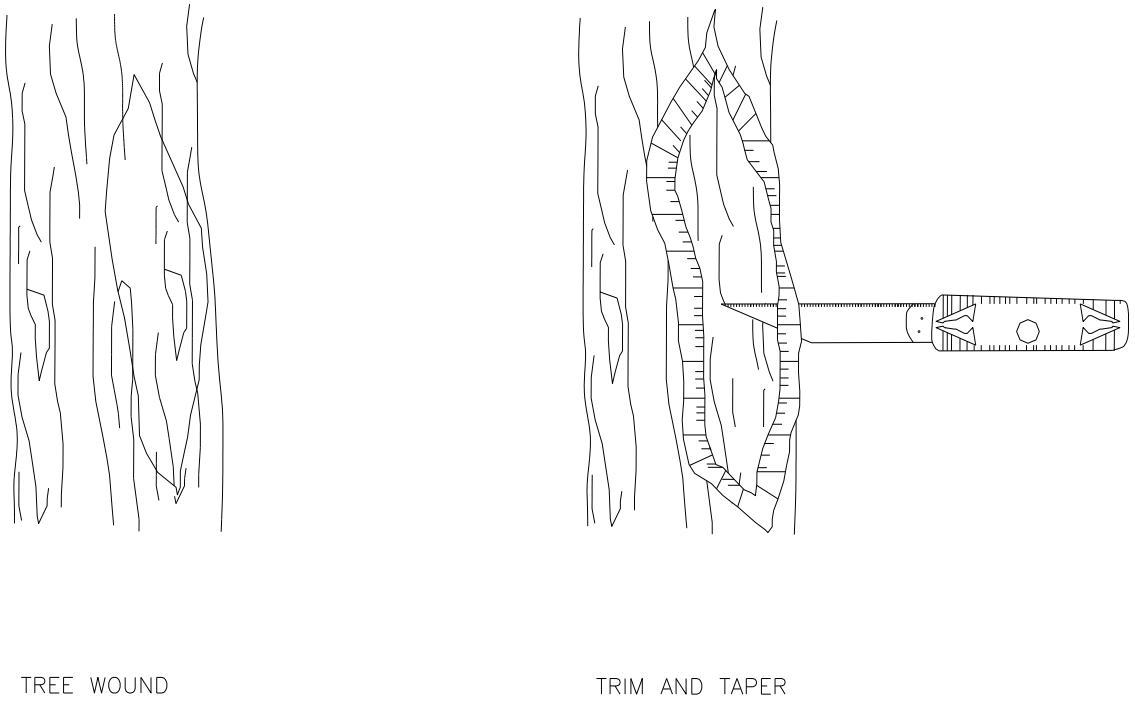


Figure 1. *Trim bark wounds with a tapered cut, then apply tree paint.*

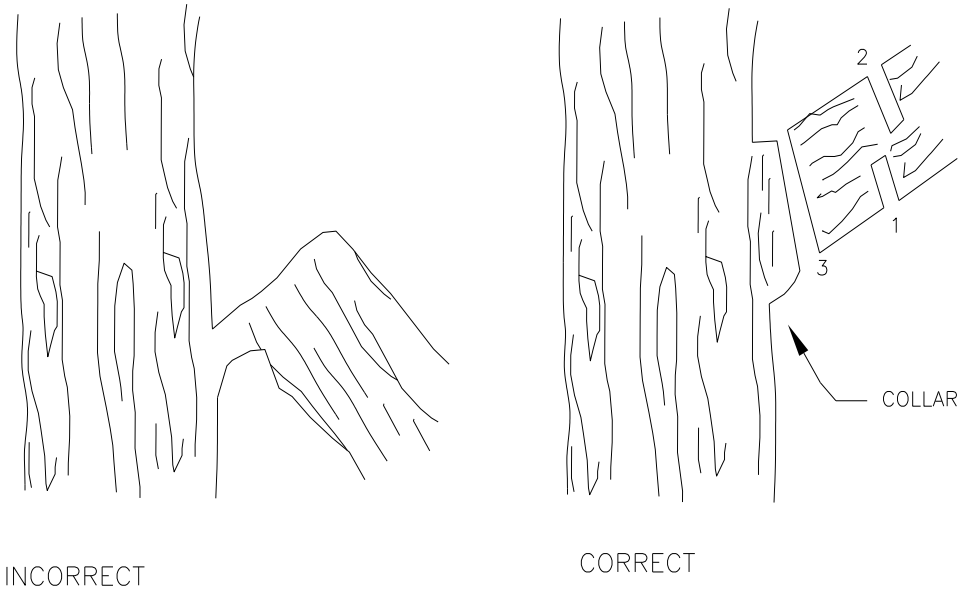


Figure 2. *Prune damaged branches with three cuts to avoid peeling bark from the tree when tree trunk falls from tree.*

To the degree possible, the vegetation that is removed during the drain line installation shall be shredded on site and used to cover the drain line installation. Larger material shall be removed from the site and disposed of properly.

3.3 Removal of Topsoil

MATERIALS
Determine whether the quality and quantity of available topsoil justifies selective handling. Quality topsoil has the following characteristics:

- **Texture —** loam, sandy loam, and silt loam are best; sandy clay loam, silty clay loam, clay loam, and loamy sand are fair. Do not use heavy clay and organic soils such as peat or muck as topsoil.
- **Organic matter content** — (sometimes referred to as "humic matter") should be greater than 1.5% by weight.
- **Acidity —** pH should be greater than 3.6 before liming, and liming is required if it is less than 6.0.
- **Soluble salts** — should be less than 500 ppm.
- **Sodium** — sodium adsorption ratio should be less than 12. The depth of material meeting the above qualifications should be at least 2 inches. Soil factors such as rock fragments, slope, depth to water table, and layer thickness affect the ease of excavation and spreading of topsoil. Generally, the upper part of the soil, which is richest in organic matter, is most desirable; however, material excavated from deeper layers may be worth storing if it meets the other criteria listed above. Organic soils such as mucks and peats do not make good topsoil. They can be identified by their extremely light weight when dry.

STRIPPING
Strip topsoil ONLY from those areas that will be disturbed by excavation, filling, roadbuilding, or compaction by equipment (NOT dripfield area). A 4–6-inch stripping depth is common, but depth varies depending on the site. Determine depth of stripping by taking soil cores at several locations within each area to be stripped. Topsoil depth generally varies along a gradient from hilltop to toe of the slope. Put sediment basins, diversions, and other controls in place prior to stripping.

STOCKPILING
Select stockpile location to avoid slopes, natural drainageways, and traffic routes. Respreading is easier and more economical when topsoil is stockpiled in small piles located near areas where they will be used.

- **Sediment barriers** — Use sediment fences or other barriers where necessary to retain sediment.
- **Temporary seeding** — Protect topsoil stockpiles by temporarily seeding as soon as possible, no more than 21 calendar days after the formation of the stockpile.
- **Permanent vegetation** — If stockpiles will not be used within 90 days, they must be stabilized with permanent vegetation to control erosion and weed growth.

SITE PREPARATION
Before spreading topsoil, establish erosion and sedimentation control practices such as diversions, and berms as needed.

- **Grading** — Maintain grades on the areas to be topsoiled according to the approved plan and do not alter them by adding topsoil.
- **Limit of subsoil** — Where the pH of the existing subsoil is 6.0 or less, or the soil is composed of heavy clays, incorporate agricultural limestone in amounts recommended by soil tests or specified for the seeding mixture to be used. Incorporate lime to a depth of at least 2 inches by disking or raking.
- **Roughening** — Immediately prior to spreading the topsoil, loosen the subgrade by disking or scarifying to a depth of at least 4 inches, to ensure bonding of the topsoil and subsoil. If no amendments have been incorporated, loosen the soil to a depth of at least 6 inches before spreading topsoil.

SPREADING TOPSOIL
Uniformly distribute topsoil to a minimum, compacted depth of 2 inches. Do not spread topsoil while it is frozen or muddy or when the subgrade is wet or frozen. Correct any irregularities in the surface that result from topsoiling or other operations to prevent the formation of depressions or water pockets. Compact the topsoil enough to ensure good contact with the underlying soil, but avoid excessive compaction, as it increases runoff and inhibits seed germination. Light packing with a roller is recommended where high-maintenance turf is to be established.

On slopes and areas that will not be mowed, the surface may be left rough after spreading topsoil. A disk may be used to promote bonding at the interface between the topsoil and subsoil. After topsoil application, follow procedures for seedbed preparation, taking care to avoid excessive mixing of topsoil into the subsoil.

3.4 Permanent Seeding

3.4.1 Seedbed Requirements

Establishment of vegetation should not be attempted on sites that are unsuitable due to inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been taken to correct these problems.

To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. The existing soil should have these criteria:

- Enough fine-grained (silt and clay) material to maintain adequate moisture and nutrient supply (available water capacity of at least .05 inches of water to 1 inch of soil).
- Sufficient pore space to permit root penetration.
- Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.
- A favorable pH range for plant growth, usually 6.0-6.5.
- Freedom from large roots, branches, stones, large clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydroseeded.

If any of the above criteria are not met—i.e., if the existing soil is too coarse, dense, shallow, or acidic to foster vegetation—special amendments are required. The soil conditioners described below may be beneficial.

3.4.2 Soil Conditioners

To improve the structure or drainage characteristics of a soil, the following materials may be added. These amendments should only be necessary where soils have limitations that make them poor for plant growth or for fine turf establishment.

- Peat — Appropriate types are sphagnum moss peat, hypnum moss peat, reed-sedge peat, or peat humus, all from fresh-water sources. Peat should be shredded and conditioned in storage piles for at least 6 months after excavation.
- Sand — clean and free of toxic materials.
- Vermiculite — horticultural grade and free of toxic substances.
- Rotted manure — stable or cattle manure not containing undue amounts of straw or other bedding materials.

3.4.3 Seedbed Preparation

Complete grading according to the approved plan before seeding. Below are steps to take to prepare the seedbed for planting.

- Chisel compacted areas and spread topsoil 3 inches deep over adverse soil conditions, if available.
- Rip the entire area to 6 inches deep.
- Remove all loose rock, roots, and other obstructions leaving surface reasonably smooth and uniform.
- Apply agricultural lime, fertilizer, and superphosphate uniformly and mix with soil.
- Continue tillage until a well pulverized, firm reasonably uniform seedbed is prepared 4 to 6 inches deep.
- Seed on a freshly prepared seedbed.
- Mulch immediately after seeding and anchor mulch.

Apply lime and fertilizer evenly and incorporate into the top 4–6 inches of soil by disking or other suitable means. Operate machinery on the contour. When using a hydroseeder, apply lime and fertilizer to a rough, loose surface.

Roughen surfaces. Complete seedbed preparation by breaking up large clods and raking into a smooth, uniform surface. Fill in or level depressions that can collect water. Broadcast seed into a freshly loosened seedbed that has not been sealed by rainfall.

3.4.4 Seeding

Seeding dates given in the manufacturer's seeding mixture specifications are designated as "best" or possible". Seedings properly carried out within the "best" dates have a high probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as you deviate from them, the probability of failure increases rapidly. Seeding on the last date shown under "possible" may reduce chances of success by 30-50%. Always take this into account in scheduling land-disturbing activities.

Labeling of non-certified seed is also required by law. Labels contain important information on seed purity, germination, and presence of weed seeds. Seed must meet State standards for the content of noxious weeds. Do not accept seed containing "prohibited" noxious weed seed.

Apply seed uniformly with a cyclone seeder, drop-type spreader drill, cultipacker seeder, or hydroseeder on a firm, friable seedbed.

When using a drill or cultipacker seeder, plant small grains no more than 1-inch deep, grasses and legumes no more than ½ inch. Equipment should be calibrated in the field for the desired seeding rate.

When using broadcast-seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one-half of the seed while moving back and forth across the area, making a uniform pattern; then apply the second half in the same way, but moving at right angles to the first pass**.**

Cover broadcast seed by raking or chain dragging; then firm the surface with a roller or cultipacker to provide good seed contact.

3.4.5 Mulch

Mulch all plantings immediately after seeding. Select material based on site and practice requirements, availability of material, labor, and equipment. Before mulching, complete the required grading, install sediment control practices, and prepare the seedbed. Apply seed before mulching except in the following cases:

- Seed is applied as part of a hydroseeder slurry containing wood fiber mulch.
- A hydroseeder slurry is applied over straw.

3.4.6 Irrigation

Moisture is essential for seed germination and seedling establishment. Supplemental irrigation can be very helpful in assuring adequate stands in dry seasons or to speed development of full cover. Assess the need for irrigation when the seeding is conducted.

Water application rates must be carefully controlled to prevent runoff. Inadequate or excessive amounts of water can be more harmful than no supplemental water.

3.4.7 Application of Organic Mulch

Organic mulches are effective where they can be tacked securely to the surface.

Spread mulch uniformly by hand, or with a mulch blower. When spreading straw mulch by hand, divide the area to be mulched into sections of approximately 1,000 ft2, and place 70-90 lb of straw (1 ½ to 2 bales) in each section to facilitate uniform distribution. After spreading mulch, no more than 25% of the ground surface should be visible. In hydroseeding operations, a green dye, added to the slurry, assures a uniform application.

3.4.8 Anchoring Organic Mulch

Straw mulch must be anchored immediately after spreading using vegetation. Rye (grain) may be used to anchor mulch in fall plantings, and German millet in spring. Broadcast at 15 lb/acre before applying mulch.

3.4.9 Permanent Stabilization

Permanent stabilization is needed in graded or cleared areas subject to erosion and where a permanent, long-lived vegetative cover is needed. Typically, disturbed portions of a site where construction activities have permanently ceased will be stabilized with permanent seeding no later than 14 days after the last construction activity. This method will not provide erosion control cover or prevent soil slippage on soils that are not stable due to soil texture or structure, water movement or excessively steep slopes. In some areas it may be necessary to install erosion or sediment control practices such as dikes, contour ripping, erosion stops, channel liners, sediment basins, diversions, subsurface drainage, or other practices.

Prior to seeding, 1,000 lbs/ac of a 12-12-12 or equivalent fertilizer and lime according to soil test or in lieu of soil test, 4,000 lbs/ac of ground agricultural limestone shall be worked into the soil to a depth of 3 inches.

Seed should be applied uniformly at a depth of 1/4 to ½ inch with appropriate equipment. Except on very flat slopes and ideal seeding conditions, small grain straw should be applied at a rate of 3,000 to 4,000 lbs/ac using appropriate mulch anchoring techniques. Other mulch materials can be used except under adverse conditions or steep slopes, grain straw should be adequate.

4.0 Installer Specifications

The system installer shall maintain Class IV Installer License with the North Carolina Onsite Wastewater Contractor Inspector Certification Board (NCOWCICB).

5.0 Material Specifications

The following are required system specifications. Contractor will be responsible to compensate Engineer for time to determine equivalence to recommended products, revision of drawings, etc. for other products suggested. Engineer maintains sole discretion in determining equivalence.

5.1 Concrete Tanks

System installer to follow OSHA safety practices during excavation, setting and backfilling of tanks. Tank excavations to be benched and/or sloped as needed or trench boxes shall be utilized. Tanks to be installed in natural soil only (in cut) and not in backfilled material. If non-desirable material is encountered in tank excavation, it shall be removed and replaced (as needed) with compacted material. All tanks shall be installed, level, on minimum 6" gravel base (#57 stone).

All concrete tanks are to be State approved tanks or specifically approved by the certifying Professional Engineer. Concrete used to manufacturer tanks to be minimum of 5,000 psi concrete. Each tank's wall penetration for either an inflow or outflow line shall have a cast in place rubber boot. All tanks' seams (between adjoining tank sections) to be sealed with 2 strips (side by side) of 1.25" diameter butyl rubber sealant.

Tank sections shall fit together without having to "stack" strips of sealant. Tank sections shall be "dry fit" to ensure the tanks sections mate properly. If during setting of the tank sections, "daylight" is observed between tank sections, the tank will not be accepted for the project.

Backfill placed around tanks shall be either compacted soil or gravel. If compacted soil is intended backfill method, tank hole shall be over-excavated by a minimum of two feet (2') in all directions to facilitate use of compaction equipment. Mechanical compaction equipment, such as a "jumping jack" or "sheeps foot" compactor is required. Compaction with an excavation bucket or equipment wheel or tread is not acceptable.

Following installation, tanks to be vacuum and/or water tested. The vacuum testing shall be completed and documented by the tank supplier (manufacturer). Passing criteria is as follows:

Vacuum Test	5" Hg for 5 min with ≤ 1/5" drop in Hg

The system installer shall water test the tanks after backfilling is completed. In addition, the test shall be completed after the pipe penetrations and access risers have been installed. The water level in the tank shall be filled to a minimum of 2" above the riser seam (connection to tank). Passing criteria is as follows:

Water Test	≤ 1/8" over one hour duration

Septic Tank

Concrete septic tank, non-traffic rated, 1,500-gallon nominal capacity, tank interior dimensions 120" x 60" x 63" (min), baffle wall with flow through holes, effluent filter in outlet compartment, two access ports (min 20" diameter), and two cast in place riser adapters to join to 24" diameter risers (risers placed on each end of tank and above far end of inlet compartment). The effluent filter shall be 8" in diameter, have a filter surface area of 14.6 sq. ft., flow area of 4.4 sq. ft., and contain a minimum of 8 inlet holes. The filter shall be fitted with an extendable handle that is brought to within 6" of the top of the access riser. Septic Tank will contain a 4" cast in place rubber boot on inlet end and a 4" cast in place rubber boot on the outlet end of the tank (see design plans for boot placement). The tank walls shall have a minimum thickness of 3", the tank floor and top shall have a minimum thickness of 4".

Basis of Design:	Shoaf Precast, Inc.;	STB-390 (Septic Tank)
	Orenco Systems, Inc.;	FTP0854-36 (Effluent Filter)

Pump (Field Dosing) Tank

Concrete pump tank, non-traffic rated, 1,775-gallon nominal capacity, tank interior dimensions 120" x 60" x 63" (min), and baffle wall with flow through holes and vents. The tank walls shall have a minimum thickness of 3", and the tank floor and top shall have a minimum thickness of 4". Two access ports, one located on the inlet end and two located on the outlet end of the tank, shall have a 20" (min) diameter with cast in place riser adapters to join the risers. One 24" riser will be located over the inlet end, and one 24" riser will be located over the outlet end.

Basis of Design:	Shoaf Precast, Inc.;	PT-352 (Pump Tank)

Pump and Haul Tank

Concrete mid-seam pump tank, traffic-rated, 2,500-gallon nominal capacity, tank interior dimensions 155" x 66" x 56" (min), and baffle wall with flow through holes and vents. The tank walls shall have a minimum thickness of 6", and the tank floor and top shall have a minimum thickness of 7". The tank floor and the bottom 1.75' (min) of the tank walls shall be cast as a single piece. Section butts for joining tank sections are to be offset. Two access ports, one located on the inlet end and one located on the outlet end of the tank, shall have a 20" (min) diameter with cast in place riser adapters to join the risers. One 24" riser will be located over the inlet end, and one 24" riser will be located over the outlet end.

Basis of Design:	Shoaf Precast, Inc.;	PT-496 H20 Traffic Rated (Pump Tank)

Riser Adapters

The riser adapter shall be constructed of ABS material. The riser adapter shall have an internal diameter of 23.00" and outer diameter of 26.77". The minimum vertical distance of adapter shall be 5.48" (Top to flange: 3.21", flange: 0.52", flange to bottom: 1.75").

Basis of Design:	Polylok;	PL-24IPA-CI (24" riser adapter)

5.2 Access Risers and Lids

All risers shall be installed per manufacturer's specifications. Installed risers shall extend a minimum of 6" above finished grade. Any penetrations through the riser wall shall be fitted with either a grommet or the penetration shall use a bulk-head fitting. Electrical conduit shall be sealed with duct seal.

Access Risers (Septic Tank, Pump Tank, Pump and Haul Tank)

Installed risers shall be 24" diameter, ribbed PVC pipe. The riser shall be installed such that a single piece riser is used at each access point. No splices, joints or sectional risers are allowed. All field cuts shall be done with a circular (with guide) or "riser" saw. Finished cuts shall be uniform and smooth and shall not have jagged edges. Riser pipes shall be sealed to the tank riser adapter with single or two-part adhesive that is appropriate for joining PVC and ABS materials. To facilitate the installation of the control floats and pump power cords, a junction box shall be mounted on pump tank and pump & haul tank outlet risers. The junction box shall be mounted with a grommet, bulkhead fitting or other water-resistant fitting. The hole for the junction box shall be cut with a hole saw or grinder and shall leave the finished hole smooth and uniform. The diameter of the hole into the riser shall be 5". The splice box shall have a UL listing (Type 6P for prolonged submergence and contain an interval minimum volume of 100in^3). A "shop vac" or equivalent means shall be used to reduce the quantity of "cut shavings" that fall into the tank. All risers shall extend a minimum of 6" above finished grade.

A safety net shall be installed in all risers of the tanks. The net shall use a 12-point connection system with six connections installed with quick-release-style connectors (locate over filters). The net shall be mounted beneath the third rib of the riser pipe.

Basis of Design:	Orenco Systems, Inc.;	Ultra-Rib^{TM} Access Riser RR24
	Orenco Systems, Inc.;	ADH100 or MA 320 (sealant)
	Orenco Systems, Inc.;	SBEX1-4 (junction box)
	Simtech;	STF-N24 (safety net)

Riser Lids (Septic Tank, Pump Tank, Pump and Haul Tank)

The riser lid shall have a 24” diameter and consist of either a solid fiberglass reinforced polyester resin, or a solid fiberglass reinforced polyester resin encapsulating wood or a structural foam core. The lid shall have a green, textured (non-skid) top surface and shall be capable of supporting a 2,500 lb. loading. The lid shall be manufactured with a molded or poured in place gasket (underside of lid). The top of lid shall be textured and secured using four 5/16” stainless steel screws with a hex pattern head.

Basis of Design: Orenco Systems, Inc.; FLD24G (24” Riser Lid)

5.3 System Piping

All gravity (non-pressure) drainlines and pressure pipe used in project shall be SCH 40 PVC. All piping shall be installed with a minimum of 18” cover and shall be properly bedded in the excavated trench bottom. Pipeline that will be exposed to vehicular traffic shall be buried with a minimum cover of 30” or shall be sleeved or consist of ductile iron pipe. Where pipelines cross a water channel, a minimum of 36” cover shall be maintained. When crossing a water line, the sewer pipeline shall be a minimum of 18” below the water line (contact Engineer for additional requirements if this condition cannot be met). All pressure pipes used shall be in 20’ sticks with bell ends.
All non-pressure drain line installed from the buildings to the septic tank to be 4" SCH 40 PVC and can be rated DWV. Sweeping style elbows shall be used for non-pressure situations.

All pressure lines to be pressure rated SCH 40 PVC. All pressure lines (2" in diameter and less) to be cut with hand ratcheting style cutter or wheel style cutter. PVC saws shall not be used to cut pressure pipe (<2”). Pressure line specifications follow this section.

The supply lines from the pump tank to the drainfield shall be pressure tested. If air is used to test the line, the line shall be pressurized to max 10 psi and held for 10 min with no drop in pressure.

5.4 *System Pumps and Flow Inducer Tower*

. The pump shall capable of providing a flowrate of 20 gpm.

One (1) submersible pump shall be installed in the pump (field dosing) tank, located within a flow inducer tower. The tower shall have the following characteristics: simplex configuration with a 4" nominal diameter Class 125 flow inducer tube, minimum tower height of 72", fiberglass tower base. The pump shall have the following characteristics: submersible, 0.5 hp, 1.25" discharge, 120-volt, single phase, 60 Hz, capable of providing a flowrate of 20 gpm, minimum 24-hour run-dry capacity with no deterioration in pump life performance, and Franklin Electric Super Stainless motor rated for continuous use and frequent cycling. A hose and valve discharge assembly will be placed on the pump discharge pipe within the top 12" of the tank access risers. The pump shall be capable of providing the following:

Pump DF1	dose: 3.9 gpm; 145' TDH
	flush: 9.4 gpm; 143' TDH

The pump shall be UL and CSA listed, and shall be fitted with 20' (min) UL listed cord. A sampling port will be located on the pump discharge within the top 12" of the access riser.

Basis of Design:	Orenco Systems, Inc.;	PF200511 (Field Dose Pump)
Basis of Design:	Orenco Systems, Inc.;	UFI-4 (Inducer Tower)

5.5 Control Panel and Floats

The Control Panels shall be supplied and manufactured by a company with experience in building wastewater control panels. Panels shall be constructed to have NEMA 4X enclosure with interior door and main disconnect. Panels shall have short circuit protection and individual circuit breakers.

<u>For the Control Panel at the Treatment:</u>
Each pump shall have hand-off-automatic (HOA) switch, elapsed time meter and cycle counter, independent disconnect, short circuit protection, run light, and individual breaker. Alarm circuit shall be ahead of any pump overload or short circuit protective device. Control panel to have alarm light and horn. The ability to program a local alarm delay shall be provided. Panel to have GFCI plug. Panel to control and have landing space for multiple floats.

Float arrangements for time dose systems (Recirculating Treatment Unit):

Float 1 (lowest)	Redundant Off/ Low Water Alarm
Float 2	Timer Enable
Float 3	Peak Enable/High Water Alarm

Float arrangements for time dose systems (Field Dosing Tank):

Float 1 (lowest)	Redundant Off / Low Water Alarm
Float 2	Timer Enable
Float 3	Peak Enable/ High Water Alarm

The timer override float shall allow for a secondary "off" time between doses. The control panel shall have a cellular connection to provide telemetry and allow for remote monitoring of the panel. All conduit penetrations shall be capped with duct seal. All conduits to the panel shall be installed vertically and shall be one solid section of conduit (not pieced).

For the Control Panel at the Pump and Haul Tank:

Alarm circuit shall be ahead of any short circuit protective device. Control panel to have alarm light and horn. The ability to program a local alarm delay shall be provided. Panel to have GFCI plug. Panel to control and have landing space for multiple floats.

Float arrangement in Pump & Haul Tank:

Float 1	High Water Alarm *(no pump, only float alarm)*

Installer shall install all electrical fittings from the control panels to the tanks. All system wire installed in electrical conduit shall be buried to a minimum of 18". All buried line not installed in conduit shall be rated for direct burial and be buried to a depth of 24". Conduit that will be exposed to vehicular traffic shall be buried with a minimum cover of 36" or shall run through ductile iron sleeve. Conduit shall be installed where the underground line breaks the soil surface. Installation shall be in accordance with manufacturer's specifications. Qualified electrician or local power utility shall bring power to panel and energize panel. Minimum wire size is defined in the design drawings.

Basis of Design:	Orenco Systems, Inc:	VeriComm Control Panel (Treatment Area)
Basis of Design:	Orenco Systems, Inc:	A Series Simplex Alarm Panel (Pump & Haul Tank)

5.6 Treatment Unit

The treatment units shall be 102" in length with a width of 64.25" inches. The exterior height of the treatment units shall be 72 inches. The maximum dry weight of the treatment units shall not exceed 908 lbs. The treatment units shall allow for a partial burial depth with a 2-3" exposure height. The treatment unit shall be delivered fully assembled including required pump and float assembly.

Basis of Design: Orenco Systems, Inc.: AX25RT-MODE3A (Treatment Unit)

5.7 UV Disinfection

Disinfection for the system will be accomplished using a UV system integrated into the inlet riser of the pump tank. The UV light should operate for approximately one year prior to needing to be replaced. If the UV light burns out or loses sufficient intensity (below a set threshold), an alarm will activate and disable the system pump. An alarm light on the control panel will also illuminate. When the alarm is activated, water use should be reduced until the alarm condition is addressed.

Basis of Design: Orenco Systems, Inc.; UV-125/3

6.0 Polyvinyl Chloride (PVC) Pressure Pipe Specifications

6.1 Installation

QUALITY ASSURANCE
This section is a minimum guideline for furnishing and the installation of Polyvinyl Chloride (PVC) pipe and fittings for lines with hydraulic pressure. Pipe shall be furnished complete with all fittings, specials, and other accessories.

Standards – ANSI/AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water, latest revision.
Manufacturer – All PVC pipe for a project/development shall be supplied by one manufacturer.

PRODUCT HANDLING

- Do not drop pipe or fittings including dropping on cushions.
- Do not use hooks.
- Polyvinyl chloride pipe has reduced flexibility and impact resistance as temperatures approach and drop below freezing. Extra care should be used in handling and installing PVC pipe during cold weather.
- Care must be taken to prevent damage to the pipe and fittings by impact, bending, compression, or abrasion.

PRODUCT STORAGE

- Store and use solvents and glue in a manner which will avoid contamination.
- Pipe shall be stored in accordance with the manufacturer's specifications.
- Pipe shall be stored on a surface which provides even support for the pipe barrel.
- Pipe which exhibits excessive ultraviolet deterioration and cracking which in the opinion of the Engineer and/or the N.C. Division of Water Quality degrades the pipe quality shall not be used.

6.2 Products

PVC PIPE – SLIP JOINT

- All PVC pipe shall be manufactured in accordance with AWWA Standard C900.
- Pipe joints shall be made using an integral bell with push-on type joint or using couplings of a sleeve type and smooth cut pipe ends to forma push-on type joint.
- All sizes of pipe under these specifications shall be pressure class as shown on the plans.
- Each length of pipe shall be a standard laying length of 20 feet (20') unless field conditions or connections dictate that a shorter length be used. If a vendor of choice does not readily carry 20-foot lengths then another vendor should be sought. Lengths less than 20 feet can be used only if primary local vendors note that this length is unavailable.

FITTINGS AND COUPLINGS
All fittings and couplings shall be of the same class and material as the pipe used for the project. Each fitting should be inspected for damage and cleaned (if necessary) prior to use. Fittings with excessive abrasions, damage or dirt where pipe connections will be made should be discarded.

6.3 Execution

INSPECTION
PVC pipe which has any of the following visual defects will not be accepted:

- Pipe which is sufficiently out-of-round to prohibit proper joining.
- Fractured, cracked, chipped, dented, abrasions, or otherwise damaged pipe.
- Pipe that has been damaged during shipment or handling. Acceptance of the pipe at the point of delivery will not relieve the Contractor of full responsibility for any defects in material of the completed pipeline.

TRENCHING, BACKFILLING, COMPACTION

- Trenching shall be performed such that soil cover over the pipe is a minimum of 18 inches.
- Pipe should be placed on native soil or soil that it well compacted using a tamping rod or a mechanical tamper.
- Fill should be placed over the pipe ONLY AFTER required testing has been performed. Fill shall be well compacted over the pipe and approximately 2 to 4 inches of soil shall be mounded over the trench to allow for subsequent settling.

CUTTING THE PIPE

- Cut pipe smooth, straight and at right angles to the pipe axis with saws or pipe cutters designed specifically for the material.
- Remove burrs and wipe off all dust from the jointing surfaces.
- Do not disturb previously installed joints during cutting operations.

FIELD JOINTS

- Use push-on joints for buried pipe except where indicated otherwise on the plans.
- Dirt, oil, grit, and other foreign matter shall be removed from the inside of the bell, outside of the spigot, and where other pipe connections are to be made.
- All joints shall be cleaned with a solvent PVC cleaner prior to joining.
- Joints shall be glued using an acceptable PVC glue that will provide a water-tight joint at a pressure of 100 psi.
- All joints shall be watertight and free from leaks.

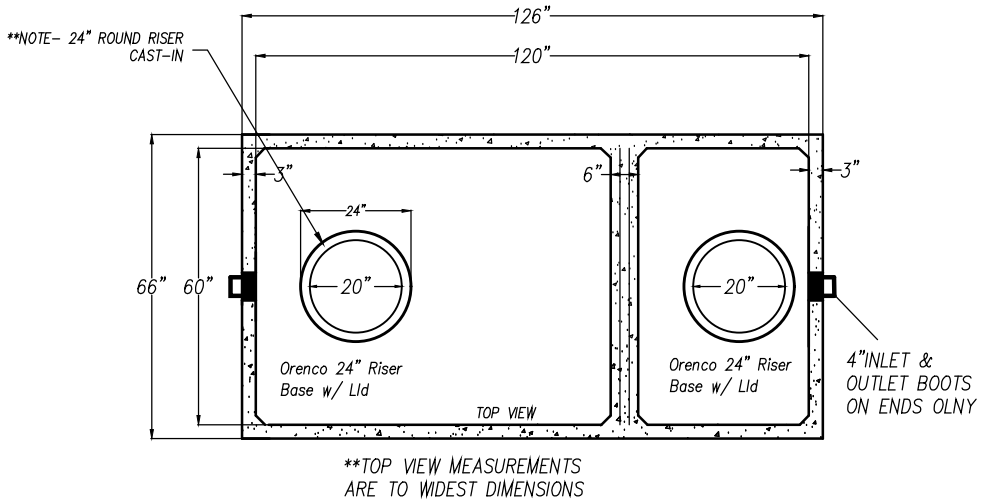
FIELD QUALITY CONTROL – PIPE LEAKAGE TESTS

- Test all pipe under drives, sidewalks and similar crossings prior to covering pipe. Pipe that is buried less with less than 3 feet of cover under such crossings shall be sleeved with PVC or ductile iron pipe that is two (2) times the diameter of the working pipe.
- When the supply line length exceeds 500', prior to filling in trenches with soil, the pipe shall be tested by pressurizing the pipe through either a water or air test. When conducting a water test, pressurize the pipe to 100 psi or 1.5 times the operating pressure of the pump, whichever is greater AND BELOW the maximum line pressure rating for the pipe used.
- This pressure shall be held on the pipe for 2 hours. For solvent weld pipe, there should not be any leakage observed during the test.
- For purposes of this specification, allowable "make up water" at a rate of 100 gal/day/inch pipe diameter/mile is acceptable. For 1" diameter pipe, "make up water" shall not exceed 0.16 gal/100 feet of pipe length for the 2-hour test (100 gal/day/inch pipe/mile). For 1.25" diameter pipe, "make up water" shall not exceed 0.20 gal/100 feet of pipe length for the 2-hour test (100 gal/day/inch pipe/mile).
- If the measured "make up water" exceeds the above rates, then the pipe shall be re-inspected and any leaking joints shall be replaced. Once this is complete the pipe shall be re-tested.
- When conducting an air test, pressurize the pipe to 10 psi. This pressure shall be held on the pipe for 10 minutes. **Ensure that no objects come into contact with the pipe while under pressure. Pressure shall be released from the pipe prior to backfill.**

5. Design Basis - Component Selection

Tank Sheets
Access Riser Adapters, Tank Risers, Riser Lids
External Splice Box
Safety Nets
Effluent Filter
AdvanTex Treatment Unit
System Pumps
Control Panel
Float Switch Assemblies
Dripline
Spin Filter
Solenoid Valve
Flow Meter

Septic Tank

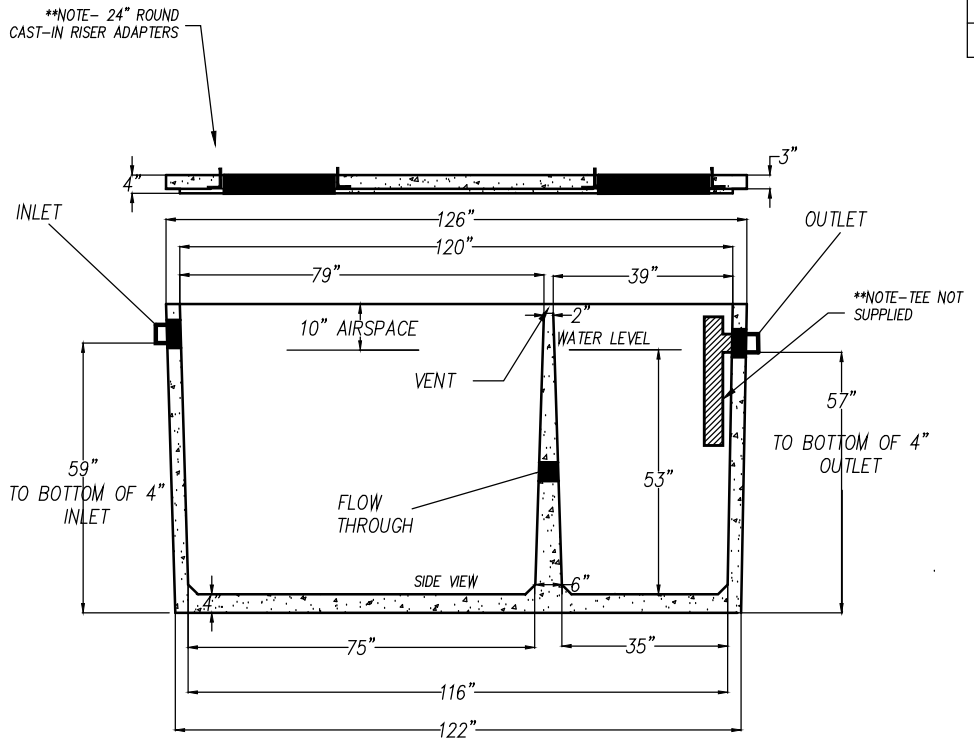


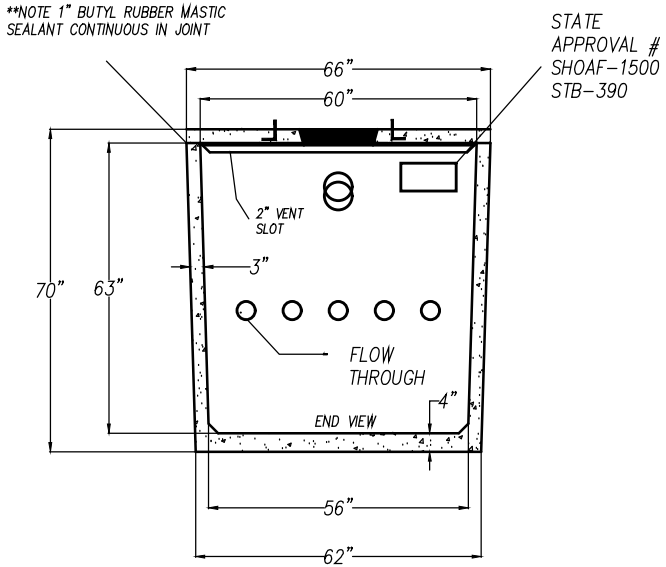
SHOAF PRECAST SEPTIC INC.
4130 WEST US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787-5826
FAX (336) 787-2826
WWW.SHOAFPRECAST.COM

MODEL: TS 1500 STB
NON TRAFFIC
1500 Gallon Septic Tank

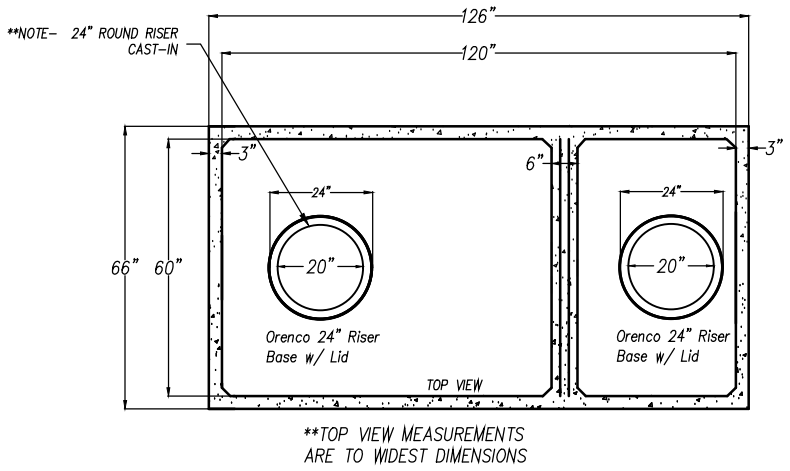
SHOAF-1,500 SEPTIC TANK
STB-390 NON TRAFFIC
LIQUID CAPACITY-1,517 GALLONS/AIRSPACE-10"
TANK HEIGHT-70"
BOTTOM OF TANK TO CENTER OF INLET-61"
BOTTOM OF TANK TO CENTER OF OUTLET-59"
LENGTH TO WIDTH RATIO-2 TO 1
SIZE OF INLET & OUTLET-3" OR 4" PIPE
TYPE OF INLET & OUTLET-POLYLOCK OR EQUAL (MEETS ASTM C-923)
CONCRETE PSI-4000; TANK WEIGHT- 13,000 LBS.
REINFORCEMENT PER STATE CODE

SCALE - N.T.S.





Pump (Field Dosing) Tank



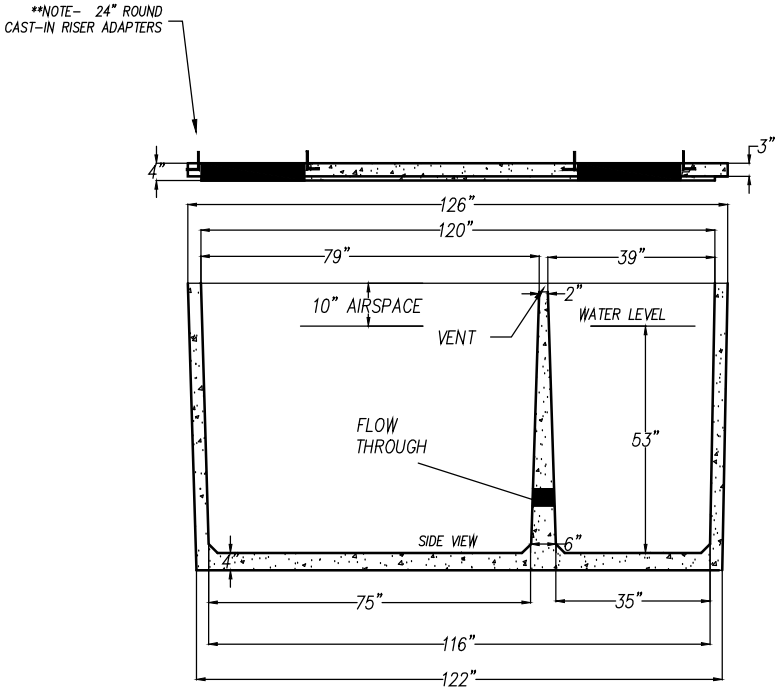
**TOP VIEW MEASUREMENTS ARE TO WIDEST DIMENSIONS

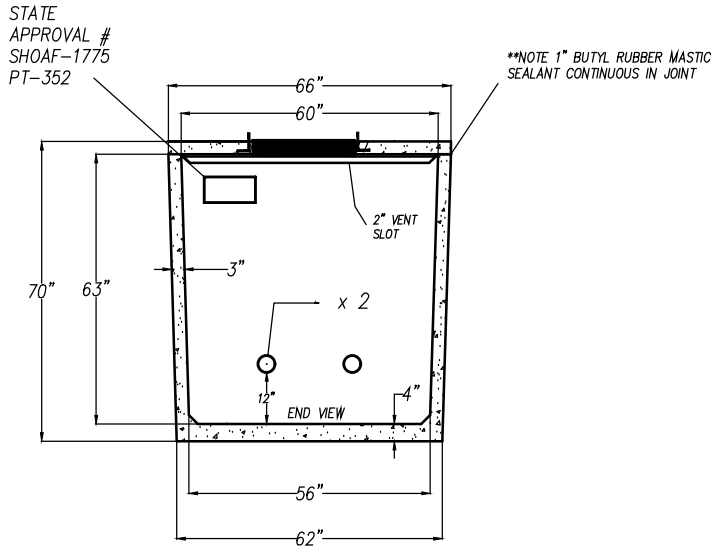
SHOAF PRECAST, INC.
4130 W US HWY 64
LEXINGTON, NC 27295
PHONE (336) 787–5826
FAX (336) 787–2826

MODEL: TS 1775 PT
NON TRAFFIC
1775 Gallon Pump Tank

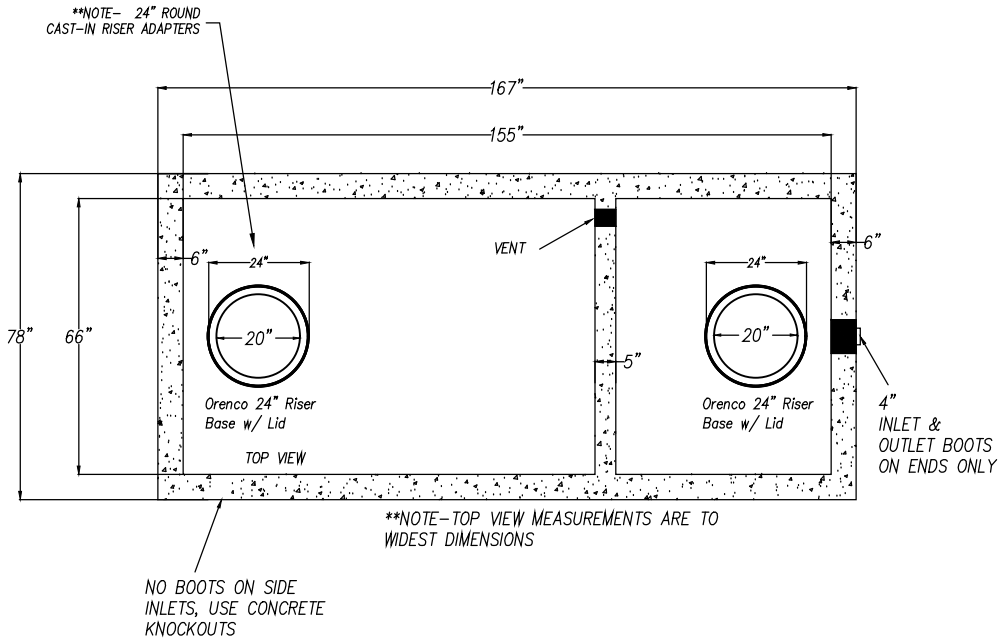
SHOAF–1,775 PUMP TANK
PT–352 NON TRAFFIC
LIQUID CAPACITY–1,775 GALLONS INCLUDING 10" AIRSPACE
GALLONS PER INCH–28.17 (AVERAGE)
TANK HEIGHT–70"
BOTTOM OF TANK TO CENTER OF INLET–59"
BOTTOM OF TANK TO CENTER OF OUTLET–61"
LENGTH TO WIDTH RATIO–2 TO 1
SIZE OF INLET & OUTLET–3" OR 4" PIPE
TYPE OF INLET & OUTLET–POLYLOCK OR EQUAL (MEETS ASTM C–923)
CONCRETE PSI–4000; TANK WEIGHT– 13,000 LBS.
REINFORCEMENT PER STATE CODE

SCALE – N.T.S.





Pump & Haul (Storage) Tank

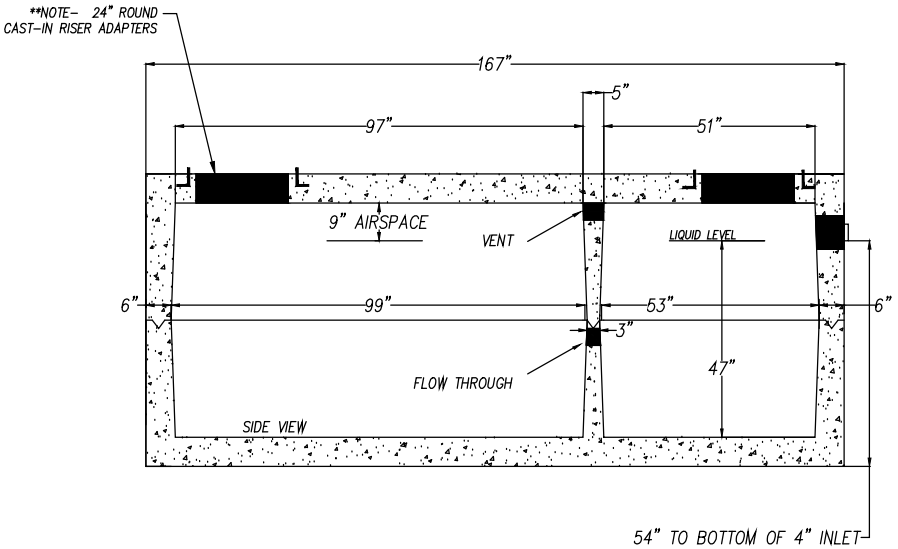


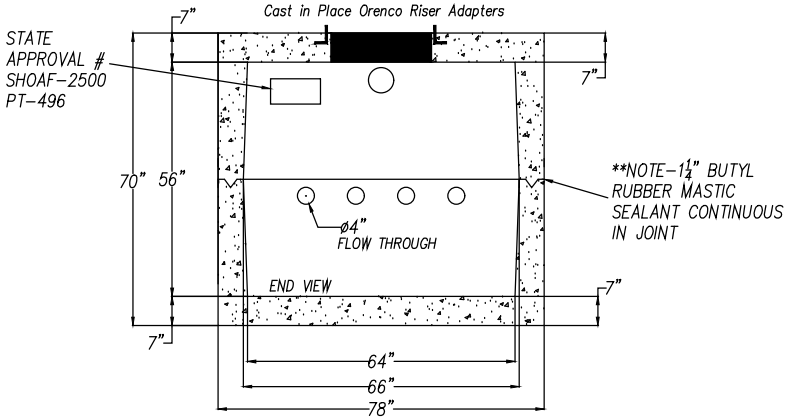
SHOAF PRECAST SEPTIC INC.	
4130 WEST US HWY 64	
LEXINGTON, NC 27295	
PHONE (336) 787–5826	
FAX (336) 787–2826	

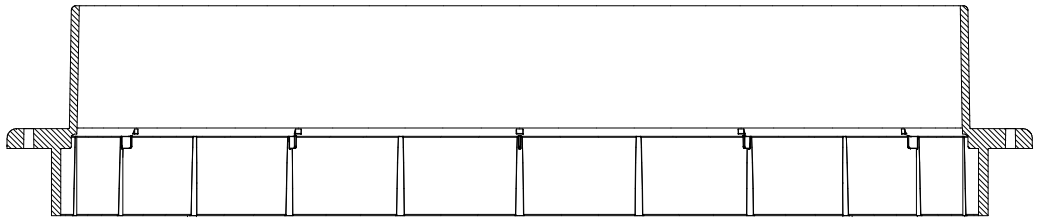
MODEL: MS 2500 H20 PT
H20 TRAFFIC RATED
2500 Gallon Pump Tank

WWW.SHOAFPRECAST.COM
SHOAF–2500 H20 TRAFFIC RATED
PT–496 H20 TRAFFIC RATED
LIQUID CAPACITY–2500 US GALLONS/AIRSPACE–9"
GALLONS PER INCH–44.64 (AVERAGE)
TANK HEIGHT–70"
BOTTOM OF TANK TO CENTER OF INLET–56"
BOTTOM OF TANK TO CENTER OF OUTLET–59"
LENGTH TO WIDTH RATIO–2 TO 1
SIZE OF INLET & OUTLET–4" OR 6" PIPE
TYPE OF INLET & OUTLET–POLYLOCK OR EQUAL (MEETS ASTM C–923)
CONCRETE PSI–5000; TANK WEIGHT– 32,000 LBS.
ACCESS– RING AND COVER W/ RISERS (NOT INCLUDED)
REINFORCING PER ENGINEERING DRAWING

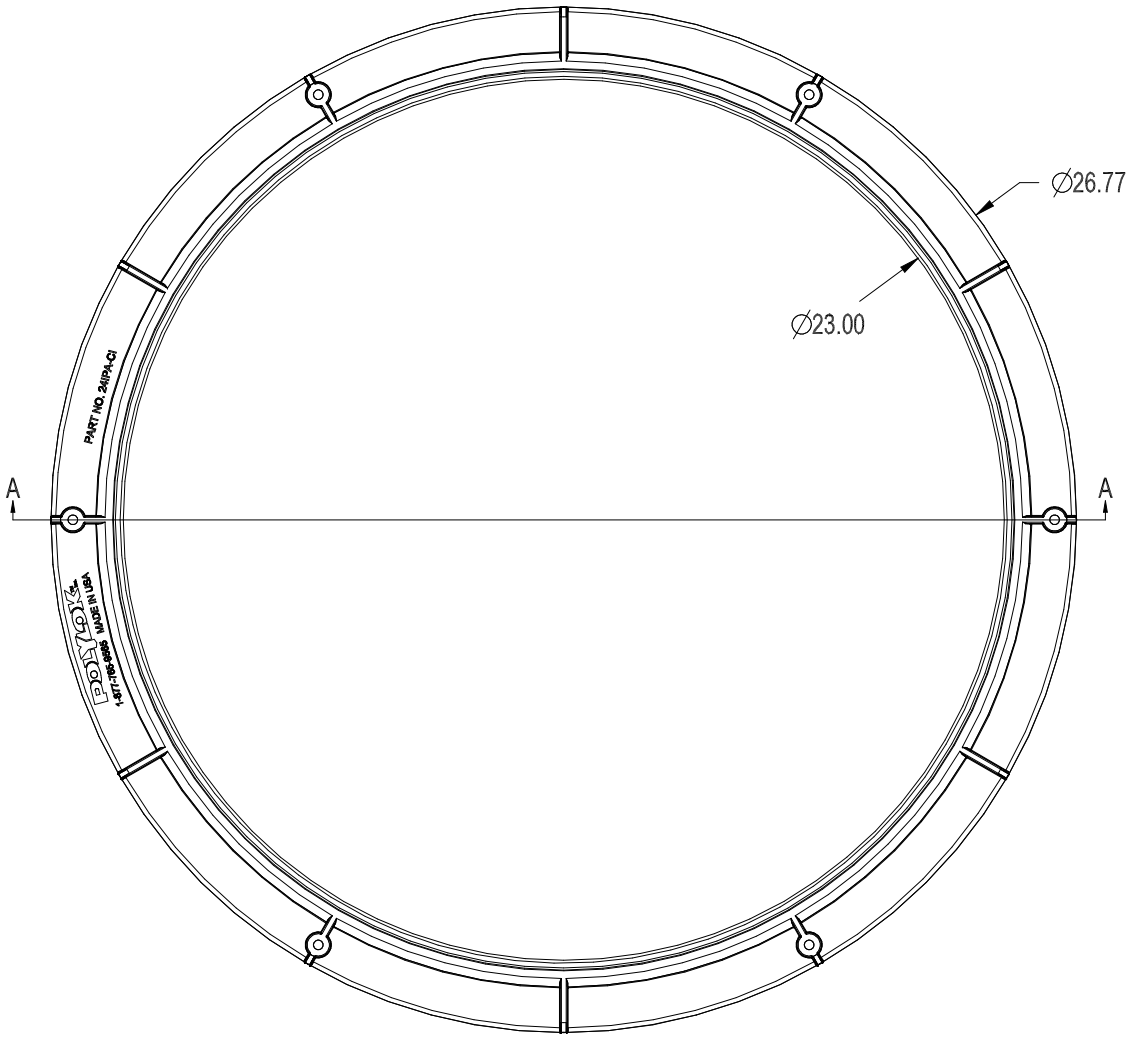
SCALE – N.T.S.

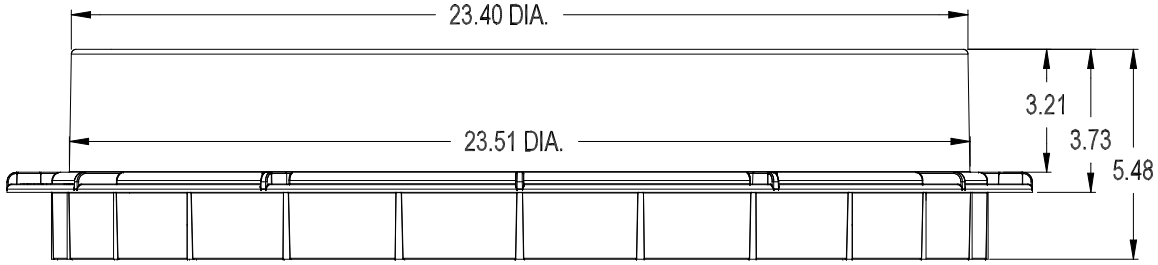


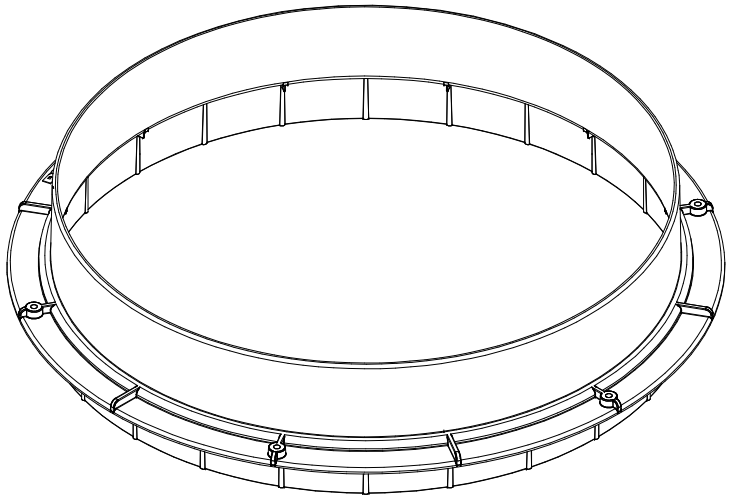


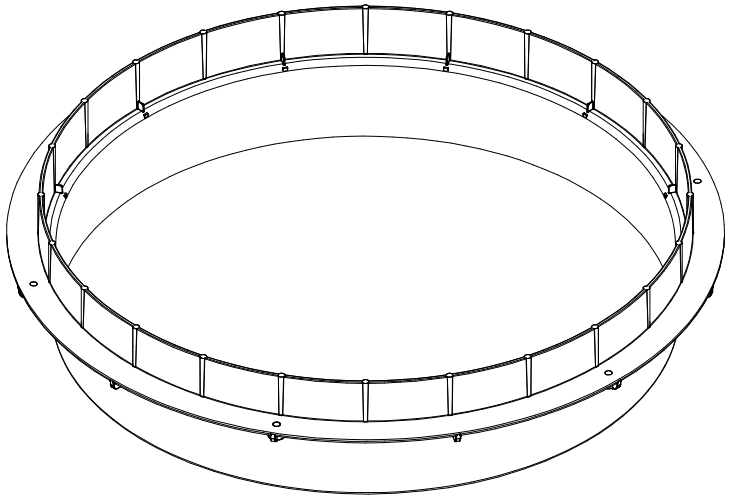


SECTION A-A









POLYLOK 24" IPEX TANK RING (CAST IN)
PART NO. PL-24IPA-CI
MATERIAL - ABS
COLOR - BLACK

Cast in place riser adapters
(Total of 6 at Treatment & Storage)
(Total of 2 at Pump and Haul Tank)

Technical Data Sheet

Access Risers – Ultra-Rib™

Applications

Orenco's Access Risers provide access to septic tank openings and can be cast into the tops of concrete tanks, bonded in place, or bolted down using a riser tank adaptor. They can also be used as valve enclosures.

General

Orenco Ultra-Rib™ Access Risers are constructed of ribbed PVC pipe and are available in 12-, 18-, 21-, and 24-in. diameters. They can be ordered in 3-in. (76.2-mm) increments in lengths up to 13 ft (3.96 m) for 12- and 18-in. diameter risers, and up to 14 ft (4.27 m) for 21- and 24-in. diameter risers. Orenco Ultra-Rib riser pipe is also available in truckload quantities. A complete line of Orenco pipe-cutting tools makes it easy to fabricate risers in your shop or in the field

Standard Models

RR12XX, RU18XX, RR21XX, RR24XX

RR24 XX Risers:
Treatment and Storage = 6
Pump and Haul = 2

Adjust riser height to allow for minimum 6" above ground.

Product Code Diagram

R □ □ □ □ + □ + □

Discharge grommet option, in. (mm):
Blank = no discharge grommet
10 = 1 (25)
12 = 1¼ (32)
15 = 1½ (38)
20 = 2 (50)

Splice box grommet or splice box options (choose one):
Blank = no grommet or splice box
or
S = grommet installed,1-in. (25-mm), fits SB1-SB4
L = grommet installed,1¼-in. (32-mm), fits SB5-SB6
SX = hole drilled for Orenco® external splice box†
or
S1 = grommet and SB1 internal splice box installed
S2 = grommet and SB2 internal splice box installed
S3 = grommet and SB3 internal splice box installed
S4 = grommet and SB4 internal splice box installed
L5 = grommet and SB5 internal splice box installed
L6 = grommet and SB6 internal splice box installed
or
XS = grommet and simplex explosion-proof splice box installed‡
XD = grommet and duplex explosion-proof splice box installed‡
XT = grommet and triplex explosion-proof splice box installed‡

Riser height in inches (3-in. increments standard)

Riser diameter:
12 = 12-in. (300-mm)*
18 = 18-in. (450-mm)*
21 = 21-in. (525-mm)
24 = 24-in. (600-mm)

Riser type code:
R = 12-in. (300-mm), 21-in. (525-mm), and 24-in. (600-mm) diameters
U = 18-in. (450-mm) diameter
PU = bulk Ultra-Rib™ pipe, all diameters

Riser, Ultra-Rib™

* Not intended for use over pump vaults
† Requires minimum 18-in. (457-mm) riser height
‡ For Class I Division I environments

Materials of Construction

Ultra-Rib™ PVC Pipe:	PVC

Specifications

Model	RR12XX	RU18XX	RR21XX	RR24XX
I.D., in. (mm)	11.74 (298)	17.65 (448)	20.50 (521)	23.50 (597)
Wall Thickness - excluding ribs, in. (mm)	0.10 (3)	0.19 (5)	0.25 (6)	0.25 (6)
O.D. - including ribs, in. (mm)	13.13 (334)	19.44 (494)	22.63 (575)	25.63 (651)
Weight, lbs per ft (kg per m)	5 (7.4)	11 (16.4)	15 (22.3)	19 (28.3)

Orenco SYSTEMS *Instructions*

PVC Riser Installation

Installing PVC Access Risers onto Cast-In Orenco® Riser-Tank Adapters

Access risers provide access to septic tank openings, simplifying inspection and maintenance procedures. Access riser-to-tank connections must be watertight for the proper functioning of an onsite septic system or effluent sewer system. Orenco strongly recommends watertightness testing of all access riser-to-tank connections after installation.

Following are instruction sets for prepping and installing access risers, installing grommets, and selecting adhesives for riser installations. Refer to the chart below to determine which instruction set to use.

Instruction Set . . . . . Page

1. Riser Preparation 1
2. Grommet Installation 2
3. Riser Installation — PRTA24-2 Adapters 3
4. Riser Installation — RRFTA24, RRFTA30, PRTA24, PRTA30, FRTA24-RVF, and FRTA30-FRP Adapters 4
5. Riser Installation — Orenco FRP Tanks with 24-inch-Diameter (600-mm) Risers 5
6. Riser Watertightness Testing 6
7. Adhesive Selection and Quantities 7

Instruction Set 1: Riser Preparation

Step 1: Determine Riser Height

Determine how high the riser needs to be.

- The top of the riser should be about 3 inches (75 mm) above finished grade after installation and backfilling — This allows 2 inches (50 mm) for tank settling and 1 inch (25 mm) for ensuring drainage away from the riser.

Step 2: Cut Riser to Size (if Necessary)

If the riser needs to be cut to size, cut it with a circular saw or table saw.

- Always cut excess length from the bottom of the riser.
- For square, even cuts, a good fit, and a watertight joint between the riser and the adapter, use an Orenco riser-cutting saw guide.
- To install risers less than 30 inches (760 mm) wide onto 500-gallon (2000-L) Orenco FRP tanks, cut the riser so it fits into the tank and the lowest rib rests on the tank's top, as shown.

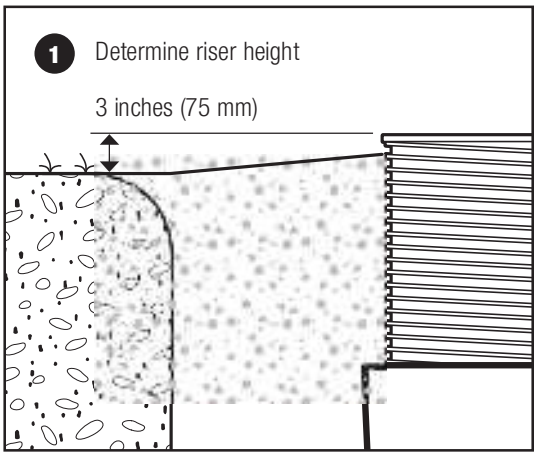
Step 3: Dry Fit Riser to Adapter

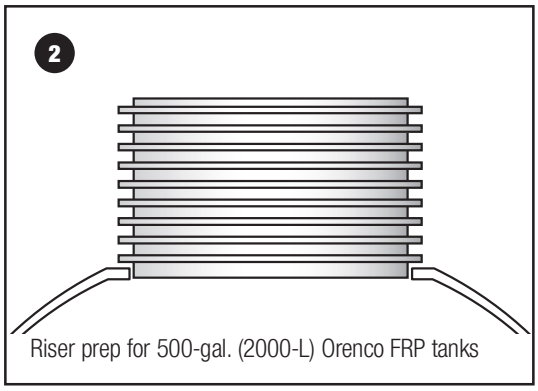
Step 3a: Dry fit the riser to the adapter.

- Make sure riser penetrations are the right sizes and in the correct locations.

Step 3b: If the riser is higher than 3 inches (75 mm) above the estimated final grade, cut it to size per the instructions in Step 2.

Step 3c: If the riser is too short, use an Orenco grade ring to extend it.





Riser prep for 500-gal. (2000-L) Orenco FRP tanks

Instruction Set 2: Grommet Installation

Step 1: Mark Access Riser

Step 1a: Use the site plans or drawings to find out if riser penetrations are needed.

Step 1b: Use the plans or drawing to mark the locations of the penetrations.

- If plans or drawings aren't available, use Drawing 1b as a general guide for locating riser penetrations.

Step 2: Drill Holes and Clean Access Riser

Step 2a: Drill holes for riser penetrations.

- If you have questions about where to locate various riser penetrations, contact your Distributor for more information.

Using Orenco® RKHS Hole Saws ...

Cut the hole and grind the ribs down to make a flat, smooth surface for installing the grommet.

- Make sure your hole saw is the correct size and your drill is at least 18 volts.
- Don't grind too deeply — about 1⁄16 inch (1.6 mm) is deep enough.

Using Standard Hole Saws ...

1: Use the correctly sized hole saw to cut a hole, centered on the mark.

2: Trim the riser ribs back 1 inch (25 mm) from around the hole.

- Use a grinder or cutting tool to notch the ribs through to the riser wall.
- Use a hammer and chisel to break off the notched rib sections.
- Use a grinder to make a flat, smooth surface around the hole.

Step 2b: Clean and deburr the hole and flat surface with a wire brush and deburring knife or tool.

- Be careful not to enlarge the penetration.

Step 3: Install Grommet

Step 3a: Apply a bead of adhesive to the groove in the grommet's outer diameter.

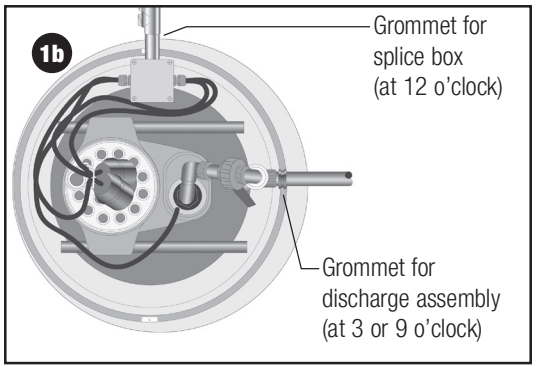
- For adhesive recommendations, see Instruction Set 7.

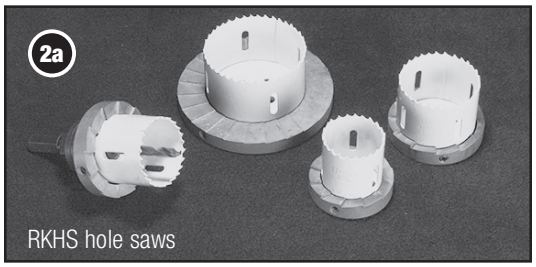
Step 3b: Firmly press the grommet into the penetration.

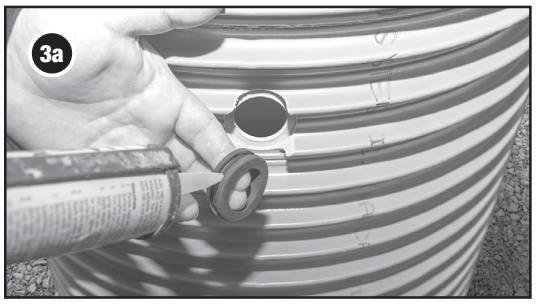
Grommet Hole Sizing Guide

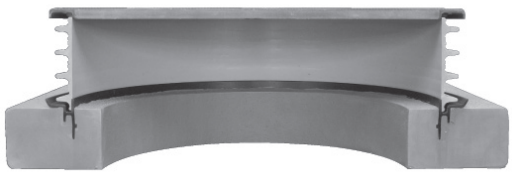
Grommet size, inches (nominal IPS pipe size)	Hole saw size
1/2	1
3/4	1-1/4
1	1-9/16
1-1/4	1-3/4
1-1/2	2-1/8
2	2-3/4
3	3-7/8
4	5

For more information on grommet dimensions and actual pipe O.D., see the Orenco Technical Data Sheet for grommets, NTD-RLA-PG-1

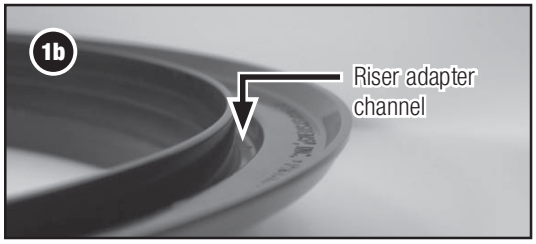








Cutaway view of Orenco® PRTA24-2, cast into concrete tank with 24-inch (600-mm) access riser attached



Instruction Set 3: Riser Installation — PRTA24-2 Adapters

Step 1: Prep Adapter Channel and Riser

Step 1a: Roughen the adapter channel and the bottom surfaces of the riser with sandpaper.

Step 1b: Use a clean cloth and acetone or alcohol to clean the channel and the bottom surfaces of the riser.

- The channel must be clean and dry for a good fit and watertight joint.
- Let the acetone or alcohol dry completely.

Step 2: Apply Adhesive

Fill the channel with methacrylate adhesive.

- For adhesive recommendations, see Instruction Set 7.

Note: *If you're using a methacrylate adhesive that's non-self-leveling, use enough to fully fill the channel, with no voids in the adhesive.*

Step 3: Install Riser

Step 3a: If the riser has penetrations, align the riser correctly.

Step 3b: Firmly press the bottom of the riser into the channel.

- Twist the riser back and forth slightly to fully seat it and to create a good bond.
- If the inside seam is not completely filled, add adhesive to form a complete fillet.

Step 3c: Use a tongue depressor, putty knife, or clean cloth to make a good fillet over the inside seam.

Note: *If cold weather conditions or frost heave are a concern at the site, contact a qualified engineer or Orenco for additional recommendations on installing ribbed PVC risers.*

IMPORTANT: *Orenco strongly recommends that all tank risers 12-in. (300-mm) and larger in diameter be equipped with riser safety grates to help prevent accidental or unauthorized entry.*

Step 4: Test Riser Watertightness

Follow Instruction Set 6 of this document for testing the riser's watertightness.

Note: *Watertight connections are critical for the wastewater system to function effectively and efficiently.*

Instruction Set 4: Riser Installation — RRFTA24, RRFTA30, PRTA24, PRTA30, FRTA24-RVF, and FRTA30-FRP Adapters

Step 1: Prep Adapter and Riser

Step 1a: Roughen the bonding surfaces of the adapter and riser with sandpaper.

Step 1b: Use a clean cloth and acetone or alcohol to clean the bonding surfaces of the adapter and the riser.

- The bonding surfaces must be clean and dry for a good fit and watertight joint.
- Let the acetone or alcohol dry completely.

Step 2: Apply Methacrylate Adhesive

Apply a bead of methacrylate adhesive to the outside of the adapter.

- For adhesive recommendations, see Instruction Set 7.

Step 3: Install Riser

Step 3a: If the riser has penetrations, align the riser correctly.

Step 3b: Firmly press the riser onto the adapter until the bottom of the riser is resting on the concrete (cast-in adapters) or the adapter flange (bolted-down adapters).

- Twist the riser back and forth slightly to fully seat it and to create a good bond.

Step 3c: Apply a bead of methacrylate adhesive to the inside of the access riser-adapter joint.

Step 3d: Use a putty knife, tongue depressor, or clean shop rag to make a continuous fillet on the inside of the access riser-adapter joint.

Note: *If cold weather conditions or frost heave are a concern at the site, contact a qualified engineer or Orenco for additional recommendations on installing ribbed PVC risers.*

IMPORTANT: *Orenco strongly recommends that all tank risers 12-in. (300-mm) and larger in diameter be equipped with riser safety grates to help prevent accidental or unauthorized entry.*

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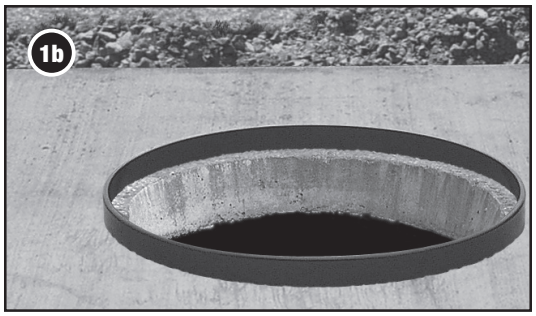
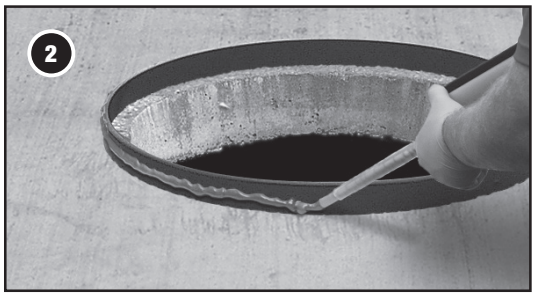
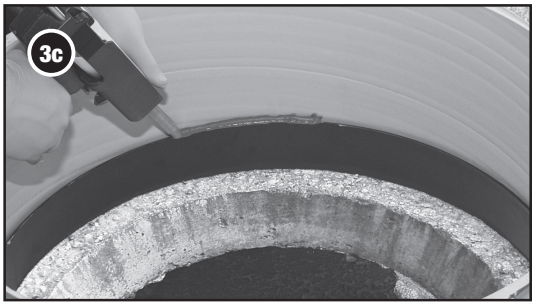
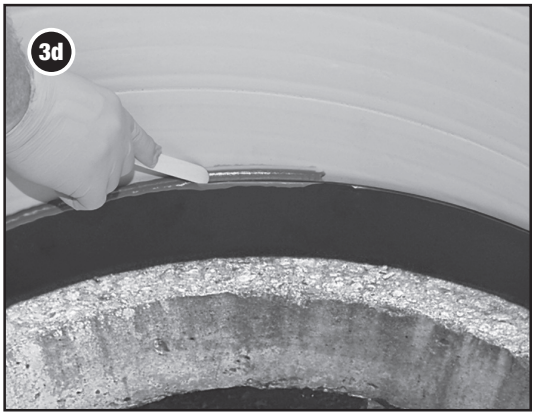
Note: *Watertight connections are critical for the wastewater system to function effectively and efficiently.*









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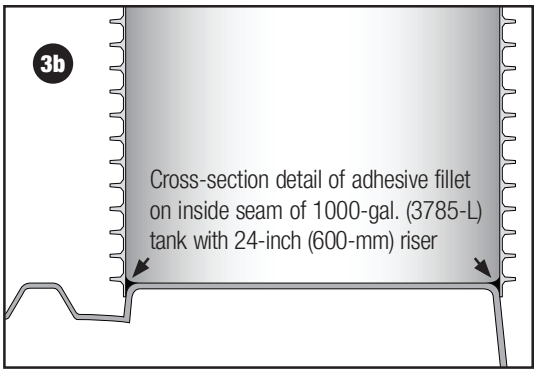
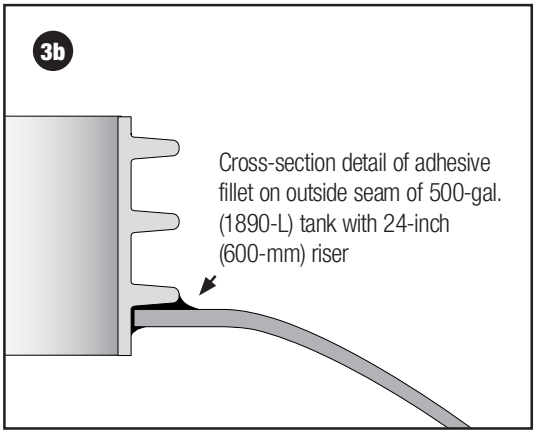




Instruction Set 5: Riser Installation — Orenco FRP Tanks with 24-inch-Diameter (600-mm) Risers

Step 1: Prep Tank and Riser

Step 1a: Roughen the bonding surfaces of the tank and the riser with sandpaper.

Step 1b: Use a clean cloth and acetone or alcohol to clean the roughened tank surface and the bottom surfaces of the riser.

- The surfaces must be clean and dry for a good fit and watertight joint.
- Let the acetone or alcohol dry completely.

Step 2: Apply Methacrylate Adhesive

Apply methacrylate adhesive to the bonding surfaces of the tank and the riser.

- For adhesive recommendations, see Instruction Set 7.

Step 3: Install Riser

Step 3a: If the riser has penetrations, align the riser correctly.

Step 3b: Press the riser into position

- For 1000-gal. through 2000-gal. tanks (3785-L through 7570-L), firmly press the riser onto the tank opening
- For 500-gal. (1890-L) tanks, firmly press the riser into the tank opening.
- Twist the riser back and forth slightly to fully seat it and create a good bond.
- If the seams aren't completely filled, add adhesive to form a complete fillet.

Step 3c: Use a tongue depressor, putty knife, or clean cloth to make a good fillet over the seams.

Note: *If cold weather conditions or frost heave are a concern at the site, contact a qualified engineer or Orenco for additional recommendations on installing ribbed PVC risers.*

IMPORTANT: *Orenco strongly recommends that all tank risers 12-in. (300-mm) and larger in diameter be equipped with riser safety grates to help prevent accidental or unauthorized entry.*

Step 4: Test Riser Watertightness

Follow Instruction Set 6 of this document for testing the riser's watertightness.

Note: *Watertight connections are critical for the wastewater system to function effectively and efficiently.*

Instruction Set 6: Riser Watertightness Testing

IMPORTANT: *A watertight tank and watertight riser-to-tank connections are critical for the wastewater system to function effectively and efficiently.*

Step 1: Prep for Test

Step 1a: Make sure the adhesive seams have set and the tank has been backfilled according to the manufacturer's instructions – typically to the tank's midpoint.

Step 1b: Plug the inlet (and outlet, if present) of the tank with watertight plugs.

Step 1c: Fill the tank with water to a level 2 inches (51 mm) into the riser.

Step 2: Test Watertightness

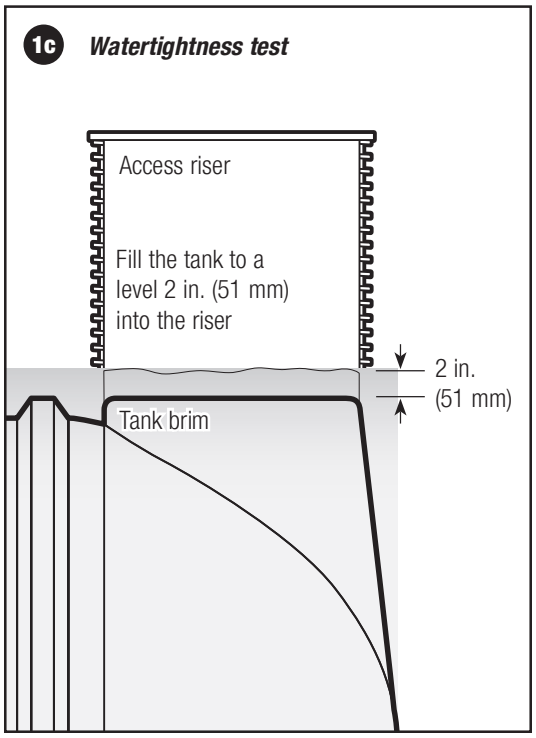
Step 2a: Wait for the required time before inspecting the riser-to-tank connections for leakage.

- Follow the tank manufacturer's recommendations (or applicable local regulations) for wait times before inspecting the tank for leaks.
- Orenco recommends at least 30 minutes for its fiberglass tanks.

Step 2b: Check for any drop in the liquid level inside of the riser and any visible leakage from the riser-to-tank connections.

- At the end of the test, there should be no drop in liquid level and no visible leakage from seams, pinholes, or other imperfections.
- If leaks are found during the test, seal the leaks and repeat the test.

Step 2c: Once the riser-to-tank connections are proven watertight, remove the plug(s) and drop the water level in the tank to just below the invert of the inlet or outlet, whichever is lower.



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Instruction Set 7: Adhesive Selection and Quantities

Use the table below to select the correct adhesive and quantity for your grommet or riser installation(s). Be sure to check the expiration date on the adhesive package. If the adhesive is expired, do not use it to install Orenco components.

Note: *Before installing a riser on an Orenco riser-tank adapter with an adhesive not recommended in the table below, contact your Distributor or Orenco.*

Component		**Adhesive Type and Approximate Usage**				
		MA8120 300/300-mL cartridge (600-mL total)	**SA510** 300/300-mL cartridge (600-mL total)	**MA320** 7-oz (200-mL) packet	**IPS 810** 1-pint (473-mL) 1-quart (946-mL)	**ADH100** 10.2-oz (300-mL) tube
Grommets		n/a	n/a	n/a	n/a	various quantities
Riser Tank Adapters	FRTA36	1 cartridge*	1 cartridge*	n/a	n/a	n/a
	PRTA24	½ cartridge*	½ cartridge*	1 packet	n/a	1 tube
	PRTA24-2	≥ ½ cartridge*	≥ ½ cartridge*	n/a	< 1 pint	n/a
	PRTA30	< 1 cartridge*	< 1 cartridge*	2 packets	n/a	2 tubes
	RRFTA24	½ cartridge*	½ cartridge*	1 packet	n/a	1 tube
	RRFTA30	1 cartridge*	1 cartridge*	2 packets	n/a	n/a

* Indicates preferred adhesive for this application

Technical Data Sheet

DuraFiber™ Access Lids

Applications

Orenco® DuraFiber™ Access Lids provide a secure, damage-resistant covering for ribbed PVC and HDPE risers, pump basins, and access ports. They are not recommended for vehicular traffic. 24-inch (600-mm) DuraFiber lids require an RLA24 adapter to mate to 24-inch (600-mm) Perma-Loc™ pipe. 30-inch (750-mm) DuraFiber lids are not compatible with 30-inch (750-mm) RLA Riser-Lid-Adapters or 30-inch (750-mm) Perma-Loc pipe. For these products, use Orenco's FLF-Series lids.

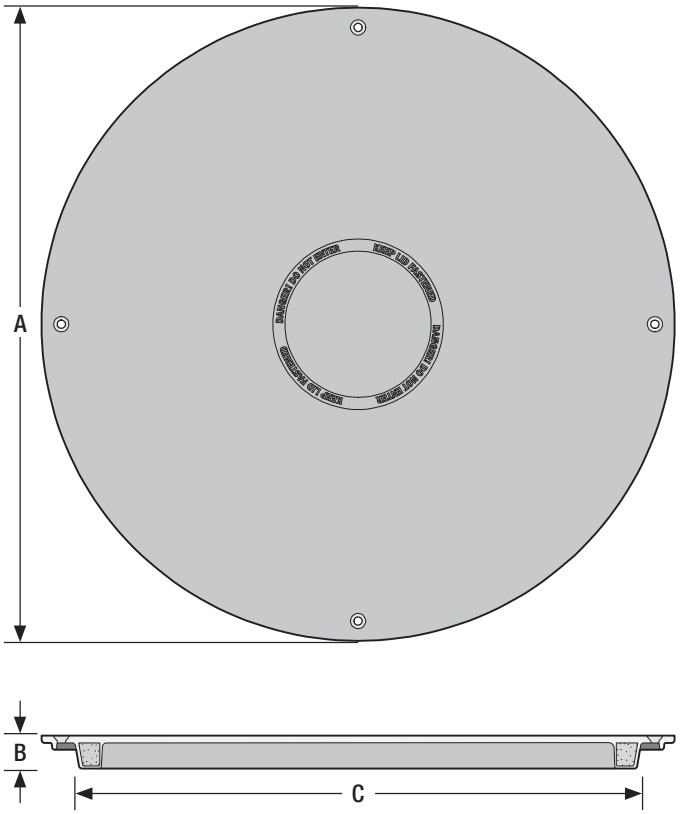
General

DuraFiber Access Lids are constructed of resin-infused fiberglass fabrics for extreme durability and damage resistance, with breaking strengths in excess of 20,000 pounds (9,000 kg).

They feature flat-style flanges for easier access, allowing clean, flush-to-grade installations. They have cored centering rings for aligning lids with risers. They also have urethane gaskets to help provide watertight seals.

DuraFiber Lids feature a non-skid surface for better grip and aesthetics, a molded-in caution statement, and room for a customer logo. They come with four 5⁄16-inch stainless steel flathead socket cap screws and a hex key wrench.

Durafiber Lids are available with optional insulation, installed at the factory or in kits that can be installed in the field.



Standard Models

FLD24G, FLD24GATX, FLD24GW, FLD30G, FLD30GATX, FLD30GW

Product Code Diagram

Riser Lids - FLD 24G
Treatment and Storage = 6
Pump and Haul = 2

FLD ☐ ☐ ☐ ☐ ☐

- Color and logo options:
  Blank = green color lid
  B = brown color lid
  C = custom logo
  ATX = AdvanTex® logo
  W = warning label
- Insulation:*
  Blank = no insulation
  I2 = 2-inch (50-mm) insulation installed
  I4 = 4-inch (100-mm) insulation installed
- Vent and filter options:
  Blank = no vent or filter options
  V = vent
  CF = carbon filter
- Gasket options:
  G = gasket (standard)
  Blank = no gasket
- Lid diameter, in. (mm):
  24 = 24 (600)
  30 = 30 (750)
- DuraFiber™ fiberglass lid

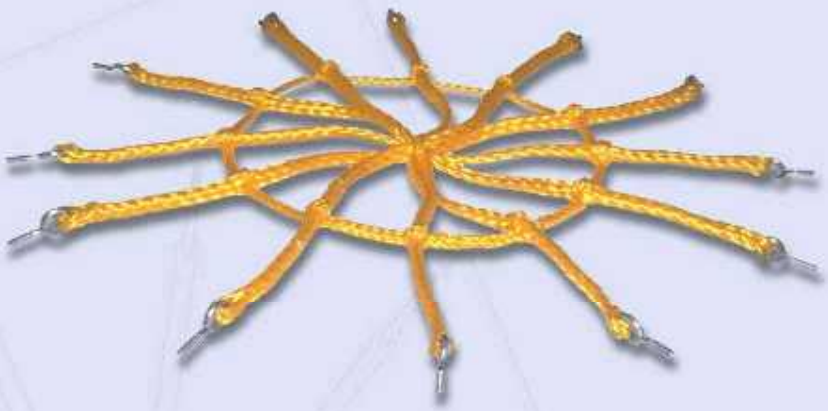
* Insulation has an R-value of 10 per 2-inch (50-mm) increment.

Materials of Construction:

Lid	Fiberglass reinforced polyester
Gasket	Urethane
Centering ring core	Structural foam
Mounting hardware	Stainless steel
Insulation (optional)	Closed-cell foam
Insulation mounting hardware	Stainless steel

Specifications

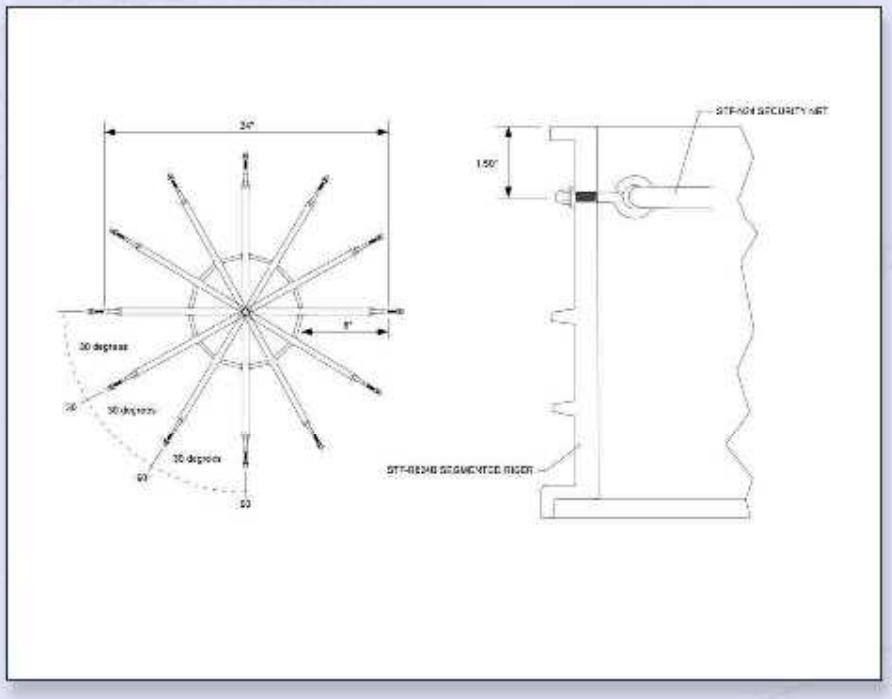
Model	FLD24XX	FLD30XX
A in. (mm)	26 (660)	33 (838)
B, in. (mm)	1½ (38)	1½ (38)
C, in. (mm)	23¼ (590)	29¼ (743)
Gasket width, in. (mm)	¾ (19)	¾ (19)
Bolt hole diameter, in. (mm)	5⁄16 (8)	5⁄16 (8)
Weight, lbs (kg)	11 (5)	20 (9)
Bolt holes, per lid	4	4



FEATURES

- Use as a security measure to keep persons, especially children, from accidental entry while systems are being serviced or any other instance where a cover is removed
- Available to fit 18", 24", and 30" diameter risers
- Open areas in web are large enough to allow tanks to be pumped without having to remove the security net
- Installs easily in our segmented riser and others

Install safety net in all risers not containing an inner lid.



Order part No. STF-N18
STF-N24
STF-N30

CAD detail drawing available in DXF format

U.S. Patent Pending

RELATED PRODUCTS

STF-CI24 page 5
STF-APC24G page 6
STF-APC24B page 6
STF-R824B page 9
STF-AR24 page 9
STF-APC24GI-075 page 14
STF-APC24BI-075 page 14
STF-APC24GI-100 page 14
STF-APC24BI-100 page 14
STF-APL24G page 14
STF-APL24B page 14

Technical Data Sheet

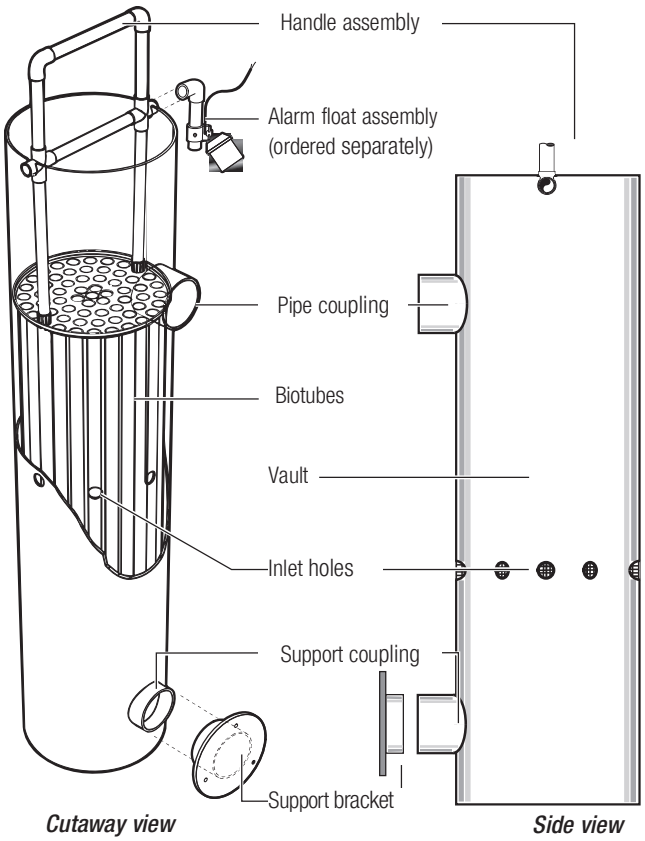
8-in. to 15-in. Dia. Biotube Effluent Filters

Applications

Orenco® 8-inch to 15-inch Biotube® Effluent Filters are designed to remove solids from effluent leaving commercial septic tanks. They can be used in new and existing tanks.

General

Orenco® 8-inch to 15-inch Biotube® Effluent Filters* are used to improve the quality of effluent exiting a commercial septic tank. The Biotube cartridge fits snugly in the vault and is removable for maintenance, the handle assembly snaps into the notches in the top of the vault, and the tee handle can be extended for easy removal of the cartridge. A "base inlet" model (see p. 2) is available for low-profile tanks. An optional slide rail system, available on larger models, simplifies installation and provides tank access for servicing.



** Orenco® Biotube® Effluent Filters are covered under multiple U.S. and international patents.*

Standard Models

FT0854-36, FT1254-36, FT1554-36, FT0822-14B, FT1254-36AR

Product Code Diagrams

FT ☐ ☐ ☐ - 36 ☐ FTP 0854-36

- Float switch bracket and slide rail options:
  Blank = no options selected
  A = float switch bracket installed
  R = slide rail installed†
- Cartridge height, in. (mm):
  36 = 36 (914), standard
- Housing height*, in. (mm):
  48 = 48 (1219)
  54 = 54 (1372)
  60 = 60 (1524)
  66 = 66 (1676-mm)
- Filter diameter, in. (mm):
  08 = 08 (200)
  12 = 12 (300)
  15 = 15 (375)
- Filter mesh option:
  Blank = ⅛-in. (3-mm) filter mesh
  P = 1/16-in. (1.6-mm) filter mesh
- Biotube® effluent filter

* Minimum liquid level (MLL) information:
48-in. (1219-mm) housing for MLL of 37-46 in. (940-1168 mm)
54-in. (1372-mm) housing for MLL of 47-63 in. (1194-1600 mm)
60-in. (1524-mm) housing for MLL of 64-84 in. (1626-2134 mm)
66-in. (1676-mm) housing for MLL of 85-112 in. (2159-2845 mm)

† For 12- and 15-in. (300- and 375-mm) only; use slide rail option when only one access is available for the filter chamber

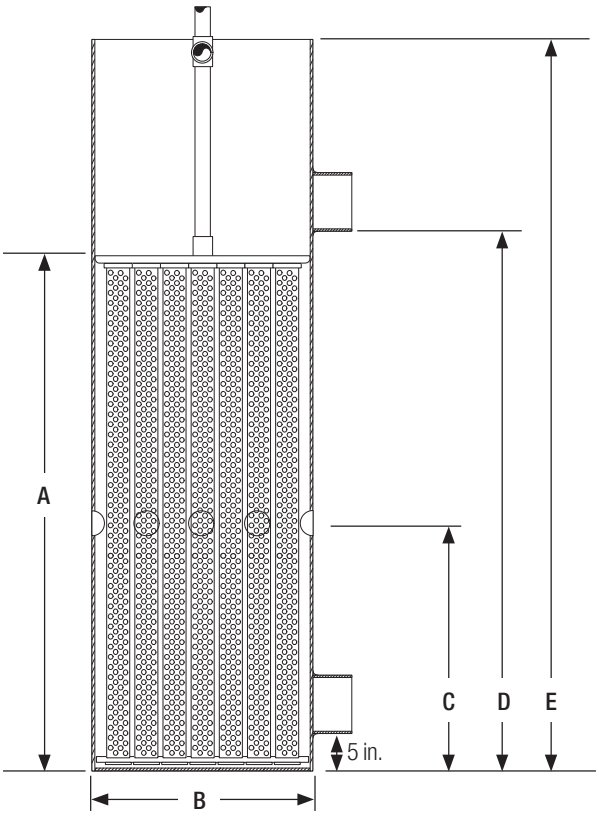
FT ☐ ☐ 22 - 14 B ☐

- Float switch bracket and overflow plate options:
  Blank = no options selected
  A = float switch elbow installed
  FSO = overflow plate installed
- Base inlet model
- Cartridge height, in. (mm):
  14 = 14 (356), standard
- Filter housing height, in. (mm):
  22 = 22 (558), standard
- Filter diameter, in. (mm):
  08 = 8 (200)
  12 = 12 (300)
- Filter mesh option:
  Blank = ⅛-in. (3-mm) filter mesh
  P = 1/16-in. (1.6-mm) filter mesh
- Biotube® effluent filter

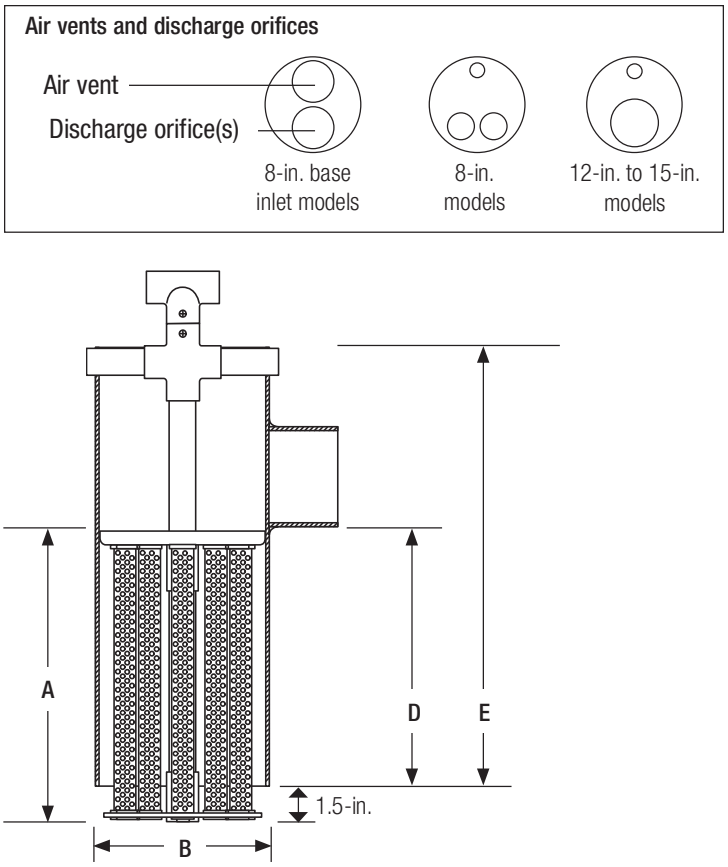
Materials of Construction

Vault	PVC
Pipe coupling	PVC
Handle components	PVC
Support coupling and bracket	PVC
Biotube® cartridge	Polypropylene and polyethylene

Note: Support coupling and support bracket are available on 12-inch and 15-inch filters only.



Standard model



Base inlet model

Specifications

Model	FT0854-36	FT0822-14B	FT1254-36	FT1254-36AR	FT1554-36
A - Cartridge height, in.	36	14	36	36	36
B - Nominal diameter, in.	8	8	12	12	15
C - Inlet hole height*, in.	22	n/a†	22	22	22
D - Vault base to invert height, in.	38	13	38	38	38
E - Vault height	54	22	54	54	54
Number of inlet holes	8	n/a	8	8	8
Inlet hole diameter, in.	1.375	n/a	1.375	1.375	1.375
Number of discharge orifices	2	1	1	1	1
Discharge orifice diameter, in.	1.125	1.750	2	2	2
Pipe coupling diameter, in.	4	4	4	4	4
Number of air vents	1	1	1	1	1
Air vent diameter, in.	0.75	1.750	0.75	0.75	0.75
Filter surface area‡, ft^2	14.6	6.0	30.0	30.0	50.5
Flow area**, ft^2	4.4	1.8	9.0	9.0	15.2

** Inlet hole height can vary depending on the configuration of the tank. Optimum hole height is 65-75% of the minimum liquid level.*

† No inlet holes required, because influent enters between the vault base and the bottom of the filter cartridge.

‡ Filter area is defined as the total surface area of all individual Biotubes® within the filter cartridge.

*** Flow area is defined as the total open area (area of the mesh openings) of all the individual Biotubes within the filter cartridge.*

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Biotube® Effluent Filters

Orenco Systems® Incorporated
1-800-348-9843

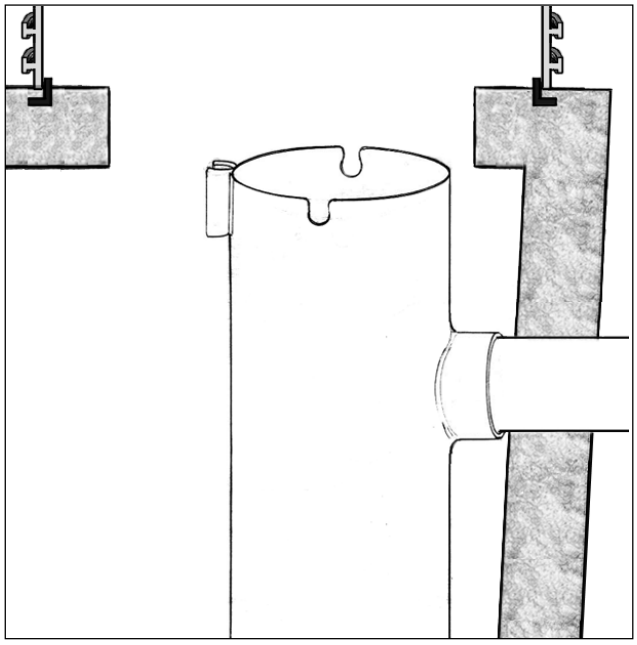
Installation, Operation and Maintenance Instructions
FT08 Models and All Base Inlet Models
U.S. Patent Nos. 5294635 / 4439323

Installation Instructions:

The Biotube Effluent Filter is suspended in the septic tank by the 4" outlet pipe. The filter is composed of a vault body that will be fixed to the discharge pipe and a removable cartridge that consists of the Biotube filter cartridge and the extendible handle.

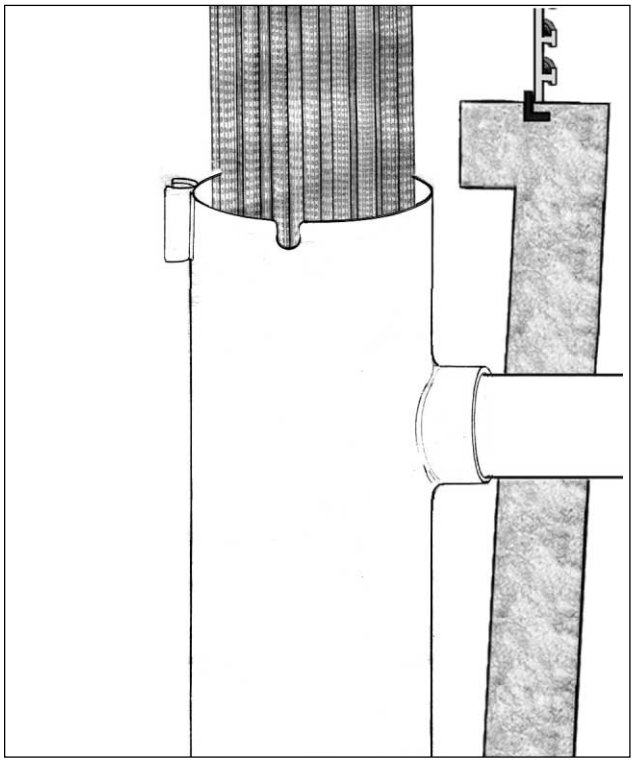
1. Test-fit the effluent filter on the 4″ outlet pipe without gluing. Make sure that it fits plumb.

   Any existing outlet tee will have to be removed.



2. Ensure sufficient clearance for trouble-free servicing of filter cartridge. Install assembly near the tank wall to reduce any stresses that may be caused by maintenance.

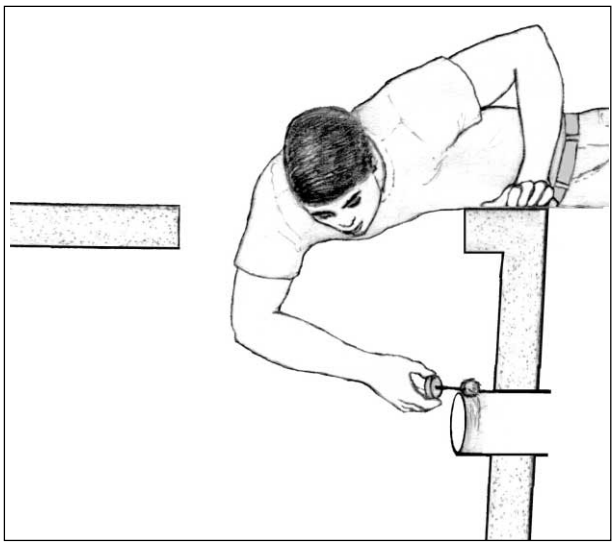
   Sufficient room between the access port and filter should be provided for easy removal of solids from the tank. The cartridge will need to be removed and cleaned while the tank's solids content is being pumped-out.



Installation Instructions (continued)

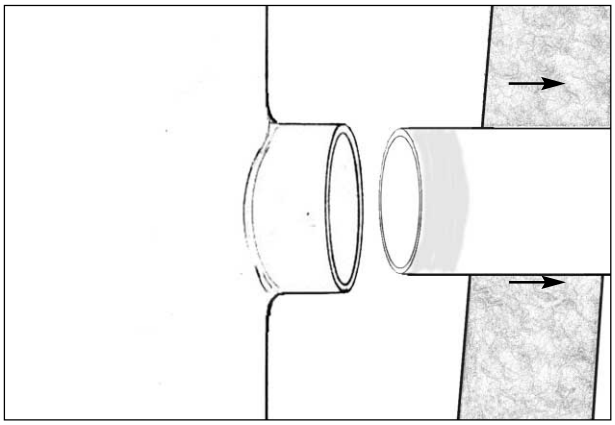
3. Once the filter has been fitted properly, apply primer and PVC cement to the outside of the outlet pipe and the filter's 4″ outlet. Use a multipurpose cement if the outlet pipe is ABS. Do not use primer on ABS.

   Optional: Stainless steel set screws may be used instead of glue.



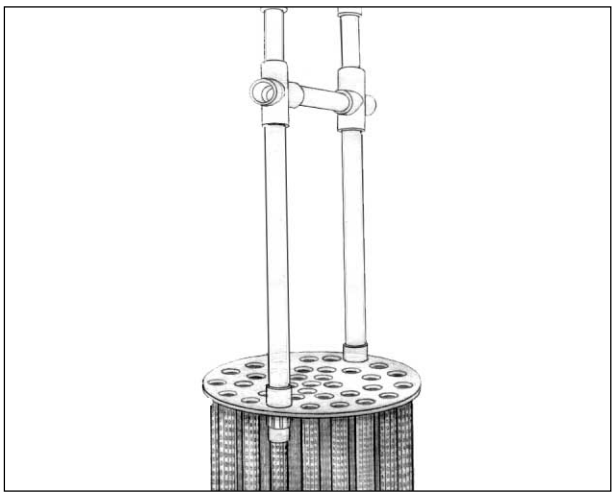
4. Slide the effluent filter onto the 4″ pipe and plumb vertically.

5. Hold the filter in position until the adhesive has time to set (approximately 20 seconds).



6. Extend the handle of the cartridge to an elevation above the top of the tank for easy access. Use 3/4″ schedule 40 PVC for extension.

   Either use the stainless steel set screws or glue the extensions in place.

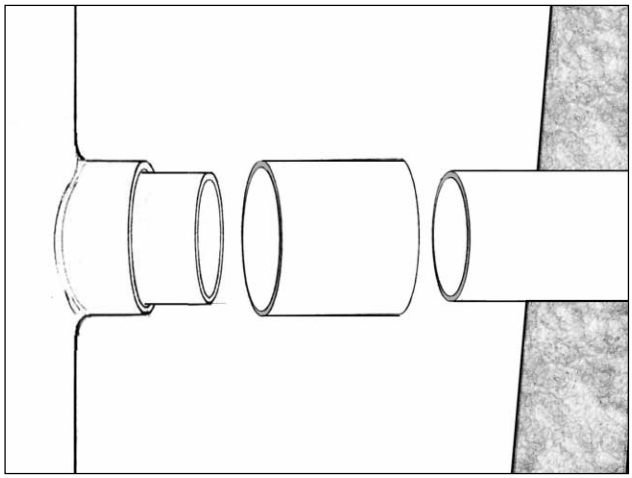


Installation Instructions (continued)

Optional

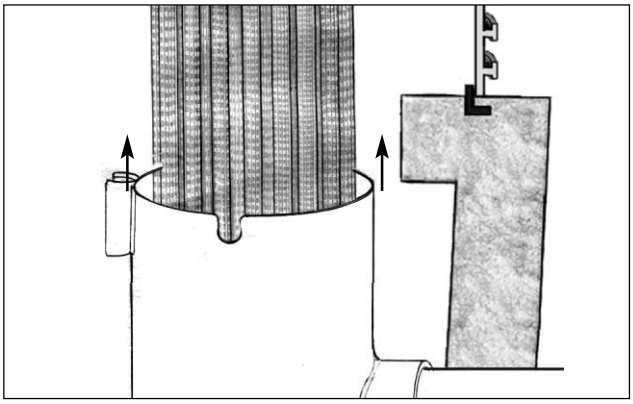
In existing tanks or in tanks with poorly located access ports, it may be necessary to extend the tank outlet fitting by using a coupling.

A coupling may also be needed to bush from 3034 PVC to the schedule 40 outlet of the filter.



Maintenance Instructions:

1. Remove the filter cartridge by lifting it out of the vault.
2. Spray the cartridge tubes with a hose to remove material sticking to them. Make sure the rinse water runs back into the tank.



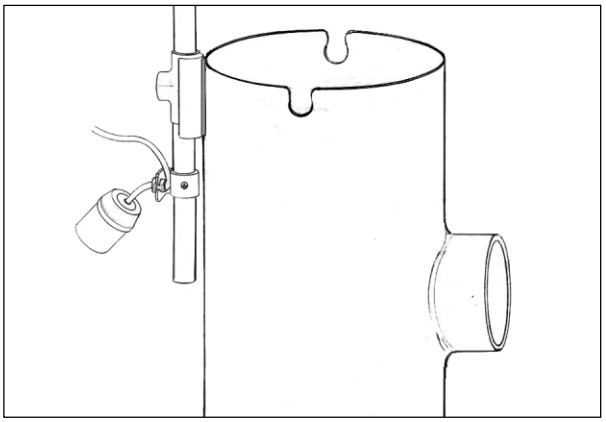
3. Inspect the vent hole and modulating orifices. Spray them clear of any debris.

   Replace the cartridge. Be sure to snap the cartridge back into the saddle holes at the top of the cartridge vault.

Maintenance Instructions (continued)

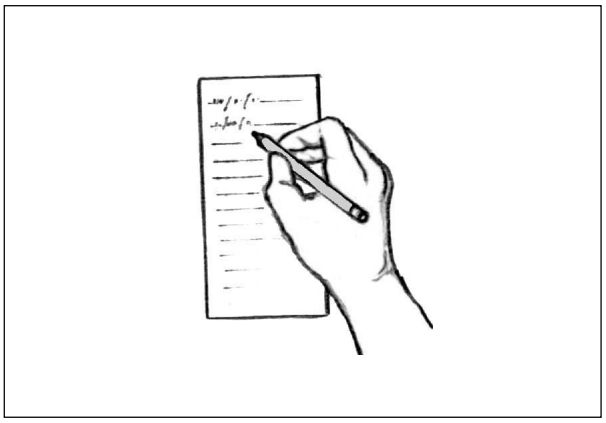
4. An alarm is optional and will give notice that the filter needs attention before the building sewer backs up.

   If you have an alarm, check to make sure it is working by lifting the float switch and sounding the alarm.



5. Record that you have cleaned the filter and, if applicable, checked the alarm. Also comment any other observations about the tank or system.

   Make sure to clean up thoroughly when finished.



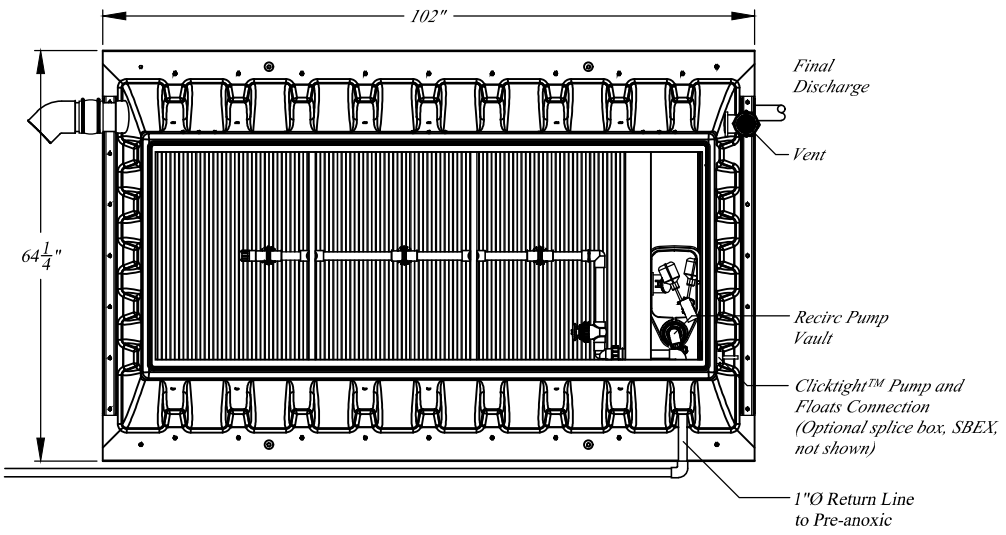
Inspection / Maintenance

Date installed:_____ Model Tank:_____ Size:_____

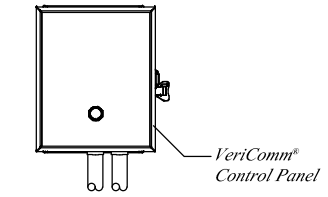
Model: _____ Single/Double Compartment:_____

Date inspected	Cleaned? yes	Cleaned? no	notes:

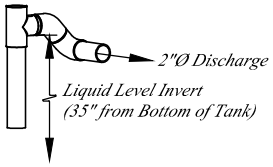
AX25RT Treatment System - Gravity Discharge



AX25 Recirc. Tank - Top View

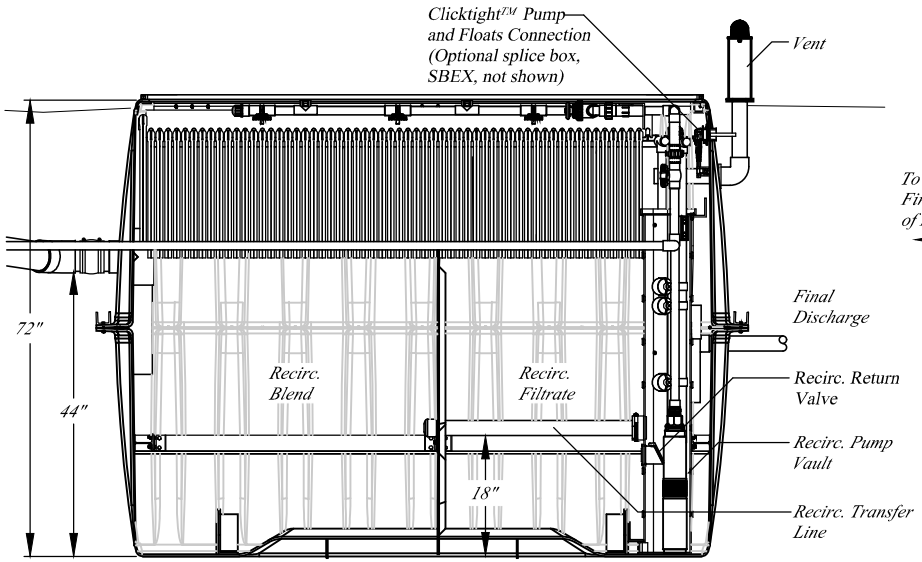


Control Panel Detail
Not To Scale

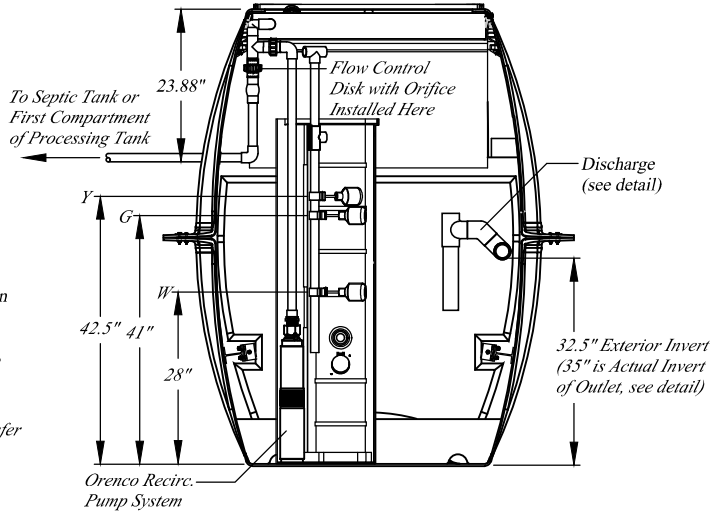


Discharge Detail
Not To Scale

Float Functions	
Y	High Level Alarm
G	Override Timer ON/OFF
W	LLA/RO



AX25 Recirc. Tank - Side View



Discharge Chamber - End View

Technical Data Sheet

AdvanTex® AX-RT Treatment Systems

Applications

Orenco's AdvanTex AX-RT Treatment System is a single, complete, self-contained module that treats septic tank effluent to better than secondary standards with nitrogen reduction before discharging it by means of pump or gravity. It is ideal for new home construction, and it is also well suited for:

- Repairs and retrofits
- Small sites and poor soils
- Sites that require shallow bury

AX20RT product image is for illustrative purposes only.

General

Following a septic tank equipped with a Biotube® effluent filter,* the AdvanTex AX-RT unit eliminates the need for separate recirc, treatment, and discharge tanks by performing all functions within a single module. It also reduces the number of risers and lids needed in the treatment train. For sites requiring antibuoyancy measures, Orenco offers antifloatation kits.

The heart of the system is the AdvanTex Recirculating Treatment Tank, a sturdy, watertight, corrosion-proof dicyclopentadiene (DCPD) tank that includes the same dependable, textile treatment media found in all AdvanTex products.

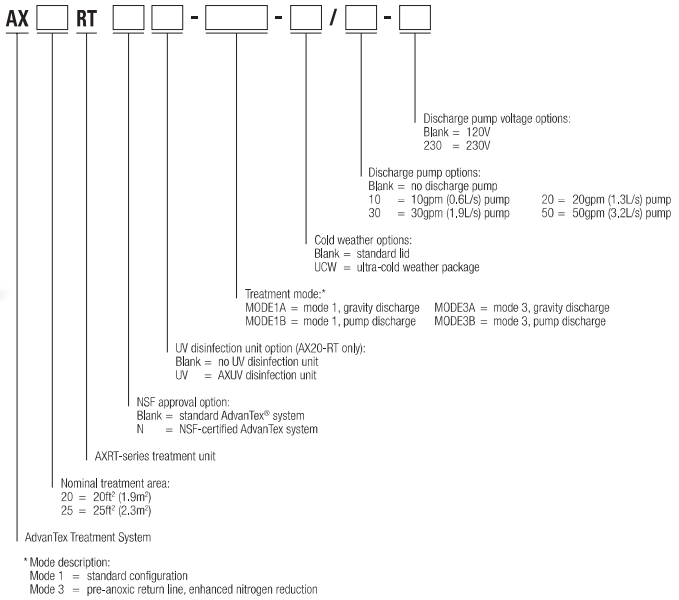
** Not to be sold individually in the state of Georgia.*

Standard Models

AX20RT-MODE1A, AX20RT-MODE1B/10, AX20RT-MODE1B/30
AX25RT-MODE1A, AX25RT-MODE1B/10, AX25RT-MODE1B/30

Product Code Diagram

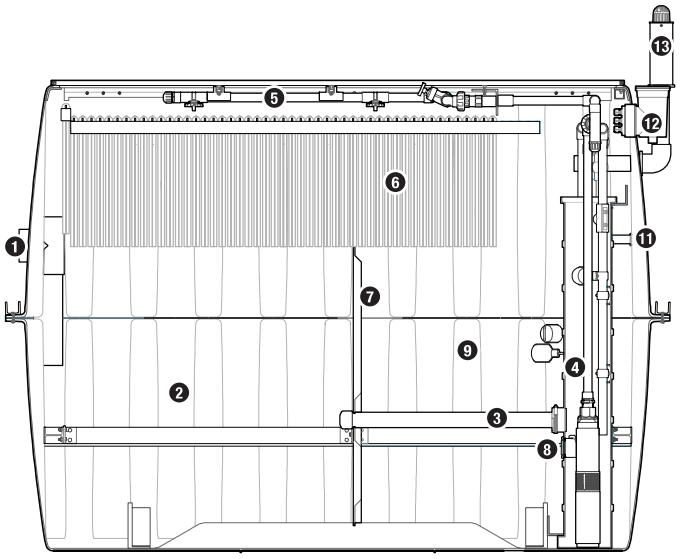
AX25RT-MODE 3A



AdvanTex Treatment System AX-RTN Models meet the requirements of NSF/ANSI Standard 40 for Class I Systems.

Components

1. Inlet
2. Recirc/blend chamber
3. Recirc transfer line
4. Recirc pumping system
5. Manifold and spin nozzles
6. Treatment media
7. Tank baffle
8. Recirc return valve
9. Recirc/filtrate chamber
10. Discharge pumping system (pump discharge only)
11. Outlet (pump discharge shown)
12. Splice box
13. Passive air vent
14. Control panel (not shown)

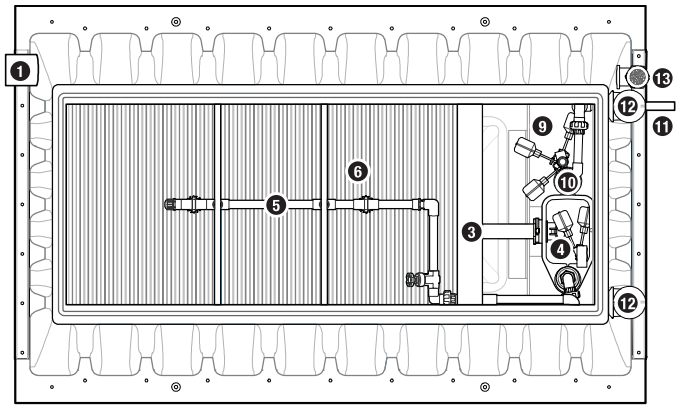


AdvanTex AX-RT side view (AX20-RT pump discharge model shown)

Specifications

Nominal Dimensions†		
Length, in (mm)		102 (2591)
Width, in (mm)		62 (1575)
Height, in (mm)		72 (1829)
Overall unit footprint, ft^2 (m^2)		44 (4.09)
Visible footprint after installation, ft^2 (m^2)		20 (1.86)
Lid insulation value		R-6 (RSI-1.1)
Dry Weight	**AX20-RT**	**AX25-RT**
Gravity discharge model, lb (kg)	883 (401)	908 (412)
Pump discharge model, lb (kg)	923 (419)	948 (430)

† *Nominal values provided. See AdvanTex Treatment System drawings for exact dimensions.*



AdvanTex AX-RT top view (AX20-RT pump discharge model shown)

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Installation Manual

AdvanTex®
AX-RT Treatment Systems

Residential Applications

Orenco® SYSTEMS

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How To Use This Manual

This manual contains an Installation Overview and a set of Installation Steps.

- **Installation Overview** — This is a simple overview of the installation steps. Its purpose is to help you quickly see the suggested order of operations for installing an AX-RT unit. It is intended as a summary only — it does not provide complete instructions.
- **Installation Steps** — This provides general instructions for each installation step along with references to detailed installation documents for specific components. Many Orenco products come with installation instructions and all of these instructions are also provided in hard copy form in our Orenco Installer Binder. Contact your Dealer or Orenco for a copy of the binder, or find individual instructions online in the Orenco Document Library at www.orenco.com. There are also steps in this manual covering operations performed before and after the AX-RT unit is installed that are necessary to successfully complete the installation.

You will find *IMPORTANT information, Key Points*, and *Notes* in this manual, marked with easy-to-see visuals:

IMPORTANT — These point out potential hazards to equipment or people during and after the installation.

Key Points — These are critical for a quality installation and must be completed in order for your installation to be successful.

Notes — These cover useful information and tips that can help make your installation simpler or easier. They may also provide information on variations in components or methods.

Before You Begin

At Orenco, we work hard to make your installation as easy and "hassle-free" as possible. This manual provides basic information for installing AdvanTex AX-RT™ treatment units. It is not intended to replace installer training or requirements and instructions detailed in your engineering plans. If you discover any inconsistencies between your engineering plans and the instructions in this manual, contact your engineer or call your AdvanTex Dealer. If you are not an Authorized AdvanTex Installer, contact your local AdvanTex Dealer for training and authorization before installing this system.

The Dealer can provide technical support, training, and replacement components. To find the nearest Dealer, check the Distributor Locator page at www.orenco.com. If there is no Dealer in your area, call Orenco Systems, Inc. at (800) 348-9843 or +1 (541) 459-4449.

Before you begin this installation, read this entire manual and any reference documents you may need to be familiar with to complete the installation. Also, be sure that the instructions for these products are the most current ones available. Please note that ***you must perform the installation according to the current manual or the AdvanTex® Treatment Systems Limited Warranty will be void.*** You can make sure your instructions are current by checking our online Document Library at www.orenco.com. You'll save time and money on installation day, and you'll get fewer call-backs.

Key Point: Inspect your order for completeness and inspect each component for shipping damage. Check to be sure instructions and items supplied comply with your state and local regulations. Carefully read and follow all instructions. Improper installation may void warranties.

IMPORTANT: *The backwash discharge from a salt-type water softener MUST NOT be plumbed into an AX-RT Treatment Unit or the preceding septic tank. Failure to follow this instruction, or any other in this manual, will void the system's warranty. Contact your AdvanTex Dealer if you have any questions about any household plumbing arrangements that may interfere with the functioning of the system.*

Note: *All pipe diameters provided are U.S. nominal PVC pipe sizes. If you are using metric pipe, you may need adapters to connect to the U.S. fittings supplied with AdvanTex Treatment Systems.*

Septic Tanks Used in AX-RT Treatment Systems

Be sure that any septic tank used in an AX-RT Treatment System meets the following conditions:

- The tank must conform to an approved and authorized tank design for AdvanTex Systems, and it must meet all applicable regulatory requirements (no pour-in-place tanks, no homemade tanks, etc.). Call your local Dealer for specifics.
- The tank must be structurally sound.
- The tank must have at least 1000 gal. (3800 L) capacity for an AX20-RT, 1250 gal. (4730 L) for a 5-bedroom AX25-RT, and 1500 gal. (5680 L) for a 6-bedroom AX25-RT at the normal operating level (below the invert of the outlet).
- The tank must have an at-grade access with a watertight, securable and removable lid. If it doesn't, an at-grade access must be installed onto the septic tank and be made watertight.
- The tank must be watertight and free of leaks.
- An Orenco effluent filter (model FTS0444-36V, FTW0444-36V, or FT0822-14B) must be installed in the septic tank.

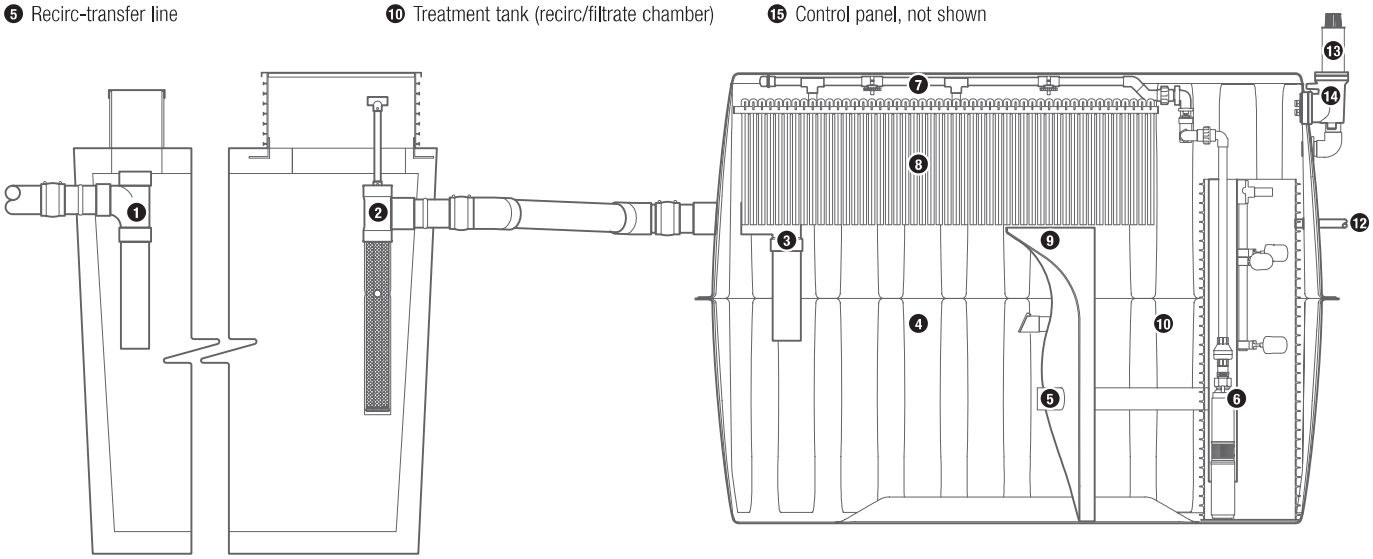
Key Point: For existing septic tanks — the tank's depth of burial must allow for a minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet. If sufficient fall cannot be met, a grade ring extension must be installed on the AX-RT or a pumping system will need to be installed in the septic tank to move the filtered effluent to the AX-RT unit. (Contact your Dealer for assistance.)

All product and performance assertions are based on proper design, installation, operation, and maintenance according to Orenco's current published documentation.

Standard Unit Components And Functions

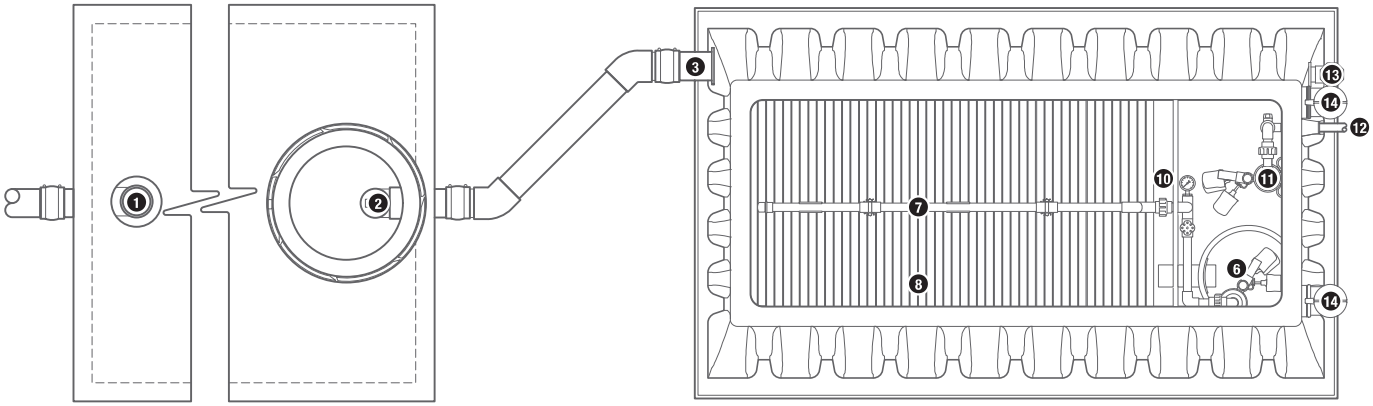
Standard Components (AX20RT-MODE1B shown):

1. Septic tank inlet tee
2. Biotube® effluent filter
3. AX-RT inlet and tee
4. Treatment tank (recirc/blend chamber)
5. Recirc-transfer line
6. Recirc-pump system
7. Manifold and spin nozzles
8. Textile media
9. Tank baffle
10. Treatment tank (recirc/filtrate chamber)
11. Discharge pumping system
12. AX-RT outlet
13. Passive air vent
14. Splice box
15. Control panel, not shown



Side view, septic tank

Side view, AX-RT unit



Top view, septic tank

Top view, AX-RT unit

Raw sewage enters the septic tank through its inlet tee. In the septic tank, the raw sewage separates into a scum layer, a sludge layer, and a clear zone. Effluent from the clear zone passes through a Biotube® Effluent Filter and is discharged to the recirc/blend chamber of the AX-RT unit. The effluent flows through the recirc transfer line to the recirc pumping system, which pumps filtered effluent to the distribution manifold in the top of the unit. Effluent percolates down through the textile media and is divided — by means of a tank baffle — between the recirc/blend chamber and the recirc/filtrate chamber inside of the unit.

The recirc pumping system's operation is controlled by a timer in the control panel. It allows the pump to dose the textile media for short periods (usually 40-60 seconds), typically 72 times a day. These frequent "micro-doses," which optimize the treatment process, occur throughout the day to maintain the proper biological environment.

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Installation Overview

Step 1: Review the site plan. If there is no site plan, draw up a plan including locations and distances.

Step 2: Perform the excavations for the AX-RT unit and (if needed) the septic tank.

Step 3: If the septic tank has not been set, set it according to the manufacturer's instructions.

Step 4: Set the AX-RT unit.

Step 5: Install antibuoyancy deadmen on the AX-RT unit (if needed).

Step 6: Partially backfill the AX-RT unit and (if needed) the septic tank.

Step 7: If the tank adapters and risers have not been installed on the septic tank, install them according to the manufacturer's instructions.

Step 8: If no watertightness test has been performed on the tank and the tank-to-riser connections, perform a watertightness test.

Key Point: The tank and tank-to-riser connections must pass this test before the AX-RT is connected to the tank.

Step 9: Perform a watertightness test of the AX-RT unit's midseam.

Step 10: If the effluent filter has not been installed in the septic tank, install it according to the manufacturer's instructions.

Step 11: Connect the transport line(s) from the septic tank outlet to the AX-RT unit.

Step 12: Connect the passive air vent to the AX-RT unit.

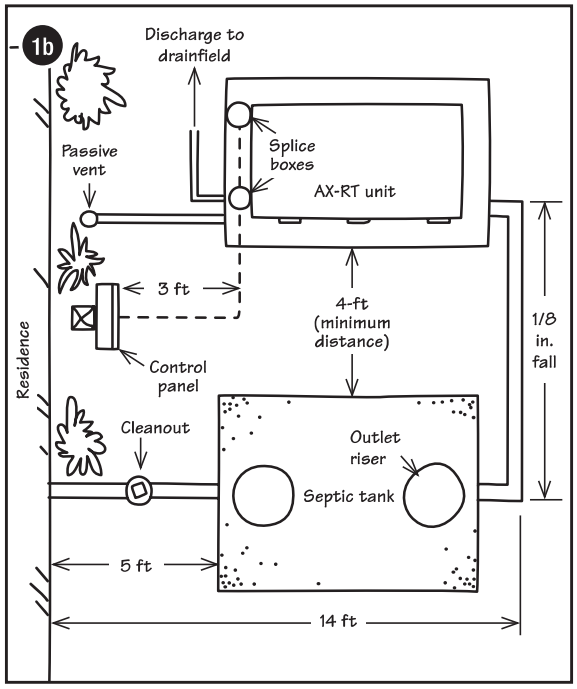
Step 13: Connect the discharge line to the AX-RT outlet.

Step 14: Install and test the control panel and wiring for the AX-RT unit.

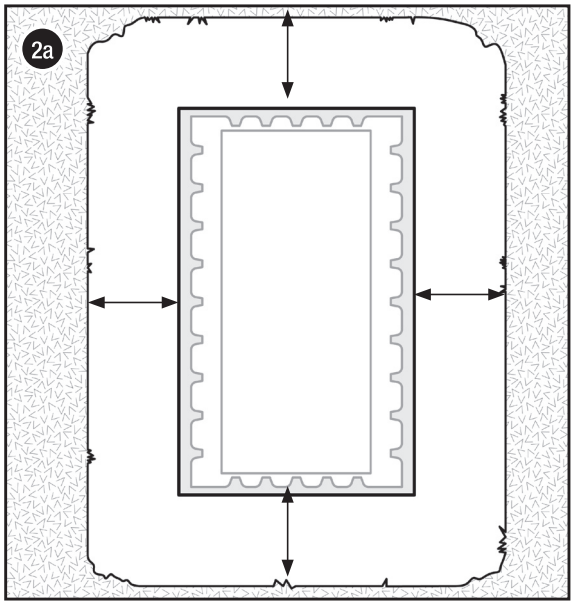
Step 15: Perform an operational test of the AX-RT float switches and pump(s).

Step 16: Complete the backfilling of the AX-RT unit and (if needed) the septic tank.

Installation Steps



This is a sample sketch of an AX-RT unit installed parallel to the septic tank, with no antibuoyancy measures installed. Distances and estimated fall from the septic tank's invert of the outlet to the AX-RT unit's invert of the inlet are included.



AX-RT units require 18-24 inches (457-610 mm) space on all four sides when installed in their own excavation.

Step 1: Review or Sketch Site Plans

Check the site plan for the specifics of your installation.

Key Point: If you're installing the AX-RT unit more than 20 ft (6 m) from the septic tank, contact your Dealer for assistance.

Step 1a: Detailed Site Plan Provided

Make sure that the plan accurately reflects conditions at the site. If it doesn't, contact the Designer before scheduling the installation.

Step 1b: Plan Of Limited Detail Or No Site Plan Provided

If you are installing the AX-RT unit with a plan of limited detail or with no plan, contact your local Dealer for assistance and then sketch a site plan that is consistent with the Designer's specifications:

Key Points:

- Sketch the exact positions of the system components, pipes, electrical conduits, etc. Account for current and likely future landscape features in the sketch. (See *Panel Installation*, EIN-CP-GEN-1, for recommendations for installing control panels.)
- A minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) is required from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.
- The invert of the inlet on the AX-RT is 46 in. (1168 mm) up from the base of the unit. The outlet is 24 in. (610 mm) down from the top of the unit for pump dispersal or 41.5 in. (1054 mm) down for gravity dispersal.
- The bottom of the AX-RT lid must sit 2 inches (50 mm) above finished grade when set and level. Standard unit height is 72 inches (1830 mm); grade rings increase height by 6 or 12 inches (152 or 305 mm).
- If the AX-RT unit is installed in its own excavation, the unit requires 18-24 inches (457-610 mm) of space on all four sides.
- If the AX-RT unit is installed in tandem with the septic tank, a minimum of 2 ft (610 mm) separation distance is required between the unit and tank.
- If the AX-RT unit is being installed parallel to the septic tank, offset the unit from the tank by 6 ft (1.8 m) if antibuoyancy measures are necessary or 4 ft (1.2 m) if antibuoyancy measures are not necessary.

Step 2: Perform Excavation(s)

Step 2a: Before excavating, consider the necessary elevations, offsets, and grade requirements for the AX-RT unit and (if needed) the septic tank.

Step 2b: Perform the excavation(s).

Key Points:

- Follow the manufacturer's recommendations for excavating the tank area.
- A minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) is required from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.

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Installation Steps

Step 2: Perform Excavation(s), cont.

Step 2c: Make sure the bottom of the excavation is suitable for setting the AX-RT unit and (if needed) the tank: stable, smooth, level, and free of debris, rocks, and other sharp objects.

Key Points:

- Follow the manufacturer's instructions for bedding the tank.
- If the bottom of the excavation is uneven or rocky, lay a 4-in. (100-mm) bed of sand or pea gravel and compact the material to create an even, smooth surface.

Step 2d: If the bottom of the excavation is unstable, stabilize the bottom of the excavation before continuing.

- For unstable base soil (peat, quicksand, muck, soft or highly expansive clay, etc.), you may need to over-excavate the site depth and set a firm, 6-in. (152-mm) compacted base of ≤ ½- to ≤ ¾-in. (13- to 19-mm) aggregate or pea gravel.
- For extremely unstable soil, you may need to pour a concrete layer to stabilize the bottom of the excavation.
- If you have doubt about the soil's stability, consult a local civil or structural engineer.

Make sure the excavation is stable, smooth, level, and free from debris, rocks, and sharp objects.

Step 3: Set Septic Tank (If Needed)

Set the septic tank according to the manufacturer's instructions.

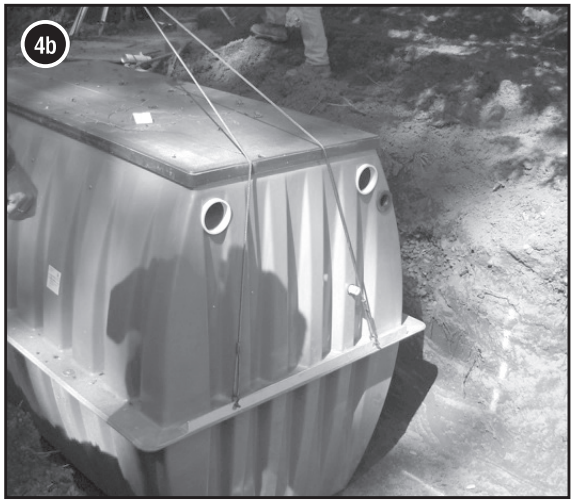
- Use Fiberglass Tank Burial instructions (NIN-TNK-1) to install Orenco's 500-gallon through 2000-gallon (2000-L through 7570-L) Fiberglass Tanks.

IMPORTANT: *Take care to keep everyone clear of the excavation when placing the tank.*

Key Points:

- The tank has to be set at the correct depth to connect to the sewage inlet.
- A minimum fall of 1/8 inch per foot (10 mm per meter or 1%) is required from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.

Installation Steps



Lower the AX-RT unit into position.

Step 4: Set AX-RT Unit

Step 4a: Attach proper lifting equipment to the lifting points on the AX-RT unit.

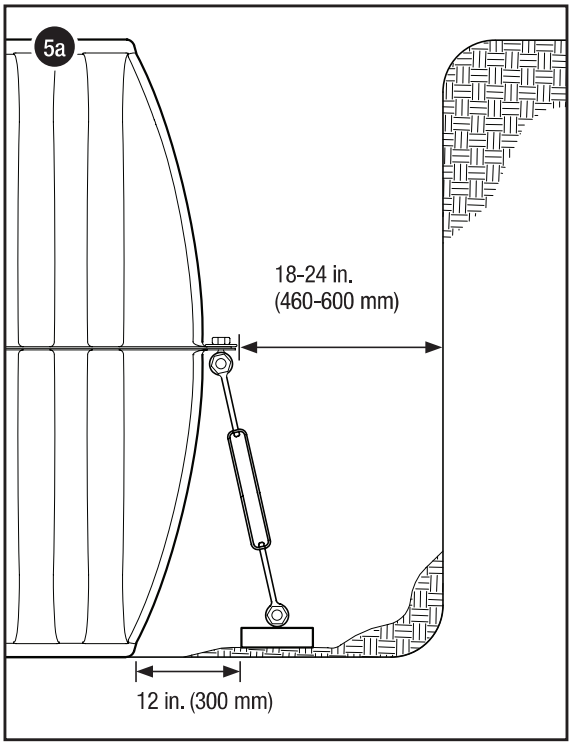
Step 4b: Carefully lift the unit and lower it into the correct position.

Step 4c: Remove the equipment when the unit is set and level in position.

IMPORTANT: *Take care to keep everyone clear of the excavation when placing the unit. Use a lifting device that will not damage the unit or the unit's lid.*

Key Points:

- A minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) is required from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.
- The bottom of the AX-RT lid must sit 2 inches (50 mm) above finished grade when set and level.
- If the AX-RT unit is installed in its own excavation, the unit requires 18-24 inches (457-610 mm) of space on all four sides.
- If the AX-RT unit is installed in tandem with the septic tank, a minimum of 2 ft (610 mm) separation distance is required between the unit and tank.
- If the AX-RT unit is being installed parallel to the septic tank, offset the unit from the tank by 6 ft (1.8 m) if antibuoyancy measures are necessary or 4 ft (1.2 m) if antibuoyancy measures are not necessary.



When using Orenco fiberglass deadmen, be sure to place them on a small lift of soil 12 inches (300 mm) from the bottom of the AX-RT.

Step 5: Install Antibuoyancy Deadmen (If Needed)

Determine if antibuoyancy deadmen are necessary for the installation. Orenco offers antibuoyancy hardware kits that can be used with Orenco fiberglass deadmen or concrete deadmen.

- Deadmen are recommended for all installations.
- Deadmen are required if there is a potential for groundwater to be present in the excavation at any time, or if surface runoff can fill the excavation at any time, resulting in a "bathtub" effect.

Note: *This effect occurs in dense soils when water fills an excavation during surface water runoff —usually during a heavy rain event — before the disturbed soil in the excavation has had time to settle.*

- If you are unsure whether to install antibuoyancy deadmen or not, consult the system Designer or an engineer.

Step 5a: Installing Orenco Fiberglass Deadmen

Step 5a (i): Build up a 3- to 4-inch (75- to 100-mm) lift of soil on each side of the unit for the deadmen to rest upon.

Step 5a (ii): Secure the deadmen along the length of the unit, on both sides, with the antibuoyancy kit hardware. Then lower the unit into the hole.

Step 5a (iii): Place the deadmen at least 12 inches (300 mm) from the bottom of the unit, and make sure they are level.

Installation Steps

Step 5: Install Antibuoyancy Deadmen (If Needed), cont.

Step 5b: Installing Concrete Deadmen

Notes:

- *We recommend preparing concrete deadmen off site before installation.*
- *PVC forms for concrete deadmen can be made from 12-in. dia. × 4-ft long (300-mm × 1200-mm long) PVC half-pipe or chamber material.*
- *Wooden forms for concrete deadmen can be built 12-in. wide × 6 in. tall × 4 ft long (300-mm × 150-mm × 1200-mm).*

Step 5b (i): Fill two forms halfway with concrete.

Step 5b (ii): Place two #4 reinforcing bars in each of the forms.

Step 5b (iii): Finish filling the forms.

Step 5b (iv): Sink eyebolts from the antibuoyancy hardware kit into the concrete for attaching the deadmen later.

Step 5b (v): Let the concrete set completely before moving the deadmen.

Step 5b (vi): Use appropriate lifting gear to set the deadmen in place.

Step 5b (vii): Secure the deadmen along the length of the unit, on both sides, with the antibuoyancy hardware kit and make sure they are level.

Step 6: Partially Backfill Excavation(s)

Partially backfill around the AX-RT unit and (if needed) the tank. Follow the manufacturer's instructions for backfilling around the tank. Follow the steps below to backfill around the AX-RT unit.

IMPORTANT: *Bolt down the AX-RT lid before backfilling! Bolting down the lid increases rigidity and helps prevent deformation.*

Step 6a: Fill the AX-RT with 16 in. (410 mm) of water on both sides of the baffle.

Step 6b: Backfill around the unit with a 16-inch (410-mm) layer of material.

Key Points:

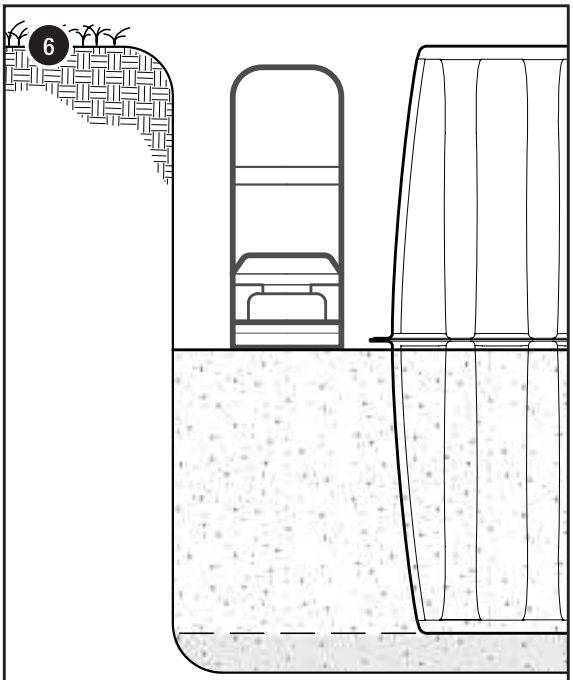
- Do not use native material to backfill if it is primarily sand; very soft or highly expansive clay; or if it contains debris, large (> ¾-in. or 19-mm) rocks, sharp rocks, peat, or muck. In these cases, use ≤ ¾ inch (≤ 19 mm) rounded gravel, crushed stone, or pea gravel as fill material. This material should be washed, free-flowing, and free of debris.
- Do not backfill with sand.

Step 6c: Compact the fill thoroughly with a mechanical compactor.

Step 6d: Fill the AX-RT with water to just above the midseam flange on both sides of the baffle.

Step 6e: Add another 16-inch (410-mm) layer of backfill.

Step 6f: Compact the fill to 2-3 inches (50-75 mm) below the midseam flange.



IMPORTANT:

Do not backfill around the unit unless the lid is bolted down!

Installation Steps

See Orenco's *PVC Access Riser Installation* (NIN-RLA-RR-1) instructions for installing access risers on Orenco Tank Adapters.

Watertight seams are critical for proper performance.

Step 7: Install Adapters and Risers (If Needed)

Step 7a: Install tank adapters if needed. Follow the manufacturer's instructions.

- Use PRTA24 and PRTA30 Tank Adapter Installation (NIN-TA-PRTA-2) instructions for installing Orenco PRTA24 or PRTA30 Tank Adapters.
- Use RRFTA and RRFTA30 Tank Adapter Installation (NIN-TA-RRFTA-1) instructions for installing Orenco RRFTA or RRFTA30 Tank Adapters.
- Use FRTA30-FRP Tank Adapter Installation (NIN-TA-FRTA-1) instructions for installing Orenco FRTA30-FRP Tank Adapters.
- Use Tank Adapter Installation for Roth Tanks (NIN-TA-RR-2) instructions for installing Orenco FRTA24-R or PRTA30 Tank Adapters on Roth Fralo tanks.

Step 7b: Install the access risers and any necessary grommets.

- Use PVC Access Riser Installation (NIN-RLA-RR-1) instructions for installing access risers on Orenco Tank Adapters and grommets in access risers.

Key Points:

- Mode 3 systems require a 1-in. (25-mm) grommet in the tank's inlet riser. The grommet must be on the same side of the riser as the AX-RT unit's return line.
- The seam between the tank and the tank adapter has to be watertight.
- Watertight seams and penetrations are critical for proper performance.
- Before installing the riser, make sure the riser is the correct height — the recommended riser height is 2-3 inches (50-75 mm) above final grade.
- Before installing the riser, make sure that the riser penetrations are made at the correct height to make connections.
- Before installing the riser, make sure the penetrations are aligned correctly.
- After installing the riser, make sure all adhesive seams are smooth, continuous fillets, free of voids.
- After installing the riser, make sure the adhesive is set before continuing.

Step 8: Test Tank and Adapter Seams For Watertightness

Step 8a: Test the tank for watertightness if it has not been tested already.

Note: *Follow the manufacturer's recommendations for watertightness testing. Some manufacturers require the tank be fully backfilled before testing watertightness.*

Step 8b: Test the tank-to-riser adapter seams for watertightness.

- Use PVC Access Riser Installation (NIN-RLA-RR-1) instructions to test the seams between the access riser, tank adapter, and tank for watertightness.

Key Points:

- Watertight seams are critical for proper system performance — all tank-to-riser seams must all pass the watertightness test before you continue.
- Follow all applicable regulations and manufacturer's instructions for watertightness testing.

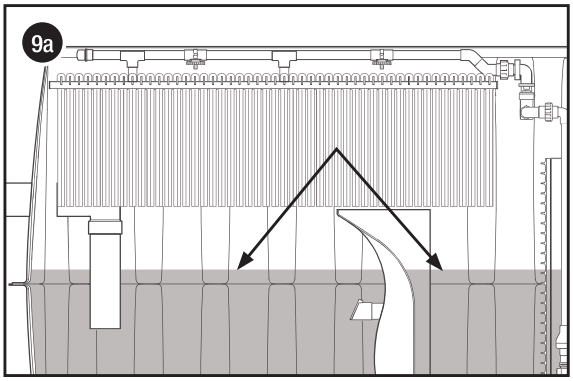
Installation Steps

Step 9: Test AX-RT Midseam for Watertightness

Step 9a: Make sure the AX-RT unit is filled with water to 1-2 inches (25-50 mm) above the midseam flange on both sides of the tank baffle.

Step 9b: Wait 15 minutes and then inspect the midseam flange for leaks. There should be no drop in liquid level and no visible leakage from the seam.

Step 9c: If there is any leakage, contact your Dealer for information on repairing the AX-RT unit.



Fill AX-RT unit with water to 1-2 inches (25-50-mm) above the midseam flange on both sides of the baffle.

Step 10: Install Effluent Filter

Install the effluent filter after the tank has been water tested.

Step 10a: Verify the model of the effluent filter.

- Orenco's FTS0444-36V, FTW0444-36V, and FT0822-14B filters are the only models allowed for use with the AX-RT Treatment Unit.

Step 10b: Dry test-fit the effluent filter on the septic tank's outlet pipe.

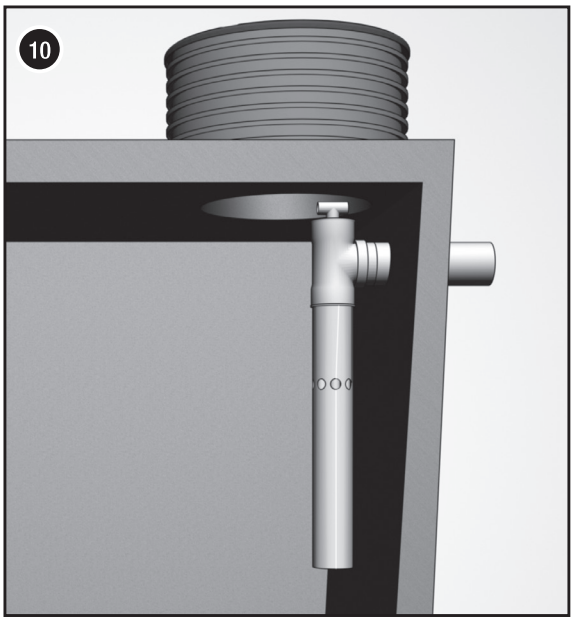
Key Points:

- Make sure the filter is plumb.
- Make sure the filter is snug to the tank wall with enough clearance for easy removal of the filter cartridge.

Step 10c: Secure the filter to the outlet pipe with one of the following methods:

- Glue the filter onto the tank outlet pipe with primer and glue, or
- Secure the filter with a stainless steel set screw.

Step 10d: If necessary for ease of access, extend the cartridge handle with a longer length of ¾-inch nominal (20-mm DN) Schedule 40 PVC pipe.



Effluent filter installed on the septic tank outlet.

Step 11: Connect Transport Line from Tank to AX-RT

Step 11a: Dry fit the 4-inch (100-mm) transport line and any fittings between the outlet of the septic tank and the inlet of the AX-RT unit.

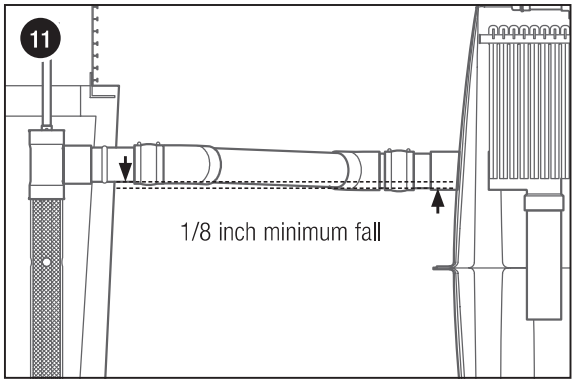
Key Point: Confirm there is a minimum fall of 1⁄8 inch per ft (10 mm per m or 1%) from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.

Step 11b: Glue all of the transport line pieces in place.

IMPORTANT: *Do not use primer on ABS parts.*

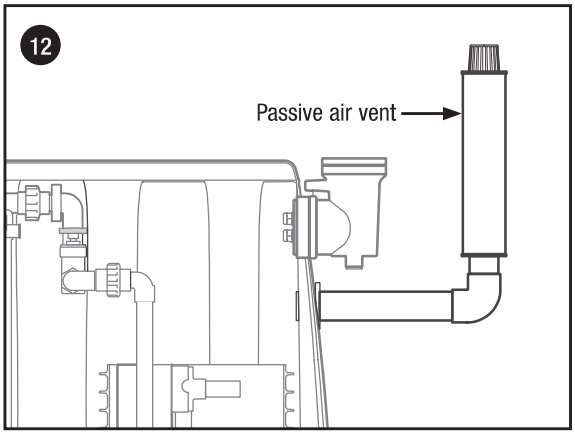
Step 11c: For Mode 3 units, glue all of the return line pieces in place.

- Install the 1-in. (25-mm) return line between the return line port and the 1-in. (25-mm) grommet for the return line on the tank's inlet riser.
- To avoid siphoning, the return line should allow effluent to pour into the tank from the height of the riser grommet.



Confirm a minimum fall of 1⁄8 inch per foot (10 mm per meter or 1%) from the septic tank's invert of outlet to the AX-RT unit's invert of the inlet.

Installation Steps



Install the vent within 20 ft (6 m) of the AX-RT unit.

Step 12: Connect Passive Air Vent

Use 2-inch (50 mm) PVC pipe to plumb the passive air vent to the 2-inch (50 mm) vent fitting that protrudes from the outlet side of the AX-RT unit.

Key Points:

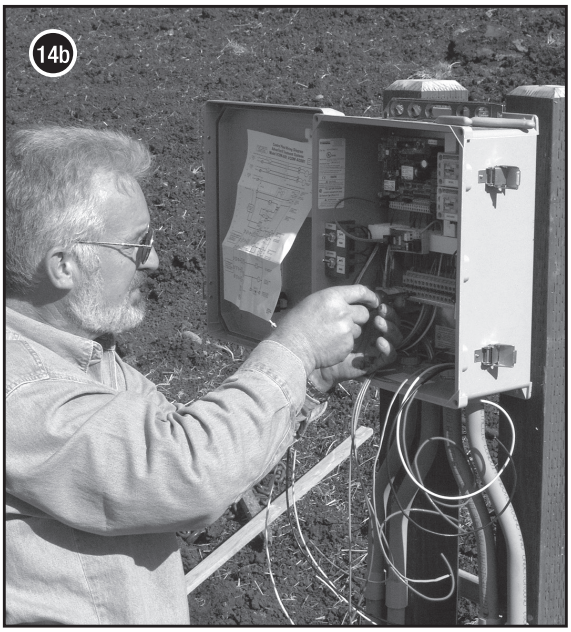
- Install the vent within 20 ft (6 m) of the AX-RT unit, preferably near a wall or other location that will protect it from damage.
- Make sure the vent line is sloped back a minimum of ¼ inch per foot (20 mm per meter) so that it can drain back into the unit.
- Make sure there are no "bellies" in the line that can collect water.
- Make sure the vent's top is a minimum of 3 in. (75 mm) above final grade.

Notes:

- *The air vent can easily be hidden by shrubbery or landscaping.*
- *The air vent can be painted to better blend in with landscaping.*

Step 13: Connect AX-RT Outlet to Transport Line

Glue the AX-RT discharge plumbing line to the transport line for final discharge.



Wire control panel.

Step 14: Mount Control Panel and Perform Wiring

Key Points:

- This step should be performed by a licensed or qualified electrician.
- Installation instructions, schematics, and wiring diagrams specific to the panel and float switch configuration are included with each panel. If any of these is missing, contact your Dealer or Orenco for a replacement.

Step 14a: Install the splice box(es) on the AX-RT using the instructions that came with it.

Step 14b: Mount the panel using the instructions that came with it.

IMPORTANT: *DO NOT mount the control panel on an exterior wall other than a garage or shop wall! The motor contactor makes a sound while engaging and disengaging that can be disruptive to residents.*

Key Points:

- Follow all applicable regulations for placement of the control panel.
- Mount the panel within sight of the tank in a service-friendly location.

Installation Steps

Step 14: Mount Control Panel and Perform Wiring, cont.

Step 14c: Route wires and connect the panel, pump, float switches, and other equipment shown in the instructions and schematics into the control panel.

IMPORTANT: *Follow all applicable regulations and electric codes.*

Key Points:

- Use watertight wire connectors (provided) to avoid electrical shorts and other issues.
- Be sure to seal the conduit at the control panel and at the splice box with UL-listed sealing foam, putty, or silicone sealant.

Note: *To help identify wiring runs for individual pumps and float switches, use different-colored wires for each electrical component.*

Step 15: Perform AX-RT Operational Test

IMPORTANT: *Before using a generator to operate a pump, contact your Dealer or Orenco to make sure it can supply sufficient starting amperage to the pump.*

Step 15a: Rotate the manifold so that the spin nozzles face upward.

Step 15b: Remove the cap at the end of the manifold.

Step 15c: Toggle the recirc pump "AUTO/OFF/MAN" switch to "MAN" for 10-20 seconds to flush any debris out of the manifold.

IMPORTANT: *Always make sure there is enough water in the AX-RT's recirc/blend chamber to safely run the pump.*

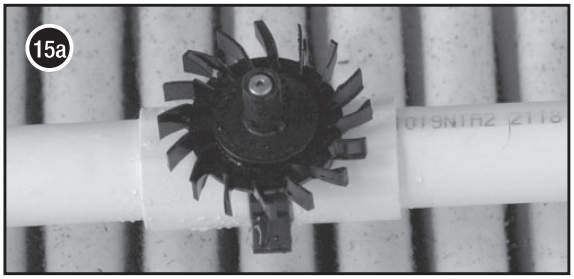
Step 15d: Rotate the manifold so that the spin nozzle faces down and reinstall the cap on the end of the manifold.

Step 15e: Manually run the recirc pump and adjust the gate valve for consistent coverage over the textile area and continual water distribution against the splash guards on the edges of the textile.

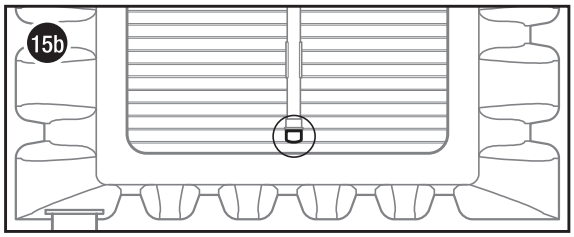
Note: *If the spin nozzles won't properly distribute with the gate valve fully open, check for debris, line breaks or damaged valves. Check and verify the pump has sufficient run voltage and is operating correctly. Contact your Dealer for additional assistance.*

Key Point: If using a pressure gauge for calibration, the residual pressure in the manifold should be about 4psi. Check for complete spray coverage over the textile media and adjust the gate valve as needed per Step 15e.

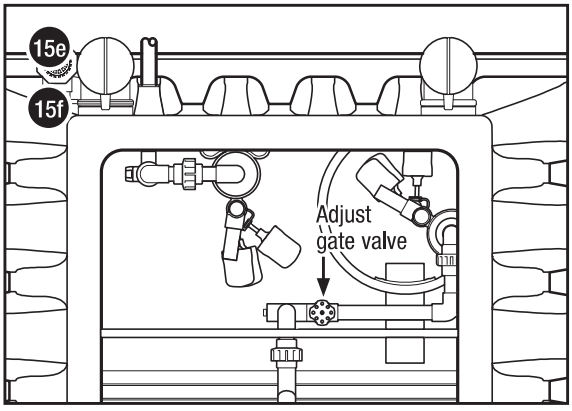
Step 15f: Return the recirc pump "AUTO/OFF/MAN" switch to "AUTO."



Rotate the manifold so spin nozzles face upward.



Remove the cap at the end of the manifold.



Installation Steps

Step 15: Perform AX-RT Operational Test, cont.

Step 15g: If the system uses a VCOM™ control panel, use the instructions that came with it to place the control panel in "Test Mode." If the system uses an MVP control panel, go on to the next step.

Step 15h: Check the operation of the recirc chamber's float switches by raising and lowering the low-level, mid-level, and high-level float in turn and verifying that each performs its intended function.

- If the AX-RT unit has a discharge pump, continue to step **15l**.
- If the AX-RT unit has an MVP panel and gravity discharge, go to step **15o**.
- If the AX-RT has a VCOM panel and gravity discharge, take the panel out of "Test Mode" and go to step **15o**.

IMPORTANT: *Always make sure there is enough water in the AX-RT's discharge chamber to safely run the pump.*

Step 15i: Toggle the discharge pump's "AUTO/OFF/MAN" switch to "MAN" and verify the pump runs.

Step 15j: Toggle the discharge pump's "AUTO/OFF/MAN" switch to "AUTO."

Step 15k: Check the operation of the discharge chamber's float switches by raising and lowering the low-level, mid-level, and high-level float in turn and verifying that each performs its intended function.

- For units with a VCOM control panel, take the control panel out of "Test Mode."

Step 15l: Make sure the recirc pump and (if equipped) discharge pump's "AUTO/OFF/MAN" switches are toggled to "AUTO."

Step 15m: Close and bolt down the lid on the AX-RT unit.

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Installation Steps

Step 16: Complete Backfilling

Key Points:

- When backfilling, be careful not to alter the slope of any of the pipes. Brace the pipes or place the pipes on a compacted bed and carefully fill around them.
- Before backfilling, make sure the AX-RT unit's lid and all riser lids are bolted down.

Step 16a: Backfill the septic tank excavation if it has not yet been done. Follow the tank manufacturer's guidelines for backfilling.

Step16b: Backfill and compact around the AX-RT unit in maximum 12-inch (305-mm) lifts.

Key Points:

- Do not use native material to backfill if it is primarily sand; very soft or highly expansive clay; or if it contains debris, large (> ¾-in. or 19-mm) rocks, sharp rocks, peat, or muck. In these cases, use ≤ ¾-in. (≤ 19 mm) rounded gravel, crushed stone, or pea gravel as fill material. This material should be washed, free-flowing, and free of debris.
- For installations in non-cohesive soils* with high seasonal water tables, use ¾-inch crushed rock as the backfill material.
- Do not backfill with sand.

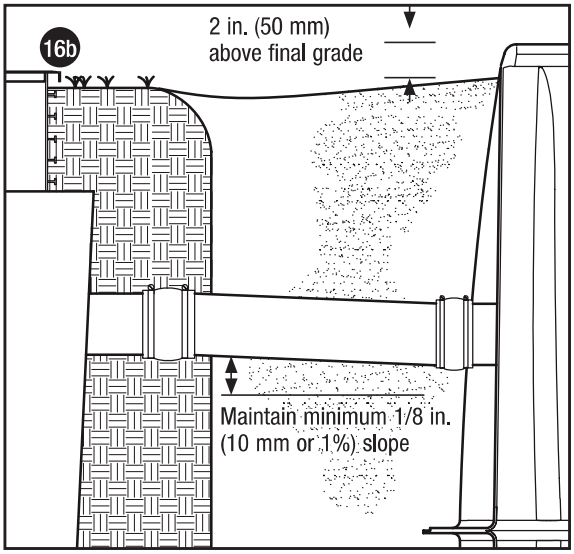
Step 16c: Compact the fill thoroughly with a mechanical compactor.

Key Points:

- The bottom of the AX-RT lid should sit 2 inches (50 mm) above final grade.
- After backfilling, call the system's Service Provider to arrange for the official System Start-up.

Step 16d: Be sure the AX-RT unit's lid is closed and secured.

Step 16e: Be sure the septic tank's access lids are secured.



Backfill the AX-RT in 12-inch (300 mm) lifts.

* As described in OSHA Standards (29 CFR, Part 1926, Subpart P, Appendix A), noncohesive soils or granular soils include gravel, sand, or silt with little or no clay content. Granular soil cannot be molded when moist and crumbles easily when dry. Cohesive soils include clayey silt, sandy clay, silty clay, clay, and organic clay. Cohesive soil does not crumble, can be excavated with vertical sideslopes, is hard to break up when dry, and when moist, can be rolled into threads without crumbling. For example, if at least a 2-inch (51-mm) length of 1/8-inch (3-mm) thread can be held on one end without tearing, the soil is cohesive.

Installation Manual

AdvanTex®
AX-RT Treatment Systems

Residential Applications

AdvanTex Treatment Systems are listed to NSF/ANSI Standards 40 and 245 for Class I Systems.

c UL us LISTED

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VeriComm® AXB_ Control Panels

VeriComm AXB1 UV IB (*at Treatment & Storage*)

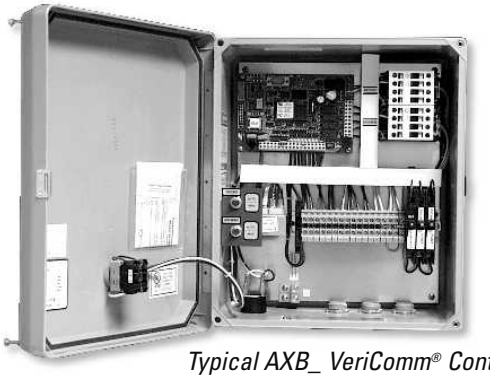
IP Upgrade Kit is required if Internet line is used.

Technical Data Sheet

For AdvanTex® Treatment Systems

Applications

VeriComm® AXB1 and AXB2 remote telemetry control panels are used with two-pump operations — recirculation and discharge (on-demand or timed) — for AdvanTex® Treatment Systems. Interlocked controls prevent the recirculation pump from running if there is a high level alarm on the discharge side. Coupled with the VeriComm Web-based Monitoring System, these affordable control panels give water/wastewater system operators and maintenance organizations the ability to monitor and control each individual system's operation remotely, with real-time efficiency, while remaining invisible to the homeowner. VeriComm AXB panels allow remote operators to change system parameters, including timer settings, from the Web interface.



Typical AXB_ VeriComm® Control Panel
Standard Models: VCOM AXB1, VCOM AXB2

To Specify...

To specify this panel for your installation, require the following:

Basic Control Logic: Three Operating Modes

- A "Start-up Mode" for the initial 30 days, during which the system collects trend data to establish operating standards for future reference.
- A "Normal Mode" that manages day-to-day functions.
- A "Test Mode" that suspends data collection and alarm reporting during installation and service.

Data Collection and Utilization

- Data logs of system conditions and events, such as pump run times, pump cycles, and alarm conditions.

Troubleshooting and Diagnostic Logic

- Troubleshooting capabilities that can report suspected failed components, which then trigger Alarms.

Advanced Control Logic

- Advanced control logic that activates during float malfunctions to diagnose the situation and keep the system operating normally until servicing.

Communication and Alarm Management

- Remote telemetry capabilities coupled with a Web-based monitoring application (see *VeriComm Monitoring System*, ATD-WEB-VCOM-1) for communication and alarm management. Updating of point values (including timer settings) and receipt of queued changes during each communication session with host. Communication sessions that occur monthly, at a minimum, and more frequently during alarm conditions.
- Multiple methods of communication, as follows:

Call-In to VeriComm® Host

  – Automatic notification to host of "Alarms," which signal fault conditions that need to be addressed immediately (e.g., pump failure).

  – Automatic notification to host of "Alerts," which signal less critical fault conditions and which trigger the panel's troubleshooting logic and alternative operating mode (e.g., stuck float switch).

  – Automatic notification to host of "Updates," which include alarm updates or all-clear notifications following Alarms/Alerts, as well as normally scheduled monthly panel reports.

  – Manual, forced communication from panel to host to effect an updating of point values and receipt of queued changes.

Real-Time Direct Connection to Panel

  – Manual, direct connection at the site via RS-232 serial port, to allow a local operator real-time access to detailed logged data and the ability to change point values from a laptop.

  – Manual, forced communication by local operator/homeowner at the site to initiate an auto-answer mode, allowing a remote operator real-time access to detailed logged data and the ability to change point values.

During real-time, manual connections, software with open architecture (and password security) is used; no proprietary software is required. VT100 protocol allows access and control from any computer modem (Mac or PC) with a simple communication program (e.g., Windows® HyperTerminal); multilevel password protection in panel ensures that only qualified personnel can access the panel's data.

Additional Features

- Status light indicators on the board, including . . .
  – Flashing green LED for normal operation
  – Yellow LEDs for status of digital inputs
  – Red LEDs for status of digital outputs and modem activity
- UL-recognized and FCC-approved

For more information, try our online demo at www.vericomm.net (no password required).

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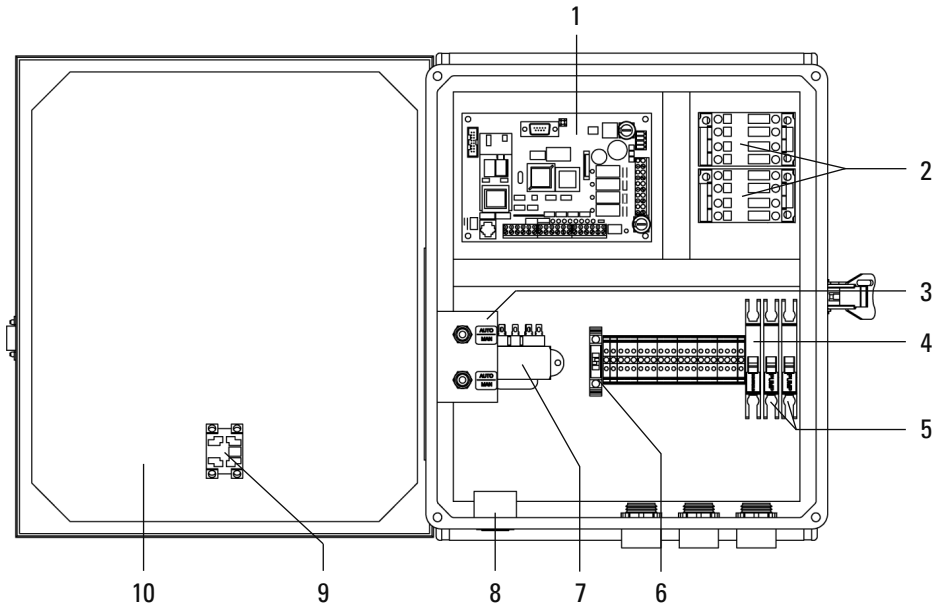
VeriComm® AXB_ Control Panels

Technical Data Sheet

1. VeriComm® Remote Telemetry Board
2. Motor-Start Contactors
3. Toggle Switches
4. Control Circuit Breaker
5. Pump Circuit Breakers
6. Fuse
7. Transformer
8. Audio Alarm
9. Visual Alarm
10. Panel Enclosure



Standard Components

Feature	Specifications
1. VeriComm® Remote Telemetry Unit*	ATRTU-100: 36/18 VAC (center tap transformer), 8 digital inputs, 4 analog inputs, 4 digital outputs, 0 analog outputs, on-board modem (2400 baud), LED input and output indicators, 1-year battery backup of data and program settings.
2. Motor-Start Contactors	120 VAC: 16 FLA, 1 hp, 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA). 240 VAC: 16 FLA, 3 hp, 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).
3. Toggle Switches	Single-pole switch, automatic On, with spring-loaded, momentary, manual On. 20 A, 1 hp.
4. Control Circuit Breaker	10 A, OFF/ON switch. Single-pole 120 VAC, double-pole 240 VAC. DIN rail mounting with thermal magnetic tripping characteristics.
5. Pump Circuit Breakers	20 A, OFF/ON switch. Single-pole 120 VAC, double-pole 240 VAC. DIN rail mounting with thermal magnetic tripping characteristics.
6. Fuse	120 VAC Primary, 36 VCT @ 0.85 A Secondary.
7. Transformer	250 VAC, 1 A.
8. Audio Alarm	95 dB at 24 in. (610 mm), warble-tone sound.
9. Visual Alarm	7/8 in. (22 mm) diameter red lens, "Push-to-silence." NEMA 4, 1 W bulb, 120 VAC.
10. Panel Enclosure	Measures 15.5 in. high x 13.3 in. wide x 6.7 in. deep (384 mm x 338 mm x 170 mm). NEMA 4X rated. Constructed of UV-resistant fiberglass; hinges and latch are stainless steel. Conduit couplings provided.
VCOM-AXB1	120 VAC, 3/4 hp, 14 A, single-phase, 60 Hz.
VCOM-AXB2	240 VAC, 2 hp, 14 A, single-phase, 60 Hz.

Optional Components

Feature	Specifications	Product Code Adder
Pump Run Light	7/8 in. (22 mm) diameter green lens. NEMA 4, 1 W bulb, 120 VAC.	PRL
Anticondensation Heater	Self-adjusting: radiates additional wattage as temperature drops.	HT
Programmable Timer	Discharge side timed dosing.	PT
UV Disinfection Compatibility	UV grounded power circuit and alarm contacts. Pump disable upon UV failure.	UV

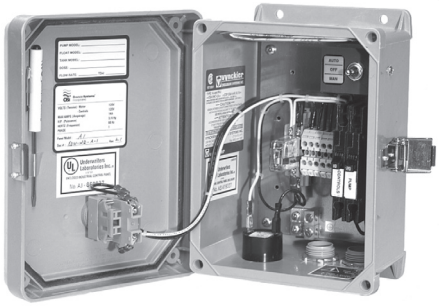
** See VeriComm® Remote Telemetry Unit (ATD-CP-VCOM-1) and VeriComm® Monitoring System (ATD-WEB-VCOM-1) for more detail.*

Technical Data Sheet

A-Series Simplex Alarm Panels

Applications

A-Series Simplex Alarm Panels are used to control pump motors and alarm functions in simplex pumping systems. They are intended as a low-cost option for pump controls into gravity or pressurized drain-fields or for Effluent Sewers (aka STEP sewers or Septic Tank Effluent Pumping Systems), especially where cost is the critical factor.



General

Standard features for A-Series Simplex Alarm Panels include circuit breakers, an automatic/manual/off toggle switch, and an audible/visible high water alarm with auto reset. 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; a UL-Canada listing is available.

Standard Models

A1, A2.

Pump and Haul Tank:
A1 ETM CT

Product Code Diagram

A [ ] [ ]

Standard options (list in order):
RO = redundant off relay
ETM = elapsed time meter
CT = event counter
HT = heater

Pump voltage:
1 = 120 VAC
2 = 240 VAC

A Series simplex control panel

Materials of Construction

Component	Material
Enclosure	UV-resistant fiberglass, Type 4X (IP 66)
Hinge	Stainless steel
Latch	Stainless steel

Specifications

Height, in. (mm)	9.5 (241)
Width, in. (mm)	7.3 (185)
Depth, in. (mm)	5.0 (127)
A1 panel ratings	120 VAC, 1 hp (0.75 kW), 16 A, 1-phase, 60 Hz
A2 panel ratings	240 VAC, 1 hp (0.75 kW), 10 A, 1-phase, 60 Hz

Standard Features

Feature	Specifications*
Controls Circuit Breaker	10 A, OFF/ON switch, single pole, DIN rail mounting with thermal magnetic tripping characteristics
Pump Circuit Breaker	20 A, OFF/ON switch, single pole (120 VAC) or double pole (240 VAC), DIN rail mounting with thermal magnetic tripping characteristics
Auto/Off/Man toggle switch	Single-pole, double-throw HOA switch
Audible alarm	95 dB at 24 in. (610 mm), warble-tone sound; gasketed, UL Type 4X (IP66)
Audible alarm silence relay	Automatic reset, DIN rail mount
Visible alarms	⅞-in. (22-mm) diameter red lens, "Push-to-silence," UL Type 4X (IP66), 1 W bulb, 120 VAC

Optional Features

Feature	Specifications*	Product Code Adder
Redundant off relay(s)	DIN rail mount; provides a secondary off; sounds alarm upon low level condition	RO
Elapsed time meter(s)	120 or 240 VAC (model-dependent), 7-digit, non-resettable; limit of 99,999 hours; accurate to 0.01 hours	ETM
Event counter(s)	120 or 240 VAC (model-dependent), 6-digit, non-resettable	CT
Heater	Anti-condensation heater; self-adjusting: radiates additional wattage as temperature drops	HT

** all voltages are 120 VAC unless otherwise noted*

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Float Switch Assemblies

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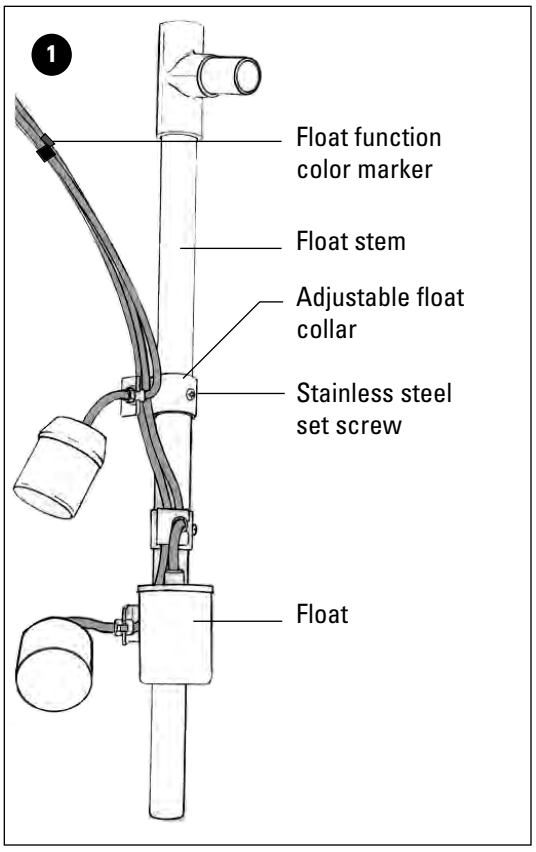
Installation, Operation and Maintenance Instructions
Model MF___

Installation Instructions

The float switch assembly is typically mounted in the screened pump vault or effluent screen inside of a septic or dosing tank. The assembly is detachable without removal of the screened pump vault or effluent screen. A typical float switch assembly is shown below.

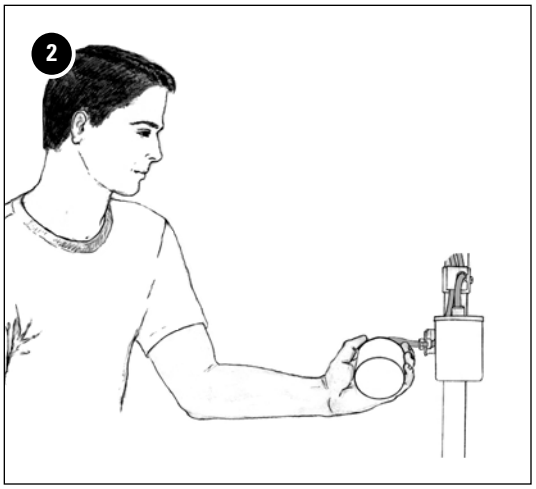
Step 1:

Each float cable is provided with a color marker. This marker indicates the function of the float. Make sure that your float cable color markers correspond with the wiring diagram provided. If the wiring diagram does not match your float cable marker colors, contact Orenco Systems® Inc. or your local dealer for assistance.



Step 2:

To check for proper float switch operation, move each switch up and down and check for interference. Remove the assembly from its holding bracket by snapping it out of the holding bracket.



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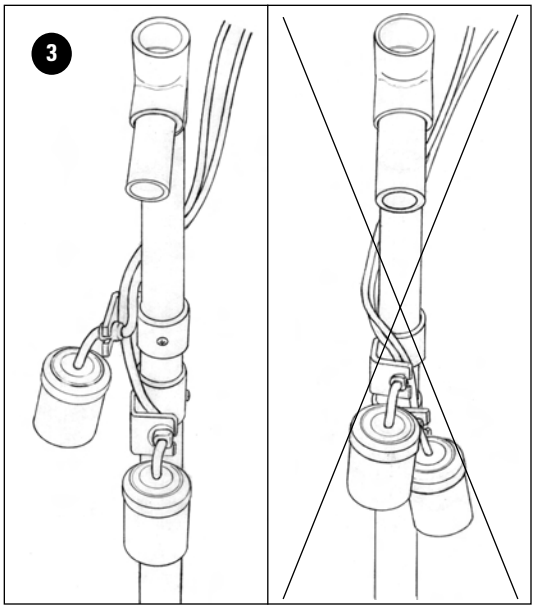
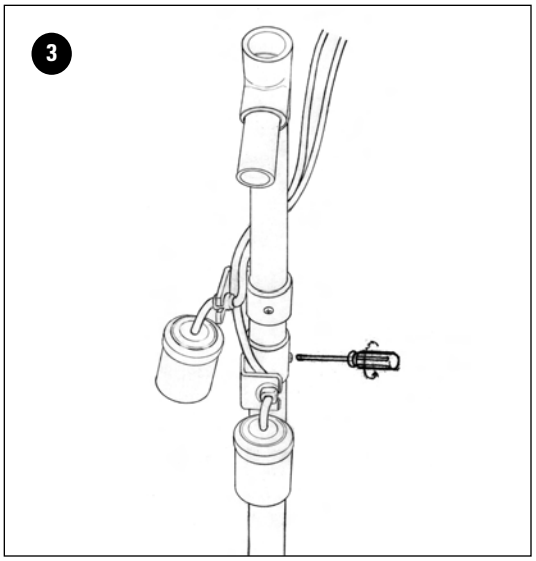
Installation Instructions (continued)



Step 3:

If any float interferes with another, the float may be adjusted by loosening the stainless steel set screw provided in the float collar. Using a phillips screwdriver, slowly back the screw out of the collar to a point at which the collar may be adjusted. Be careful not to back the screw completely out of the collar. Carefully rotate the collar on the stem until the float switches can move freely past one another. Tighten the stainless steel set screw and recheck.

Warning: Be careful not to alter the the tether lengths of any of the floats. Alteration of the tether length may affect proper operation of the float switch assembly.

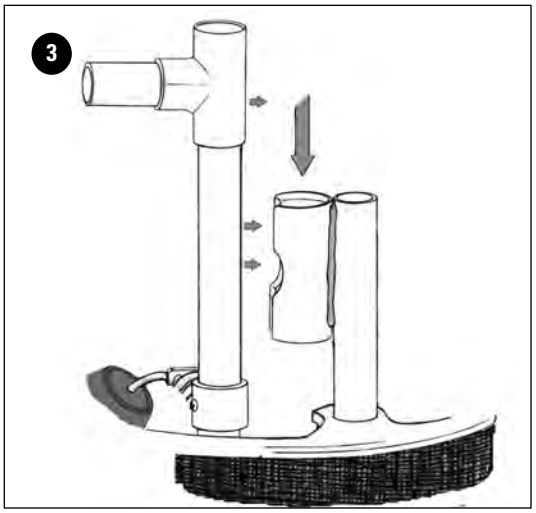


Step 4:

Check the float settings with the project plans and specifications. If the settings need to be adjusted, loosen the set screw as described in step 3.

Adjust the float switches to the desired level and tighten the set screw. Make sure float level settings do not violate any state or local regulations.

Note: The float stem provided is the maximum length possible without interfering with the pump minimum liquid level or screened pump vault intake ports. Never lengthen the float stem without prior approval from Orenco. Lengthening of the float stem will void the warranty.



Step 5:

Replace the float switch assembly in the holding bracket. Make sure the assembly snaps fully into the bracket.

Step 6:

To allow for easy removal of a float switch assembly, a 1" diameter handle may be added to the top of the float switch assembly. Measure the distance from the top of the float switch assembly up to about one foot from grade level. Cut a 1" diameter PVC pipe to the measured length and glue it into the handle.

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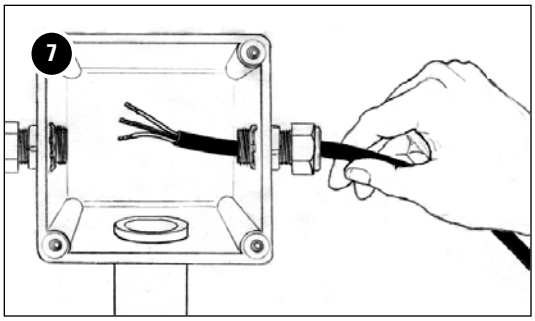
Installation Instructions (continued)

Step 7:

When used with an Orenco electrical splice box:

Push the level control wires through the watertight cord grips into the electrical splice box. Leave an adequate length of electrical cable coiled inside the riser to allow for easy removal of the pump and float switch assembly. **Do not remove the colored markers or the paper tags from the float cables, and do not try to thread the markers and tag through the cord grip.** Tighten the cord grips by hand, not by tool, then test the tightness of the cord grips by tugging on each cable. A cable is secure when the cord grip is tight enough to prevent slippage. Adequate lengths of cable should be left within the splice box to allow easy removal for future disconnecting and resplicing.

Note: See the splice box instructions (EIN-SB-SB-1) and corresponding splice box diagram for connection instructions.



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Maintenance Instructions

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1-800-348-9843

During the annual inspection, follow the testing procedures provided to ensure that the system is operating properly. If a float is found to be faulty, either during the annual inspection or during troubleshooting after an alarm condition, see the section below titled Removing and Replacing Inoperative Floats.

Removing and Replacing Inoperative Floats

Important: Before doing any work either on the wiring to the level control floats and pump in the vault or in the pump control panel, switch the circuit breakers in the panel to their "OFF" positions; then switch off the power to the system at the service entrance panel.

1. Remove the float assembly from the vault.
2. Using a Phillips screwdriver, remove the stainless steel screws from the splice box lid, being careful not to drop the screws into the tank. If the splice box was submerged, or if there is a crack in the conduit, there may be water in the splice box. If this is the case, remove water from the splice box with a syringe, sponge, or other appropriate method. Loosen the cord grip at the splice box and verify the appropriate splice for the float. Unscrew the wire nuts and remove the float.
3. Remove the inoperative float and replace it with a new one. Push the float cable through the watertight cord grip into the electrical splice box. Leave an adequate length of electrical cord coiled inside the riser to allow for easy removal of the float assembly. Do not remove the colored markers or the paper tags from the float cords, and do not try to thread the markers and tag through the cord grip. Tighten the cord grip *by hand, not by tool*, then test the tightness of the cord grip by tugging on the cord. A cord is secure when the cord grip is tight enough to prevent slippage. An adequate length of cord should be left within the splice box to allow for easy removal for future disconnecting and resplicing.
4. Refer to document EIN-SB-SB-1 for instructions to splice the float wire to the wire from the control panel. Attach the float wires using the waterproof wire nuts. It is necessary to replace this wire nut with a new watertight wire nut. Always use watertight wire nuts or heat shrink splice kits for all connections!
5. Replace the float and collar and return the assembly to the pump vault.
6. Reconnect power and test the unit.

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Technical Data Sheet

External Splice Box

Applications

The Orenco® External Splice Box attaches outside the access riser of an underground tank. It is engineered specifically for water and wastewater treatment systems and is especially suited for use in locations prone to high groundwater and other wet conditions. Its separate conduit hubs, large volume, and optional dividers make it useful for maintaining isolation of high and low voltage wires where needed. It has four cord grips which accommodate power cords for floats and pumps of 0.170 - 0.470 inches (4.3 - 11.9 mm) in diameter. Unused cord grips can be plugged watertight with the supplied cord grip plugs. Each External Splice Box is provided with a hole-cutting template to simplify installation on the riser and a 4-inch (100-mm) diameter grommet for the riser penetration.

SBEX1-4,
Use as Needed.

General

To specify the Orenco External Splice Box for your installation, require the following:

- Watertight for prolonged submergence per UL listing (Type 6P)
- Attachment external to access riser to allow inspection with no need to open the riser lid
- Volume of 100 $in.^3$ (1639 cm^3) for easy wiring access and to accommodate multiple wiring configurations
- Bottom entry, so conduit or direct-bury cable always remains below minimum burial depth
- Molded of UL (f1) rated plastic, resistant to cold and UV exposure, suitable for external applications
- Optional divider plates available for isolating high and low voltage wires from separate conduits or direct-bury cable

Standard Models

SBEX1-4, SBEX1-4-P

Product Code Diagram

SBEX1-4 - ☐

Blank = no divider plates
P = divider plates

External splice box

The External Splice Box is molded of a UL (f1) rated PVC alloy. It has a UL Type 6P listing for prolonged submergence.

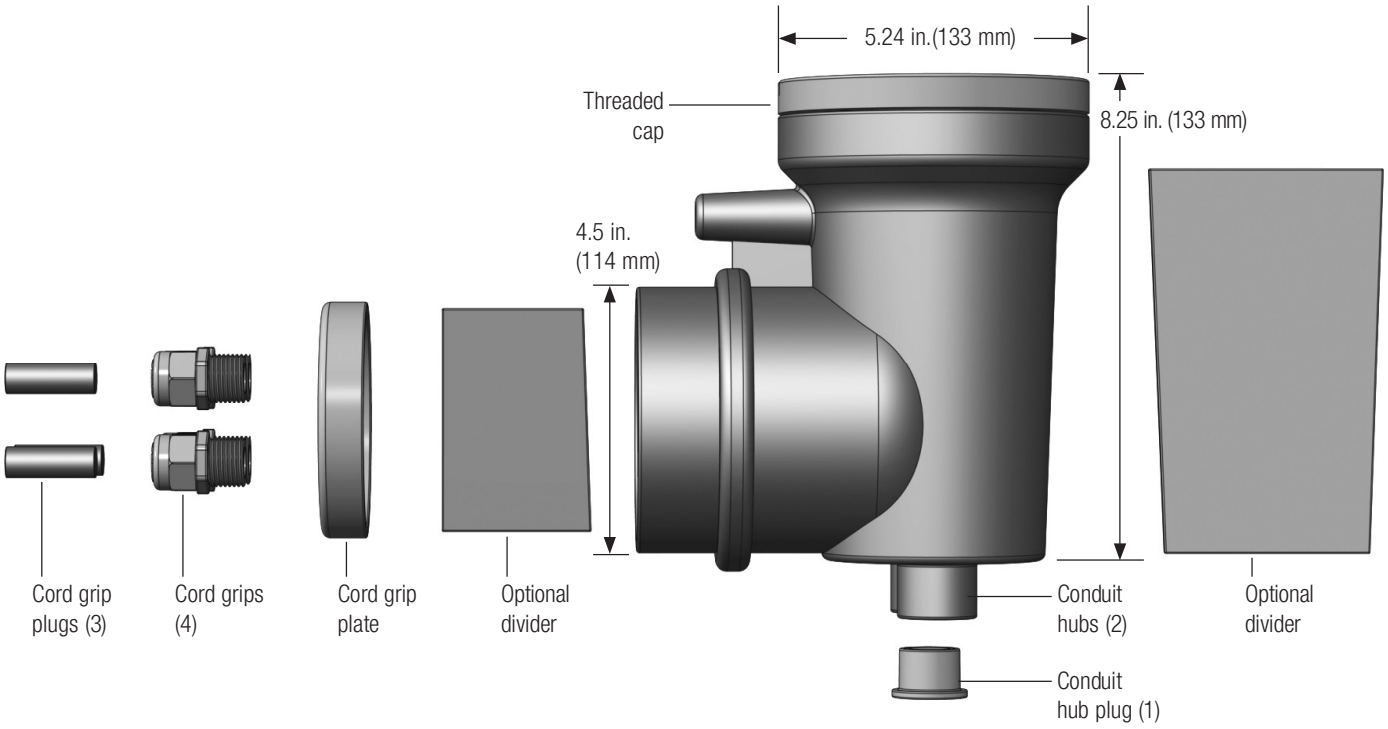
Physical Specifications

Volume	100 in.3 (1639 cm^3)
Cord grips	4 per SBEX
Cord grip plugs	3 per SBEX
Cord diameters accommodated	0.170- 0.470 in. (4.3 - 11.9 mm)
Conduit hubs	2
Conduit hub plug	1
Conduit sizes accommodated	¾ in., 1 in. (with coupling), ½ in. (with fitting or bell end)
Dia. of hole into riser	5 in. (127 mm), hole-cutting template included

Materials of Construction

Splice box	PVC alloy
Cord grips	Nylon
Cord grip plugs	EPDM rubber
O-rings	Buna rubber
Conduit hub plug	PVC per ASTM D-1784
4-in. (100-mm) grommet*	EPDM rubber

** Grommet not shown in illustration below*



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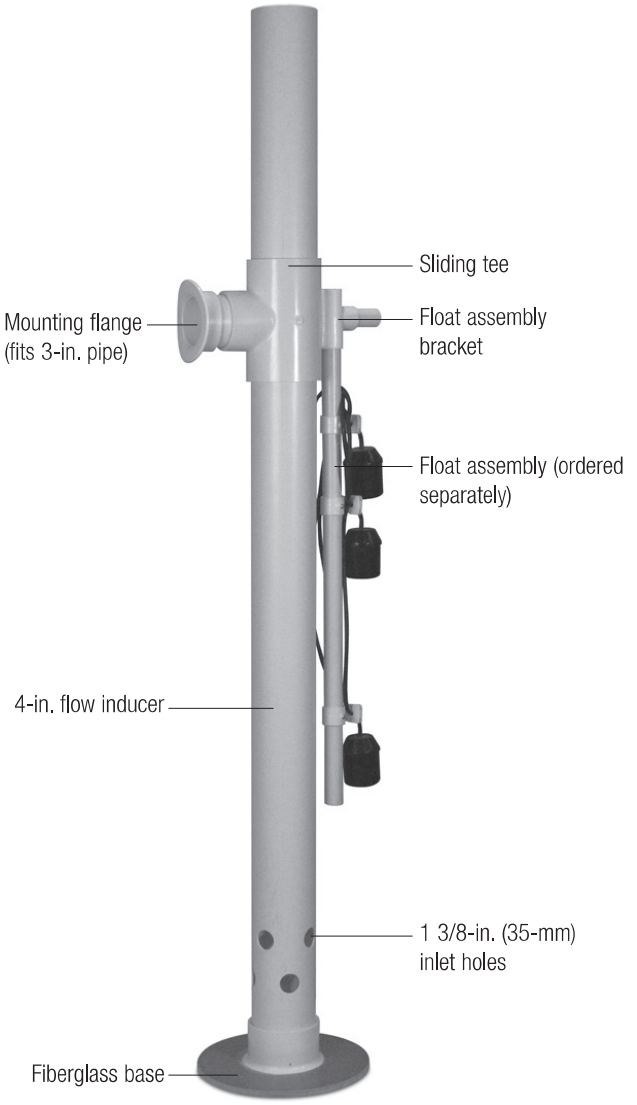
Technical Data Sheet

Universal Flow Inducer

Applications

Orenco's Universal Flow Inducer houses any Orenco high-head effluent pump in applications where filtration is not necessary. The base rests on the bottom of the tank, and the mounting flange is epoxied to a PVC riser. The flow inducer can be lengthened or shortened to fit any tank. The tee, which holds the mounting flange and float assembly bracket, slides to any position along the flow inducer. A float assembly (ordered separately) snaps into the bracket. Applications include:

- Pump tanks
- Disinfection systems
- Effluent reuse systems
- Cisterns



General

To specify this product, require the following:

- Class 125 4-in. (nominal) PVC pipe body
- Injection-molded ABS mounting flange
- Injection-molded holster for float tree
- Ability to accommodate flows as great as 65 gpm (4.1 L/sec)

Standard Model

UFI-4

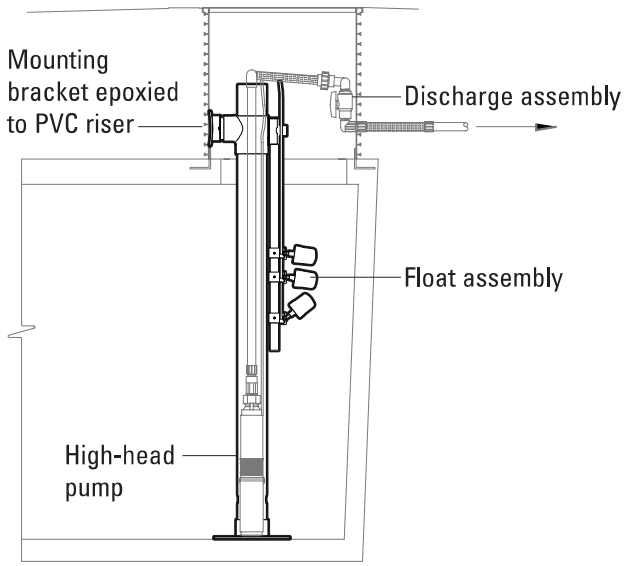
Field Dosing Tank

Materials of Construction

Flow inducer	Class 125 PVC
Mounting flange	Injection-molded ABS
Base	Fiberglass-reinforced polyester

Specifications

Dimensions	
Flow inducer diameter	4" nominal
Height	72" (1828 mm) (can be lengthened or shortened)
Shipping weight	13 lb (5.9 kg)



Typical installation in concrete pump tank. Use screws to secure mounting bracket to riser while epoxy cures.

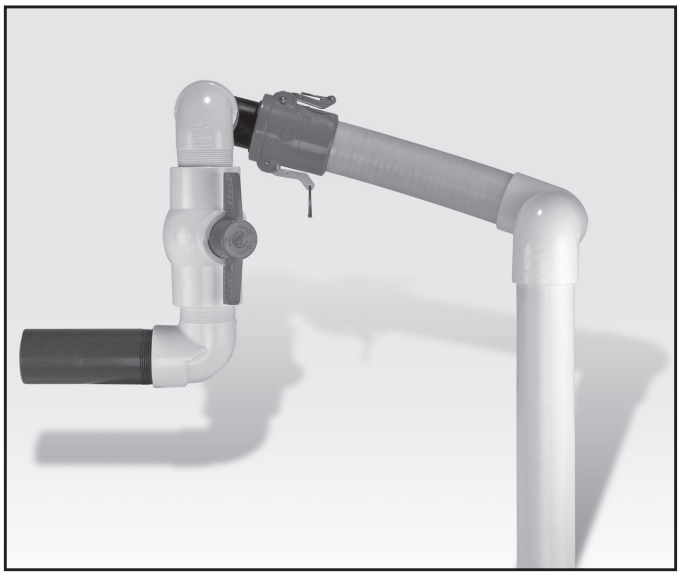
Technical Data Sheet

Discharge Assemblies

Applications

Orenco Discharge Assemblies are used to convey effluent from a pump to the exterior of a riser or pump basin. They come in the following configurations:

- High head, for use with submersible turbine pumps
- Low head, for use with common effluent pumps
- Drainback, for use with shallowly buried tanks and transport lines in cold climates
- Two additional applications are available:
- The cold weather kit coupled with a high-head discharge assembly is intended for use with deeply buried tanks and transport lines in cold weather
- The external flex extension is recommended for installations where tank settling may occur to avoid line breakage during settling.



High head style shown with optional quick-disconnect

General

Orenco Discharge Assemblies are corrosion-resistant and adjustable for a proper fit. Discharge assemblies are composed of PVC valves and flexible hose that simplify installation and maintenance. The flexible hose damps vibrations from the pump and allows for easy installation. Cam-style quick-disconnect fittings are available on all configurations. All parts are either solvent welded or threaded and sealed with Teflon® paste.

Teflon® is a registered trademark of DuPont.

Standard Models

HV100, HV125, HV150, HV200

Field Dosing Tank

Product Code Diagram

HV □□□ □□ - □

- Configuration:
  - Blank = field cut (high-head style)
  - H = high-head style pump
  - L = low-head style pump
  - DB = drainback (always field cut)
- Options:
  - B = ball valve
  - C = check valve
  - FC = flow controller (1" diameter only)
  - AS = antisiphon
  - X = external flex house
  - Q = quick disconnect
  - S = true-union ball check valve*
  - PR = high pressure
- Discharge diameter:
  - 100 = 1"
  - 125 = 1-1/4"
  - 150 = 1-1/2"
  - 200 = 2"
- Pump discharge assembly

* Available for 1-1/2" discharge only

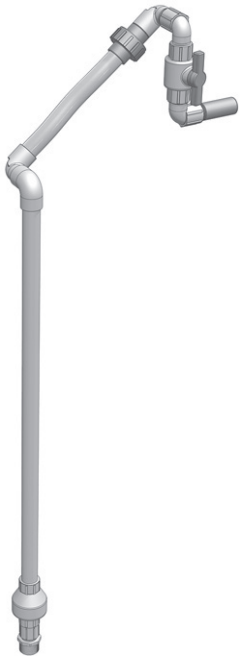
HV CW 125 -KIT- □□□*

- Drain hole:
  - Blank = 1/8" drain hole in elbow
  - NDH = No drain hole
- Kit
- Discharge diameter:
  - 100 = 1"
  - 125 = 1-1/4"
  - 150 = 1-1/2"
  - 200 = 2"
- Cold weather application
- Pump discharge assembly

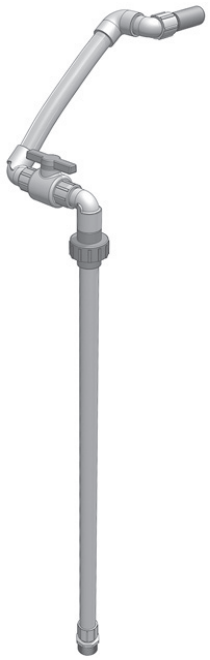
* Always ordered with high head discharge assembly

HVX □□□ - □□□

- Discharge connection (inches):
  - Blank = same as discharge diameter
  - 100 = 1"
  - 125 = 1-1/4"
  - 150 = 1-1/2"
  - 200 = 2"
- Discharge diameter (inches):
  - 100 = 1"
  - 125 = 1-1/4"
  - 150 = 1-1/2"
  - 200 = 2"
- Flex extension
- Pump discharge assembly

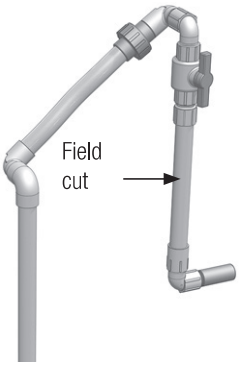


High head style

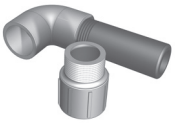


Drainback style

Low head style



High head style with cold weather kit installed



Cold weather kit

External flex extension

Materials of Construction

Component	Material
Anti-siphon valve	Schedule 40 PVC
Ball valve	Schedule 40 PVC
Check valve	Schedule 40 PVC
Pipe and fittings	Schedule 40 PVC
Flexible hose	PVC
External flex hose	PVC
Flow control disc	Schedule 80 PVC
Gate valve	Schedule 80 PVC
Unions	Schedule 80 PVC
High-pressure flex hose compound	Special elastomer

Component Working Pressure Ratings

True union ball check valve	200 psi (14 bar) at 73˚ F (23˚ C)
All other valves	150 psi (10 bar) at 73˚ F (23˚ C)
Unions	150 psi (10 bar) at 73˚ F (23˚ C)

Hose Specifications

Thickness and working pressures at 73˚ F (23˚C)

Flexible hoses	Size (U.S. Nominal)	Wall thickness	Working pressure	Bursting pressure
(standard and external)	1 in.	0.11 in. (2.8 mm)	100 psi (7 bar)	355 psi (24 bar)
	1.25 in.	0.13 in. (3.3 mm)	80 psi (6 bar)	250 psi (17 bar)
	1.5 in.	0.13 in. (3.3 mm)	65 psi (4 bar)	200 psi (14 bar)
	2 in.	0.16 in. (4.1 mm)	60 psi (4 bar)	175 psi (12 bar)
Flexible hoses	**Size (U.S. Nominal)**	**Wall thickness**	**Working pressure**	**Bursting pressure**
(high-pressure)	1 in.	0.235 in. (6.0 mm)	250 psi (17 bar)	N/A
	1.25 in.	0.24 in. (6.1 mm)	250 psi (17 bar)	N/A
	1.5 in.	0.24 in. (6.1 mm)	250 psi (17 bar)	N/A
	2 in.	0.22 in. (5.6 mm)	200 psi (14 bar)	N/A

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Orenco SYSTEMS® *Instructions*

Pump and Discharge Plumbing

Installation Instructions for 4-in. (100-mm) Pumps and HV-Style Discharge Assemblies

These instructions explain how to install an Orenco 4-in. (100-mm) submersible effluent pump and an HV-style discharge assembly into an Orenco pump vault or flow inducer. For other installation options, contact your Distributor or Orenco. For wiring instructions, see the schematics and wiring diagrams included with the pump's control panel.

Step 1: Prep Pump and Discharge Stem

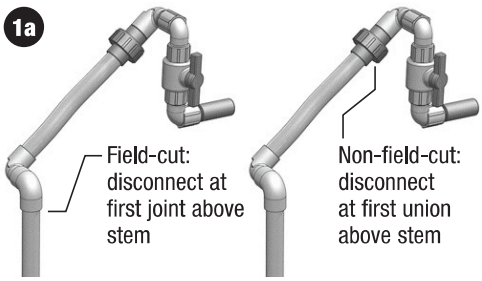
Step 1a: Disconnect the discharge assembly above the discharge stem.

- Field-cut assembly: disconnect at the first pipe joint above the stem.
- Non-field-cut assembly: disconnect at the first union above the stem.

Step 1b: Apply Teflon® paste or tape to the threads on the stem's bottom fitting.

Step 1c: Screw the stem's bottom fitting into the top of the pump.

- Do not tighten the fitting to more than hand-tight.



Disconnect the discharge assembly (standard HV shown).

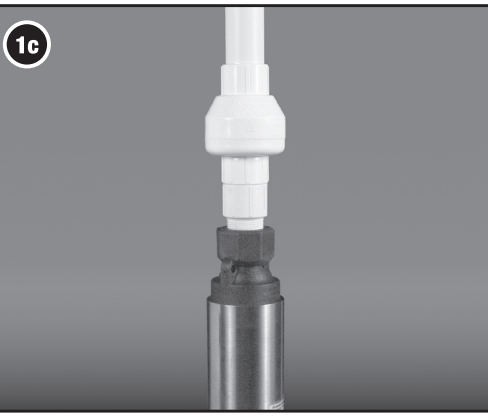
Step 2: Install Pump and Discharge Stem

Step 2a: Make sure that the pump vault or flow inducer has been installed.

Step 2b: Lower the pump and stem into the pump vault's flow inducer compartment or into the flow inducer.

IMPORTANT: *DO NOT lower the pump by the cord! This can damage the pump!*

- The base of the pump rests on the bottom of the vault or flow inducer.



Step 3: Install Upper Discharge Assembly

Install the upper portion of the discharge assembly. Position it to allow the best possible access to the quick disconnect union or ball valve (where used), and to allow easy removal of the float switch assembly and Biotube® filter cartridge.

Step 3a: Lubricate the inside of the discharge pipe grommet and the outside of the discharge assembly nipple with petroleum jelly or a similar product.

Step 3b: Push the nipple of the discharge assembly through the grommet.

- Make sure there is enough nipple outside the riser to attach a coupling.

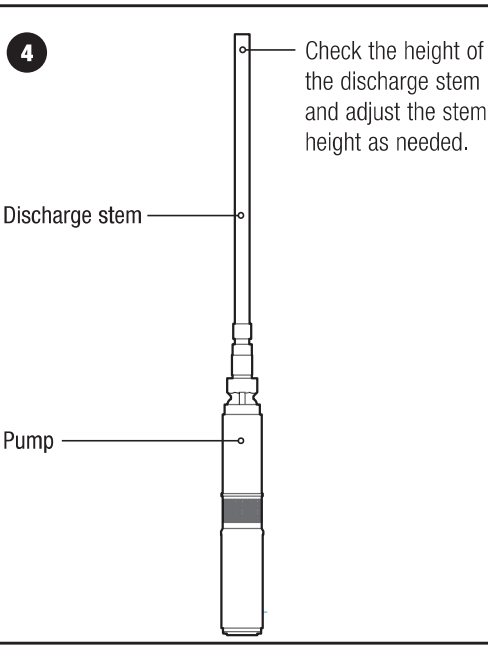
Step 3c: Route the discharge assembly to the top of the discharge stem.

- The section of the discharge assembly above the stem should be routed along the riser wall, as close to it as possible.

Step 4: Adjust Discharge Stem Height (If Necessary)

Before reconnecting the discharge stem to the rest of the discharge assembly, check the height of the stem and adjust it, if necessary.

- Field-cut stems must be measured for height and adjusted as needed.
- Non-field-cut stems may also require adjustment.
- If no adjustment is necessary, go to Step 5.



Step 4: Adjust Discharge Stem Height (If Necessary), cont.

Step 4a: Dry fit the stem to the rest of the discharge assembly.

- If the stem is too long, mark the stem at the location where it needs to be cut in order to provide the best access to key components.
- If the stem is too short, measure the additional distance necessary in order to provide the best access to key components.

Step 4b: If necessary, make adjustments to the stem length.

- To cut the stem ...
  - ~ Remove the pump and stem from the vault or flow inducer.
  - ~ Cut the stem off at the mark.
  - ~ Deburr the cut on the stem.
- To add length to the stem ...
  - ~ Cut a section of pipe equal to the additional necessary distance for an easy-to-service installation.
  - ~ Deburr the cuts on the pipe section.
  - ~ Glue the section to the stem with an appropriately sized pipe coupling.

Step 4c: Dry fit the stem to the rest of the discharge assembly.

Step 4d: If the pump and stem have been removed, lower the pump and stem back into the pump vault's flow inducer compartment or into the flow inducer.

IMPORTANT: *DO NOT lower the pump by the cord! This can damage the pump!*

Step 5: Reassemble Discharge Assembly

Step 5a: Reconnect the discharge assembly.

- Field-cut type assemblies: glue the stem to the rest of the discharge assembly at the first pipe joint above the top of the stem.
- Non-field-cut type assemblies: reconnect the stem and discharge assembly at the first union above the stem.

Step 5b: Check and tighten all of the fittings on the discharge assembly.

- Hand-tighten all threaded connections to snug — do not overtighten.
- Make sure all slip-fit connections are glued and secure.

Step 5c: Install the external flex extension, if necessary.

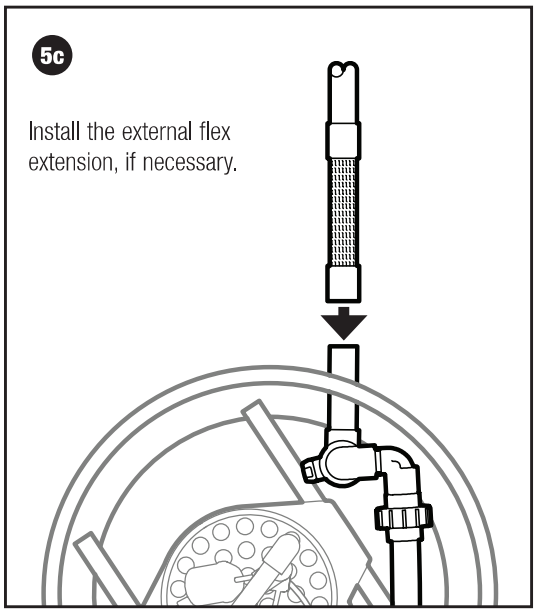
- Clean the lubricant off of the discharge nipple.
- Glue the external flex extension to the end of the discharge nipple.

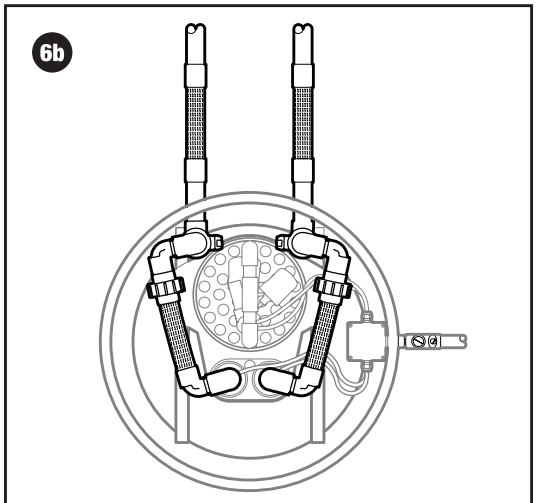
Step 6: Final Installation Checks

Step 6a: Neatly coil the pump cord and secure it inside of the riser.

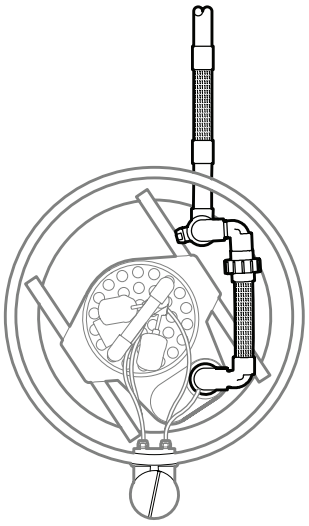
Step 6b: Make sure the pump vault or flow inducer and discharge assembly are positioned for easy access to key components.

- Check for easy access to the ...
  - ~ Float switch assembly
  - ~ Biotube® filter cartridge
  - ~ Pump vault or flow inducer





Example installation — duplex pump system, top view



Example installation — simplex pump system, top view

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Technical Data Sheet

PF Series 60-Hz, 4-inch (100-mm) Submersible Effluent Pumps

Applications

Our 4-inch (100-mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or separate dosing tanks. All our pumps are constructed of lightweight, corrosion-resistant stainless steel and engineered plastics; all are field-serviceable and repairable with common tools; 60-Hz PF Series models are CSA certified to the U.S. and Canadian safety standards for effluent pumps, meeting UL requirements.

Orenco's Effluent Pumps are used in a variety of applications, including pressurized drainfields, packed bed filters, mounds, aerobic units, effluent irrigation, effluent sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.

C US
LR80980
LR2053896

Powered by Franklin Electric

Features/Specifications

To specify this pump for your installation, require the following:

- Minimum 24-hour run-dry capability with no deterioration in pump life or performance*
- Patented 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, 15, 20, and 30 gpm (0.6, 1.0, 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

** Not applicable for 5-hp (3.73 kW) models*

Standard Models

See specifications chart, pages 2-3, for a list of standard pumps. For a complete list of available pumps, call Orenco.

Product Code Diagram

PF □ □ □ □ □ - □

Pump, PF Series

Nominal flow, gpm (L/sec):
10 = 10 (0.6) 15 = 15 (1.0)
20 = 20 (1.3) 30 = 30 (1.9)
50 = 50 (3.2) 75 = 75 (4.7)

Horsepower (kW):
03 = ⅓ hp (0.25) 05 = ½ hp (0.37)
07 = ¾ hp (0.56) 10 = 1 hp (0.75)
15 = 1½ hp (1.11) 20 = 2 hp (1.50)
30 = 3 hp (2.24) 50 = 5 hp (3.73)

Frequency:
1 = single-phase 60 Hz
3 = three-phase 60 Hz

Voltage, nameplate:
1 = 115* 200 = 200
2 = 230 4 = 460

Check valve:
Blank = no internal check valve
CV = internal check valve†

Cord length, ft (m):‡
Blank = 10 (3) 20 = 20 (6)
30 = 30 (9) 50 = 50 (15)

Recirculation Pump
PF3005 1 1
Dose Pump
PF2005 1 1

* ½-hp (0.37kW) only
† Available for 10 gpm (0.6 L/sec), 1/2 hp (0.37 kW) only
‡ Note: 20-ft cords are available only for single-phase pumps through 1½ hp

Specifications

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Impellers	Discharge size and material [1]	Length, in. (mm)	Min. liquid level, [2] in. (mm)	Weight, [3] lb (kg)	Rated cycles/day
PF100511	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	6	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100511CV	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	6	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512	10 (0.6)	0.50 (0.37)	1	230	240	6.3	6.3	6	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF10053200	10 (0.6)	0.50 (0.37)	3	200	208	3.8	3.8	6	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712 [4, 5]	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	8	1 ¼ in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF10073200 [4, 5]	10 (0.6)	0.75 (0.56)	3	200	208	5.1	5.2	8	1 ¼ in. GFP	25.4 (645)	17 (432)	31 (14)	300
PF101012 [5, 6]	10 (0.6)	1.00 (0.75)	1	230	240	9.6	9.6	9	1 ¼ in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF10103200 [5, 6]	10 (0.6)	1.00 (0.75)	3	200	208	5.5	5.5	9	1 ¼ in. GFP	27.3 (693)	18 (457)	37 (17)	300
PF102012 [5, 6, 7, 8]	10 (0.6)	2.00 (1.49)	1	230	240	12.1	12.1	18	1 ¼ in. SS	39.5 (1003)	22 (559)	48 (22)	100
PF102032 [5, 6, 8]	10 (0.6)	2.00 (1.49)	3	230	240	7.5	7.6	18	1 ¼ in. SS	37.9 (963)	20 (508)	44 (20)	300
PF10203200 [5, 6, 8]	10 (0.6)	2.00 (1.49)	3	200	208	8.7	8.7	18	1 ¼ in. SS	37.9 (963)	20 (508)	44 (20)	300
PF150311	15 (1.0)	0.33 (0.25)	1	115	120	8.7	8.8	3	1 ¼ in. GFP	19.5 (495)	15 (380)	23 (10)	300
PF150312	15 (1.0)	0.33 (0.25)	1	230	240	4.4	4.5	3	1 ¼ in. GFP	19.5 (495)	15 (380)	23 (10)	300
PF200511	20 (1.3)	0.50 (0.37)	1	115	120	12.3	12.5	4	1 ¼ in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512	20 (1.3)	0.50 (0.37)	1	230	240	6.4	6.5	4	1 ¼ in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF20053200	20 (1.3)	0.50 (0.37)	3	200	208	3.7	3.8	4	1 ¼ in. GFP	22.3 (566)	18 (457)	26 (12)	300
PF201012 [4, 5]	20 (1.3)	1.00 (0.75)	1	230	240	10.5	10.5	7	1 ¼ in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF20103200 [4, 5]	20 (1.3)	1.00 (0.75)	3	200	208	5.8	5.9	7	1 ¼ in. GFP	27.8 (706)	20 (508)	33 (15)	300
PF201512 [4, 5]	20 (1.3)	1.50 (1.11)	1	230	240	12.4	12.6	9	1 ¼ in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF20153200 [4, 5]	20 (1.3)	1.50 (1.11)	3	200	208	7.1	7.2	9	1 ¼ in. GFP	30.7 (780)	20 (508)	35 (16)	300
PF300511	30 (1.9)	0.50 (0.37)	1	115	120	11.8	11.6	3	1 ¼ in. GFP	21.3 (541)	20 (508)	26 (13)	300
PF300512	30 (1.9)	0.50 (0.37)	1	230	240	6.2	6.2	3	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF30053200	30 (1.9)	0.50 (0.37)	3	200	208	3.6	3.6	3	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	5	1 ¼ in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF30073200	30 (1.9)	0.75 (0.56)	3	200	208	4.9	4.9	5	1 ¼ in. GFP	24.6 (625)	21 (533)	30 (14)	300
PF301012 [4]	30 (1.9)	1.00 (0.75)	1	230	240	10.4	10.4	6	1 ¼ in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF30103200 [4]	30 (1.9)	1.00 (0.75)	3	200	208	5.8	5.8	6	1 ¼ in. GFP	26.4 (671)	22 (559)	33 (15)	300
PF301512 [4, 5]	30 (1.9)	1.50 (1.11)	1	230	240	12.6	12.6	8	1 ¼ in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF30153200 [4, 5]	30 (1.9)	1.50 (1.11)	3	200	208	6.9	6.9	8	1 ¼ in. GFP	29.8 (757)	22 (559)	34 (15)	300
PF301534 [4, 5]	30 (1.9)	1.50 (1.11)	3	460	480	2.8	2.8	8	1 ¼ in. GFP	29.5 (685)	22 (559)	34 (15)	300
PF302012 [5, 6, 7]	30 (1.9)	2.00 (1.49)	1	230	240	11.0	11.0	10	1 ¼ in. SS	35.5 (902)	26 (660)	44 (20)	100
PF30203200 [5, 6]	30 (1.9)	2.00 (1.49)	3	200	208	9.3	9.3	10	1 ¼ in. SS	34.0 (864)	24 (610)	41 (19)	300
PF303012 [5, 6, 7, 8]	30 (1.9)	3.00 (2.23)	1	230	240	16.8	16.8	14	1 ¼ in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF303032 [5, 6, 8]	30 (1.9)	3.00 (2.23)	3	230	240	10.0	10.1	14	1 ¼ in. SS	44.3 (1125)	27 (686)	52 (24)	300
PF305012 [5, 6, 7, 8]	30 (1.9)	5.00 (3.73)	1	230	240	25.6	25.8	23	1 ¼ in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF305032 [5, 6, 8]	30 (1.9)	5.00 (3.73)	3	230	240	16.6	16.6	23	1 ¼ in. SS	60.8 (1544)	48 (1219)	66 (30)	300
PF30503200 [5, 6, 8]	30 (1.9)	5.00 (3.73)	3	200	208	18.7	18.7	23	1 ¼ in. SS	60.8 (1544)	48 (1219)	66 (30)	300
PF500511	50 (3.2)	0.50 (0.37)	1	115	120	12.1	12.1	2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512	50 (3.2)	0.50 (0.37)	1	230	240	6.2	6.2	2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500532	50 (3.2)	0.50 (0.37)	3	230	240	3.0	3.0	2	2 in. SS	20.3 (516)	24 (610)	28 (13)	300
PF50053200	50 (3.2)	0.50 (0.37)	3	200	208	3.7	3.7	2	2 in. SS	20.3 (516)	24 (610)	28 (13)	300
PF500534	50 (3.2)	0.50 (0.37)	3	460	480	1.5	1.5	2	2 in. SS	20.3 (516)	24 (610)	28 (13)	300
PF500712	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	3	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF500732	50 (3.2)	0.75 (0.56)	3	230	240	3.9	3.9	3	2 in. SS	23.7 (602)	25 (635)	32 (15)	300

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Specifications, cont.

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Impellers	Discharge size and material [1]	Length, in. (mm)	Min. liquid level, [2] in. (mm)	Weight, [3] lb (kg)	Rated cycles/day
PF50073200	50 (3.2)	0.75 (0.56)	3	200	208	4.9	4.9	3	2 in. SS	23.1 (587)	26 (660)	32 (15)	300
PF500734	50 (3.2)	0.75 (0.56)	3	460	480	1.8	1.8	3	2 in. SS	34.8 (884)	25 (635)	31 (14)	300
PF501012	50 (3.2)	1.00 (0.75)	1	230	240	10.1	10.1	4	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF50103200	50 (3.2)	1.00 (0.75)	3	200	208	5.7	5.7	4	2 in. SS	26.4 (671)	26 (660)	39 (18)	300
PF501034	50 (3.2)	1.00 (0.75)	3	460	480	2.2	2.2	4	2 in. SS	26.4 (671)	26 (660)	39 (18)	300
PF501512[4]	50 (3.2)	1.50 (1.11)	1	230	240	12.5	12.6	5	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF50153200[4]	50 (3.2)	1.50 (1.11)	3	200	208	7.0	7.0	5	2 in. SS	29.3 (744)	26 (660)	35 (16)	300
PF503012 [4, 5, 7, 8]	50 (3.2)	3.00 (2.23)	1	230	240	17.7	17.7	8	2 in. SS	43.0 (1092)	37 (940)	55 (25)	100
PF50303200 [4, 5, 8]	50 (3.2)	3.00 (2.23)	3	200	208	13.1	13.1	8	2 in. SS	43.4 (1102)	30 (762)	55 (25)	300
PF503034 [4, 5, 8]	50 (3.2)	3.00 (2.23)	3	460	480	5.3	5.3	8	2 in. SS	40.0 (1016)	31 (787)	55 (25)	300
PF505012 [5,6,7,8]	50 (3.2)	5.00 (3.73)	1	230	240	26.2	26.4	13	2 in. SS	65.4 (1661)	55 (1397)	64 (29)	300
PF505032 [5,6,7,8]	50 (3.2)	5.00 (3.73)	3	230	240	16.5	16.5	13	2 in. SS	59.3 (1506)	49 (1245)	64 (29)	300
PF751012	75 (4.7)	1.00 (0.75)	1	230	240	9.9	10.0	3	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	4	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.

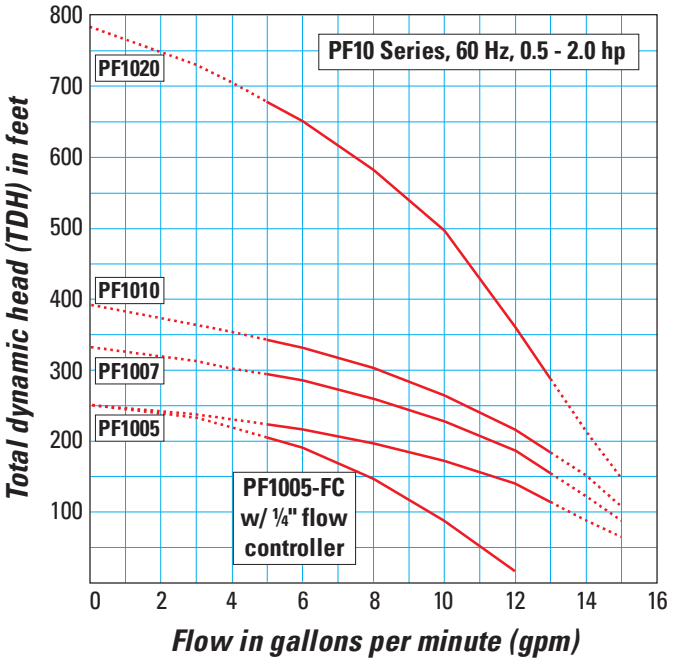
Materials of Construction

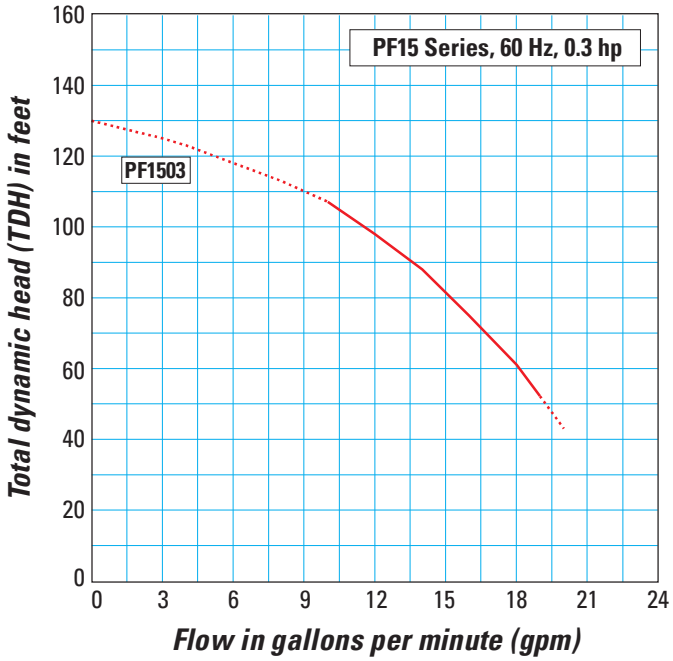
Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (Noryl GFN3)
Impellers	Celcon® acetal copolymer on 10-, 20, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	7/16 inch 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 and 200 and 230 V 3-phase motors 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).

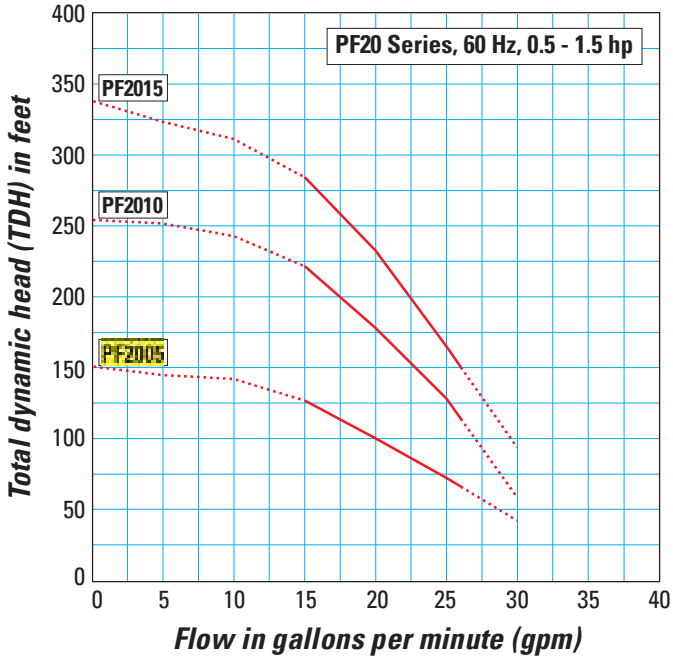
Using a Pump Curve

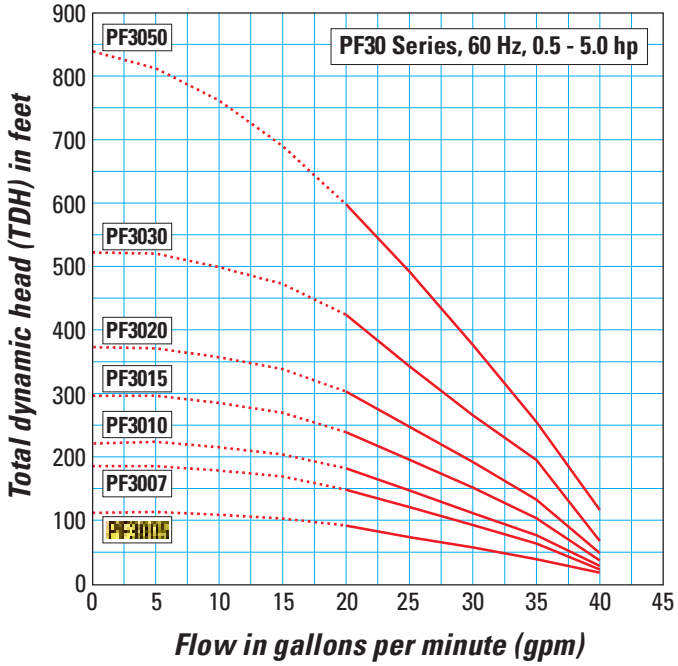
A *pump curve* helps you determine the best pump for your system. Pump curves show the relationship between flow and pressure (total dynamic head, or TDH), providing a graphical representation of a pump's optimal performance range. Pumps perform best at their nominal flow rate. These graphs show optimal 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









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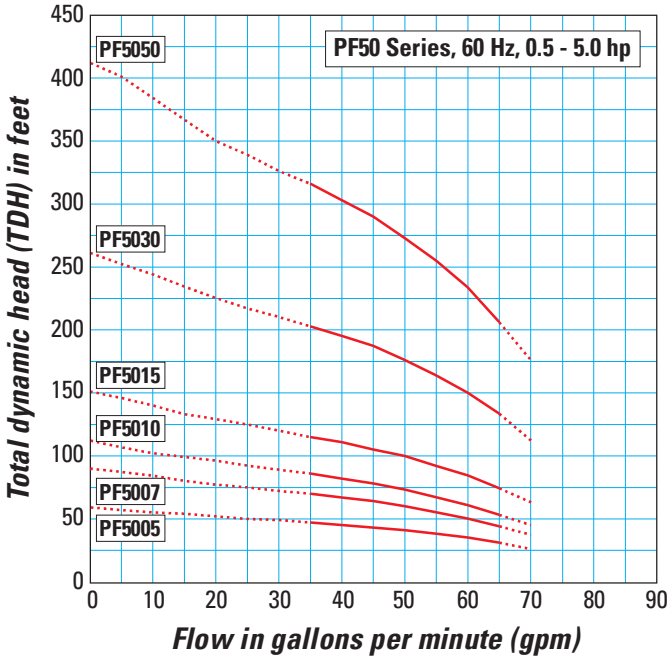
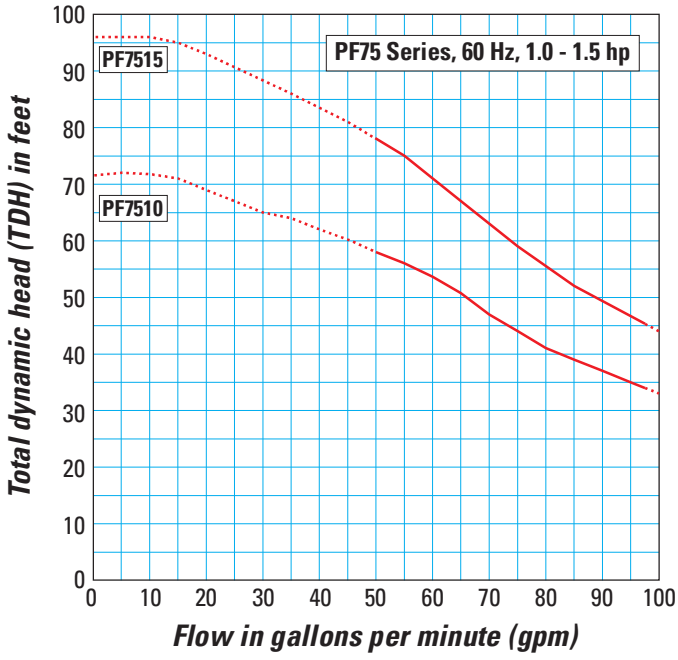
Pump Curves, cont.





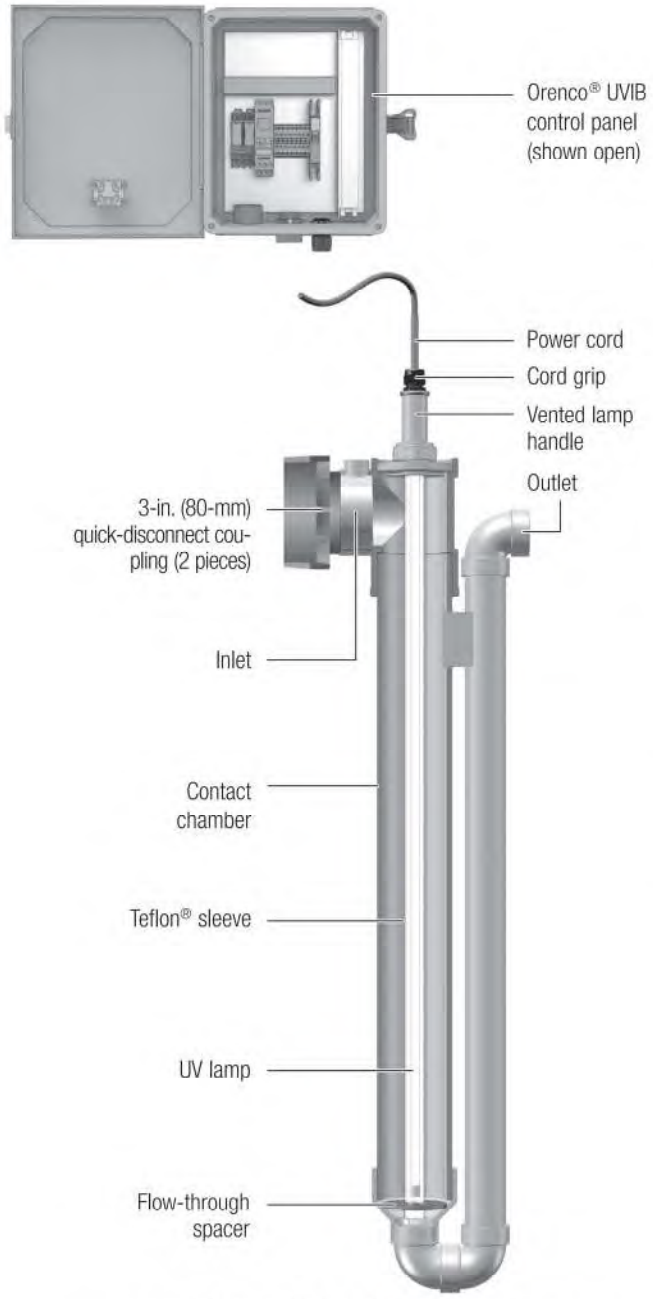
Technical Data Sheet

Orenco® UV Disinfection Unit

Applications

The Orenco® UV Disinfection Unit is designed for use in residential applications after advanced secondary treatment (10 mg/L cBOD5 and TSS) when disinfection is required before dispersal.

It requires installation inside a pump or gravity discharge basin or in a separate tank following an advanced secondary treatment system.



Orenco® UV Disinfection Unit, Cutaway View

General

Treated effluent flows by gravity through the contact chamber and around the UV lamp where it is disinfected in a 360-degree contact zone. The unit uses no chemicals and has no moving parts. It requires annual cleaning and lamp replacement.

In side-by-side NSF® testing, the Orenco UV Disinfection Unit reduced bacteria by 99.999% (5 logs), meeting or exceeding the performance of other residential UV disinfection units.

The Orenco UV Disinfection Unit comes with a power ballast and a lamp current sensor, housed in an Orenco control panel to protect the UV unit's electronic components. The control panel is installed externally, outside of the wet well.

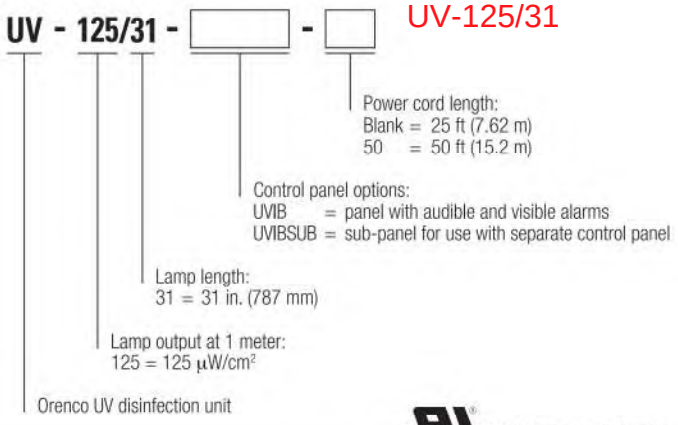
Features/Specifications

- UL-recognized for US and Canada
- Bacteria reduced by 99.999% (5 logs)
- Flow path designed for maximum contact time between effluent and lamp
- Components designed to work together — no piecemeal disinfection assemblies and wiring
- Teflon sleeve to protect lamp and minimize buildup and service intervals
- Quick-disconnect fitting for easy inspection and unit cleaning
- Power ballast and lamp current sensor housed in a control panel (not in a wet well) to minimize corrosion and failure due to environmental exposure

Standard Models

UV-125/31-UVIB, UV-125/31-UVIBSUB

Product Code Diagram



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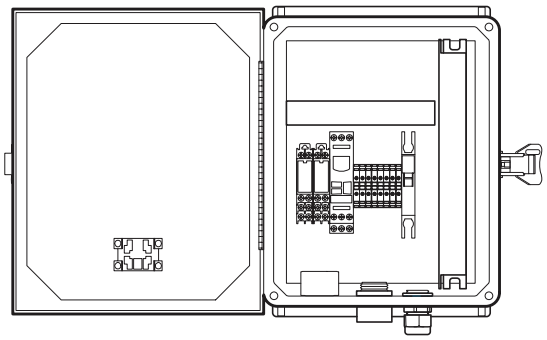
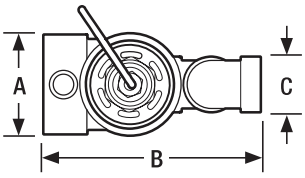


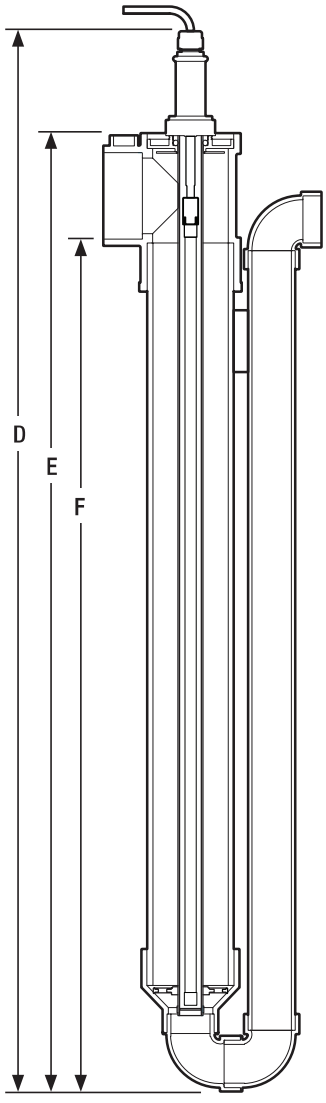
Orenco UVIB Control Panel (Shown Opened)

Materials of Construction

Panel enclosure	UV-resistant fiberglass, UL Type 4X rated
Hinges and latches	Stainless steel
Cord grip	Nylon
Contact chamber	3-in. (80-mm) diameter Sch 40 black ABS
Inlet tee	3-in. (80-mm) Sch 40 black ABS
Other fittings	Black ABS
Quick-disconnect coupling	Black ABS
1½-in. IPS outlet	Black ABS
Lamp assembly seal	EPDM rubber
Lamp sleeve	Teflon®



Orenco UV Disinfection Unit (Top View)



Orenco UV Disinfection Unit (Side Cutaway View)

Specifications

Panel Dimensions, in. (mm)	
Height	11.5 (290)
Width	9.5 (240)
Depth	5.4 (135)
UV Unit Dimensions, in. (mm)	
A	5.63 (143)
B	10.06 (256)
C	1.50 IPS (40 DN)
D	42.25 (1073)
E	38.56 (979)
F	34.50 (876)
Inlet-to-outlet fall	0.50 (13)
UV Unit Performance	
Typical contact chamber UV dose (65% trans-mittance, 20% lamp degradation)	276,000 μW·s/cm² at 1 gpm (0.06 L/sec) 55,000 μW·s/cm² at 5 gpm (0.32 L/sec) 28,000 μW·s/cm² at 10 gpm (0.63 L/sec)
Minimum target dose	30,000-38,000 μW·s/cm²·
Lamp	31 inches (787 mm), 92 VAC, 50 or 60 Hz, 425 mA, 38 W; 254 nm UVC intensity at 1m is 125 μW/cm²·
Power cord	600V, 18/2 UL Type TC
Cord plug	UL listed four-pin connector, lampholder, electric discharge, 1000 V or less
Ballast	120V, AC, 50 or 60 Hz, located in UL listed Orenco® control panel
Audible alarm*	95 dB at 24 in. (610 mm), warble-tone sound
Visual alarm*	⅞-in. (22-mm) diameter red lens, "Push-to-silence." UL Type 4X rated, 1 W LED light, 120 V
Circuit breaker	10 A, OFF/ON switch. Single-pole 120 V*. DIN rail mounting with thermal magnetic tripping characteristics

** UVIB control panels only*

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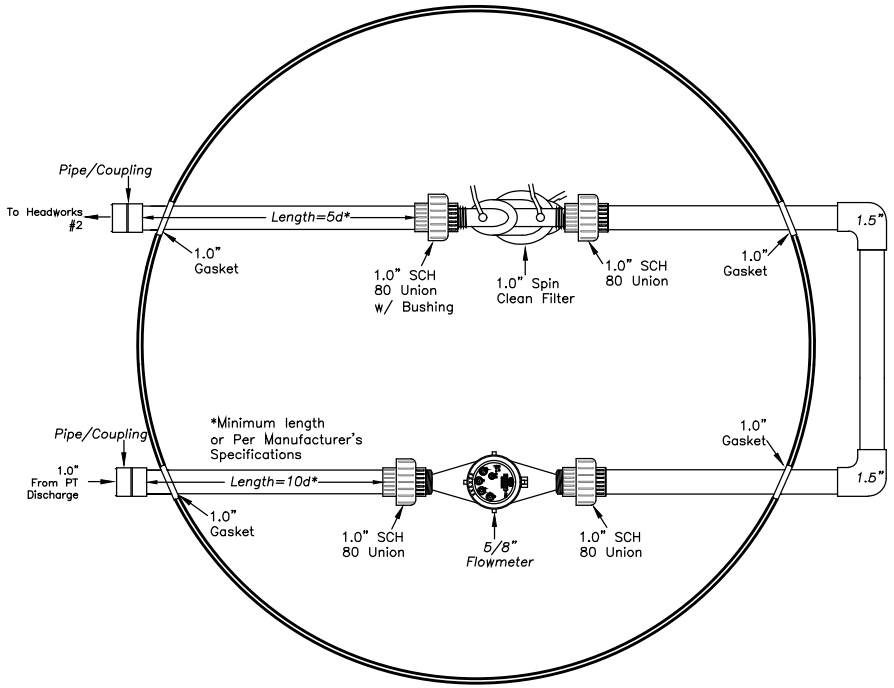
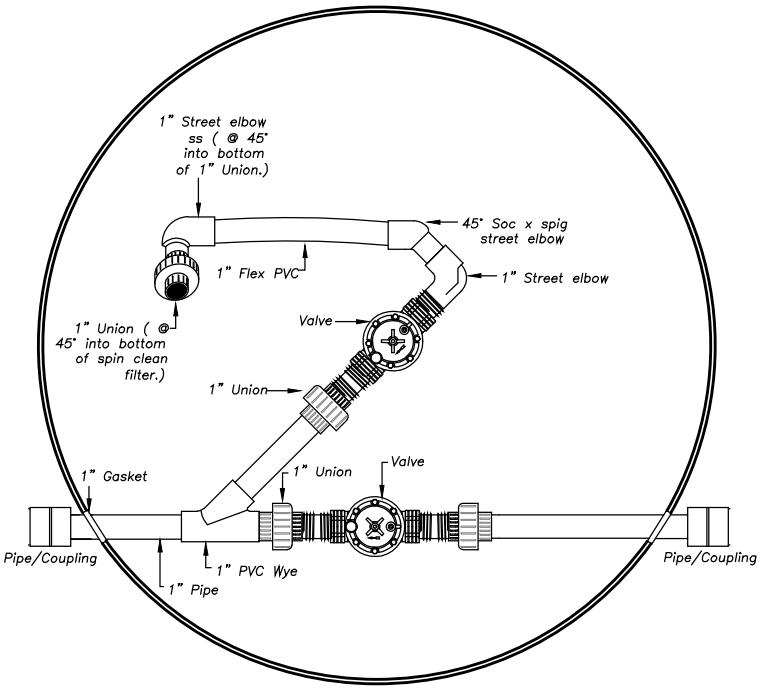
Headworks Unit #1

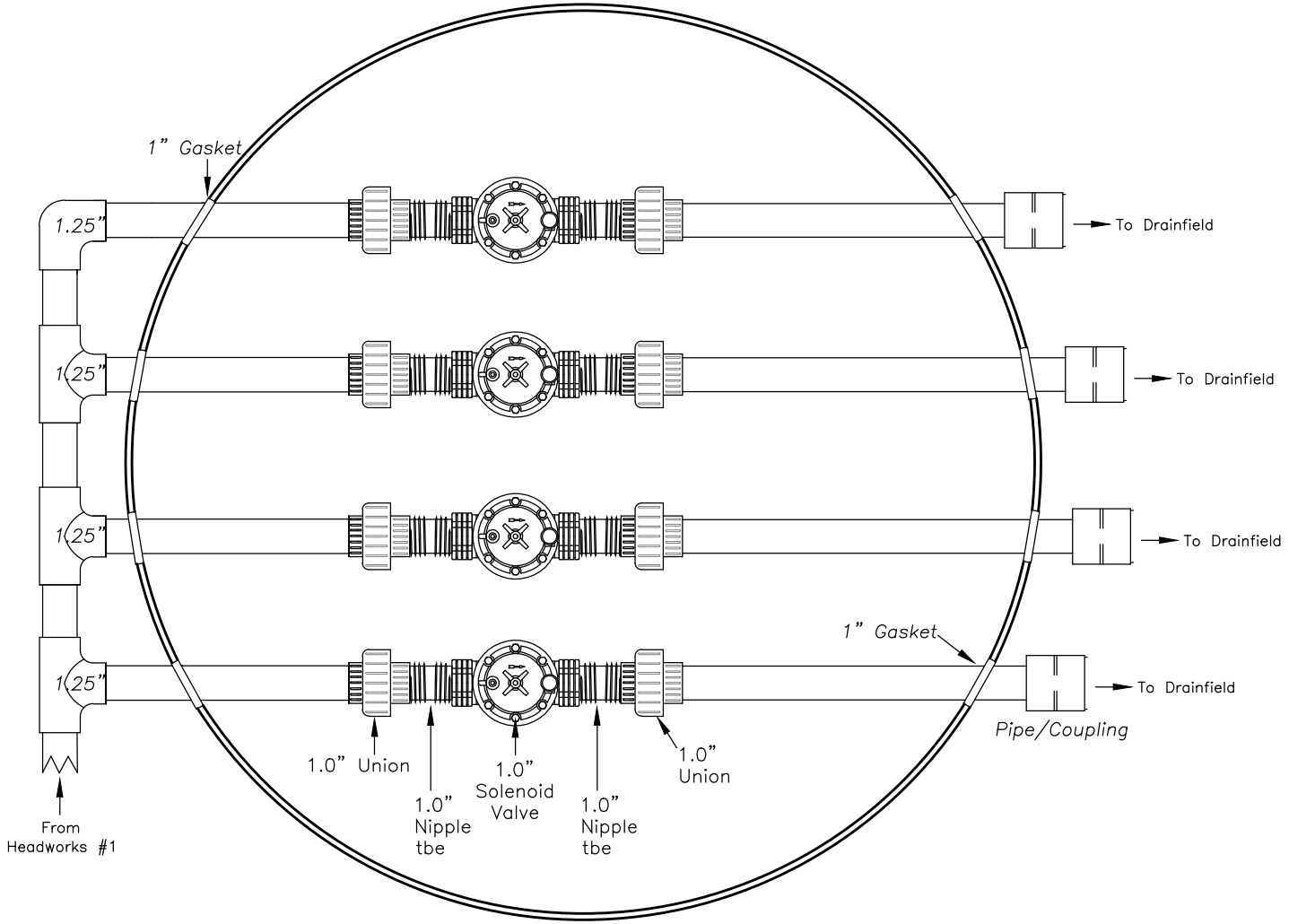


TOP LAYER



BOTTOM LAYER

Headworks Unit #2



WASTEWATER DIVISION

08WRAM.6-24V

NETAFIM™

BIOLINE® DRIPLINE

THE WORLD'S MOST ADVANCED CONTINUOUS SELF-CLEANING, PRESSURE COMPENSATING DRIPLINE SPECIFICALLY DESIGNED FOR WASTEWATER

Copper oxide is impregnated into the emitter serving as a natural antimicrobial agent to help prevent microbial activity.

PRODUCT ADVANTAGES

- Pressure compensation - all drippers deliver equal flow, even on sloped or rolling terrain.
- Unique flow path - Turbonet technology provides more control of water and a high resistance to clogging.
- Continuous self-flushing dripper design - flushes debris, as it is detected - throughout operation, not just at the beginning or end of a cycle. Ensures uninterrupted dripper operation.
- Single hole dripper outlet from tubing:
  - Better protection against root intrusion
  - Allows the dripline to be used in subsurface applications without need for chemical protection
- Drippers capture water flow from the center of the tubing - ensures that only the cleanest flow enters the dripper.
- Built-in physical root barrier - drippers are protected from root intrusion without the need for chemical protection.
- Three dripper flow rates - provides the broadest range of flow rates available. Allows the designer to match the dripline to any soil or slope condition.
- Bioline tubing is completely wrapped in purple - easily identifying it for non-potable use, regardless of how the tubing is installed.
- Cupron copper oxide is impregnated at specific concentrations, our patent-pending process, ensuring it remains effective throughout the life of the product.
- Bioline can be installed on-surface, under cover or subsurface.
- No special storage requirements - does not degrade if stored outdoors.

APPLICATIONS

- Typically installed following a treatment process
- Can be used with domestic septic tank effluent with proper design, filtration and operation
- Reuse applications including municipally treated effluent designated for irrigation and other disinfected and non-disinfected water sources.

SPECIFICATIONS

- Dripper flow rates: 0.4, 0.6 or 0.9 GPH
- Dripper spacings: 12", 18" or 24" dripper spacings and blank tubing
- Pressure compensation range: 7 to 58 psi
- Maximum recommended system pressure: 58 psi
- Tubing diameter: 0.66" OD, 0.56" ID
- Tubing color: Purple color indicates non-potable
- Coil lengths: 500' or 1,000' (Blank tubing in 250')
- Recommended filtration: 120 mesh
- Bending radius: 7"
- UV resistant
- Tubing material: Linear low-density polyethylene

Additional spacing and pipe sizes available by special order. Please contact Netafim USA Customer Service for details.

BIOLINE DRIPLINE

MAXIMUM LENGTH OF A SINGLE LATERAL WITH 3.0 fps FLUSH VELOCITY

ADDITIONAL FLOW OF 2.3 GPM REQUIRED PER LATERAL TO ACHIEVE 3 fps

	DRIPPER SPACING	12"			18"			24"		
	DRIPPER FLOW RATE (GPH)	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH
INLET PRESSURE	15	102	94	84	136	127	113	161	151	137
	25	151	136	118	203	184	161	245	223	197
	35	193	171	146	260	232	200	315	283	245
	40	211	186	158	286	254	218	347	311	267
	45	228	200	169	310	274	233	377	335	287
	Flow per 100' (GPM / GPH)	0.67/40	1.02/61	1.53/92	0.44/26.67	0.68/41	1.02/61	0.34/20	0.51/31	0.77/46

Lateral lengths are based on flows allowing for a 3 fps flushing/scouring velocity

MAXIMUM LENGTH OF A SINGLE LATERAL WITH 1.5 fps FLUSH VELOCITY

ADDITIONAL FLOW OF 1.2 GPM REQUIRED PER LATERAL TO ACHIEVE 1.5 fps

	DRIPPER SPACING	12"			18"			24"		
	DRIPPER FLOW RATE (GPH)	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH
INLET PRESSURE	15	201	171	140	275	235	194	337	289	241
	25	266	222	179	366	308	251	453	383	313
	35	316	262	210	437	365	295	543	455	369
	40	337	280	223	469	391	313	583	487	393
	45	358	296	235	497	413	331	619	517	415
	Flow per 100' (GPM / GPH)	0.67/40	1.02/61	1.53/92	0.44/26.67	0.68/41	1.02/61	0.34/20	0.51/31	0.77/46

Lateral lengths are based on flows allowing for a 1.5 fps flushing/scouring velocity

MAXIMUM LENGTH OF A SINGLE LATERAL WITH 2.5 fps FLUSH VELOCITY

ADDITIONAL FLOW OF 2.0 GPM REQUIRED PER LATERAL TO ACHIEVE 2.5 fps

	DRIPPER SPACING	12"			18"			24"		
	DRIPPER FLOW RATE (GPH)	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH
INLET PRESSURE	15	128	115	100	172	155	136	205	187	165
	25	183	161	137	248	220	188	301	268	231
	35	228	198	166	310	272	229	379	333	283
	40	248	214	178	338	295	247	413	362	305
	45	266	229	190	364	316	263	447	389	327
	Flow per 100' (GPM / GPH)	0.67/40	1.02/61	1.53/92	0.44/26.67	0.68/41	1.02/61	0.34/20	0.51/31	0.77/46

Lateral lengths are based on flows allowing for a 2.5 fps flushing/scouring velocity

MAXIMUM LENGTH OF A SINGLE LATERAL WITH 1.0 fps FLUSH VELOCITY

ADDITIONAL FLOW OF 0.8 GPM REQUIRED PER LATERAL TO ACHIEVE 1.0 fps

	DRIPPER SPACING	12"			18"			24"		
	DRIPPER FLOW RATE (GPH)	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH
INLET PRESSURE	15	248	205	163	344	285	228	427	355	285
	25	315	258	203	440	361	286	549	453	359
	35	367	299	234	513	419	331	643	527	417
	40	389	316	248	545	445	350	683	559	441
	45	409	332	260	574	468	367	721	589	463
	Flow per 100' (GPM / GPH)	0.67/40	1.02/61	1.53/92	0.44/26.67	0.68/41	1.02/61	0.34/20	0.51/31	0.77/46

Lateral lengths are based on flows allowing for a 1 fps flushing/scouring velocity

MAXIMUM LENGTH OF A SINGLE LATERAL WITH 2.0 fps FLUSH VELOCITY

ADDITIONAL FLOW OF 1.6 GPM REQUIRED PER LATERAL TO ACHIEVE 2.0 fps

	DRIPPER SPACING	12"			18"			24"		
	DRIPPER FLOW RATE (GPH)	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH
INLET PRESSURE	15	161	141	119	217	191	164	263	233	201
	25	221	190	157	302	261	218	369	321	270
	35	269	229	187	370	316	260	455	391	324
	40	290	246	200	399	340	278	493	421	347
	45	310	261	212	427	362	296	527	449	369
	Flow per 100' (GPM / GPH)	0.67/40	1.02/61	1.53/92	0.44/26.67	0.68/41	1.02/61	0.34/20	0.51/31	0.77/46

Lateral lengths are based on flows allowing for a 2 fps flushing/scouring velocity

MAXIMUM LENGTH OF A SINGLE LATERAL WITH 0.5 fps FLUSH VELOCITY

ADDITIONAL FLOW OF 0.4 GPM REQUIRED PER LATERAL TO ACHIEVE 0.5 fps

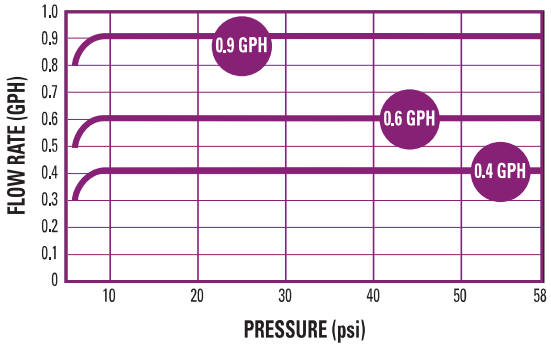
	DRIPPER SPACING	12"			18"			24"		
	DRIPPER FLOW RATE (GPH)	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH	0.4 GPH	0.6 GPH	0.9 GPH
INLET PRESSURE	15	301	242	188	422	341	265	531	429	335
	25	369	296	228	520	418	323	655	527	409
	35	421	337	260	595	476	368	749	603	467
	40	443	354	273	626	501	387	790	635	491
	45	464	371	285	656	524	404	829	665	513
	Flow per 100' (GPM / GPH)	0.67/40	1.02/61	1.53/92	0.44/26.67	0.68/41	1.02/61	0.34/20	0.51/31	0.77/46

Lateral lengths are based on flows allowing for a 0.5 fps flushing/scouring velocity

Netafim recommends flushing velocities capable of breaking free any accumulated bioslimes and debris in the piping network.

Notes:
1. Refer to local regulations for information on flushing velocities that may be written into codes.
2. Netafim does not endorse a specific flushing velocity.
3. Flushing velocities should be determined based on regulations, quality of effluent, and type of flushing control.
4. Using a flushing velocity less than 1 fps does not provide turbulent flow as defined by Reynolds Number.
5. Higher flushing velocities provide more aggressive flushing.

DRIPPER FLOW RATE VS. PRESSURE



Between 0 and 7 psi, the dripper functions as a turbulent flow emitter, ensuring that the nominal design flow is not exceeded at system start-up.

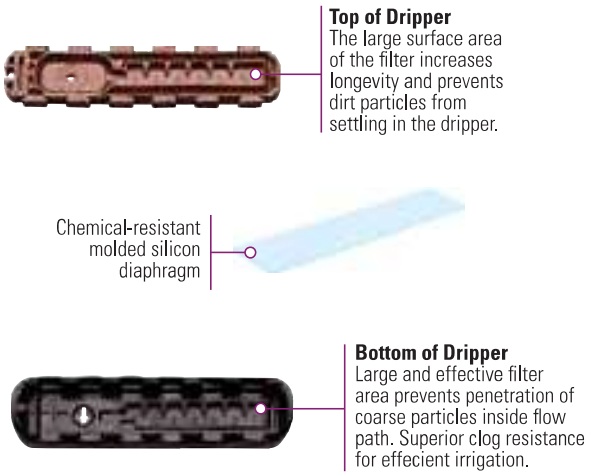
FLOW PER 100 FEET

DRIPPER SPACING	0.4 GPH DRIPPER		0.6 GPH DRIPPER		0.9 GPH DRIPPER	
	GPH	GPM	GPH	GPM	GPH	GPM
12"	40.0	0.67	61.0	1.02	92.0	1.53
18"	26.7	0.44	41.0	0.68	61.0	1.02
24"	20.0	0.34	31.0	0.51	46.0	0.77

Netafim sets the bar for innovation in drip irrigation with copper. Cupron® copper oxide-based technology allows for maximum performance. The integration of copper oxide in the internal emitter, and the unique patented emitter design with physical root barrier provides two levels of protection, giving your system the protection it needs to fight against root intrusion.

- Cupron copper oxide provides one of two layers of defense against root intrusion, a physical root barrier inside the dripper provides the other.
- Cupron copper oxide technology will not wash out, wear off or leach out; remaining effective throughout the life of the product.
- Cupron copper oxide is approved for use by the EPA ensuring peace of mind.

EXPLODED VIEW OF BIOLINE DRIPPER



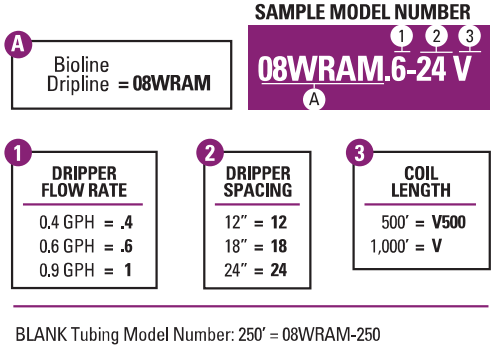
BIOLINE DRIPPER OPERATION

Bioline drippers are pressure compensating - delivering the water uniformly into the soil for further treatment or for reuse by the landscape. These unique drippers allow the tubing to be installed on flat topography or steep slopes.

Bioline drippers are protected against microbial activity. Copper oxide impregnated XR drippers – Copper, a natural antimicrobial material, is used to help prevent microbial activity.

Netafim drippers are continuously self-cleaning during operation, not just at the beginning and end of a cycle. The result is dependable, clog-free operation, year after year.

SPECIFYING INFORMATION



BLANK Tubing Model Number: 250' = 08WRAM-250

ORDERING INFORMATION

FLOW RATE	DRIPPER SPACING	COIL LENGTH	MODEL NUMBER
0.4 GPH	12"	1,000' 500'	08WRAM.4-12V 08WRAM.4-12V500
0.4 GPH	18"	1,000' 500'	08WRAM.4-18V 08WRAM.4-18V500
0.4 GPH	24"	1,000' 500'	08WRAM.4-24V 08WRAM.4-24V500
0.6 GPH	12"	1,000' 500'	08WRAM.6-12V 08WRAM.6-12V500
0.6 GPH	18"	1,000' 500'	08WRAM.6-18V 08WRAM.6-18V500
0.6 GPH	24"	1,000' 500'	08WRAM.6-24V 08WRAM.6-24V500
0.9 GPH	12"	1,000' 500'	08WRAM1-12V 08WRAM1-12V500
0.9 GPH	18"	1,000' 500'	08WRAM1-18V 08WRAM1-18V500
0.9 GPH	24"	1,000' 500'	08WRAM1-24V 08WRAM1-24V500
Blank Tubing 17mm		250'	08WRAM-250

Master Meter's Multi-Jet meter exceeds the AWWA C708 standard. With sensitivity to measure water flowing as low as 1/8 gallon per minute and accuracy unaffected by common particulates and build-up that would freeze other types, you can count on our Multi-Jet technology.

Technical Specifications:

AWWA Standard -Meets or exceeds all sections of AWWA Standard C-708, most recent revision. Compliant with SDWA, NSF ANSI 372 and NSF ANSI 61 standards.

Register - Standard Direct Read, DIALOG® 3G AMR System registers, AccuLinx Encoder, and IP 68 Electrical Output registers available. Together, an integrated and migratable technology environment is attained; direct, proximity (touch), mobile AMR, and Fixed Network AMI.

Register Sealing - Direct Read and DIALOG registers are permanently sealed with a scratch resistant glass lens, stainless steel base and wrap-around gasket to prevent intrusion of dirt or moisture.

Features & Benefits:

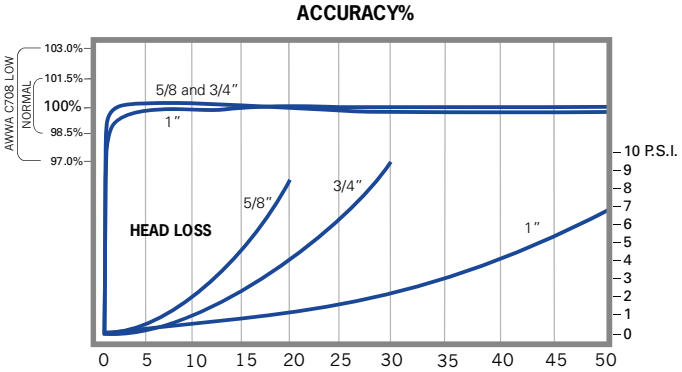
- Rugged basket strainer built from advanced polymer materials for superior wear mitigation.
- Proprietary design produces smooth, laminar flow profile for improved accuracy
- Award-winning DIALOG 3G register design houses all vital components - encoder, RF transmitter, battery and antennae - safely within the register's stainless steel and tempered glass enclosure. Free of external wires, components and connections - the #1 cause of field related issues on competitive designs.
- Assures compliance with the Safe Drinking Water Act (SDWA).
- Measures with only one moving part that is hydro-dynamically balanced on a sapphire bearing to preserve accuracy and promote a positive bottom line.
- Exceptional performance in passing entrained solids and operating in environments with high mineral content.
- Clean, elegant measurement design is highly sensitive to leaks and low flow while limiting wear for excellent revenue protection.

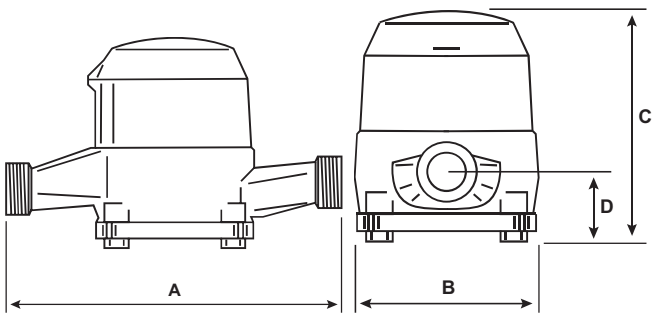
Technical Specs (Cont'd):

- **Register Unit** - Registration available in U.S. gallons, cubic feet or cubic meters.
- **Test Circle** - Large center sweep hand with one hundred (100) clearly marked gradations on the periphery of the dial face (available on Direct Read and DIALOG 3G registers).
- **Design/Operation** - Velocity-type flow measurement. Water that is evenly distributed by multiple converging inlet ports flows past an impeller in the measuring chamber, creating an impeller velocity directly proportional to water flow rate. The meter's register integrates that velocity into totalized flow. An inherent advantage for this design is unparalleled wear mitigation leading to sustained revenues. The register assembly is removable under line pressure permitting seamless, simplified upgrades in reading technology.
- **Strainer** - A rugged, 360-degree advance polymer basket strainer protects the critical measuring element from damage. The unique strainer design smoothes the flow of water entering into the meter creating a laminar flow that is gentle on the meter's internal components. Tough materials operating in a smooth, balanced environment enable the meters to perform more accurately over time. Utilities' investments last longer while capturing more revenue.
- **Measuring Chamber** - The measuring chamber housing and measurement element are built with an advanced synthetic polymer. Measurement surfaces are not wear surfaces, providing sustained accuracy despite the presence of entrained solids in the water. A long life, synthetic sapphire bearing serves as a wear surface with radially balanced water flows. The chamber housing is constructed in two parts to allow access to the impeller. Bottom plates available in Bronze, Cast Iron (CI) or Engineered Plastic.

METER OPERATING CHARACTERISTIC/DIMENSION	*5/8"*	*3/4" x 7-1/2"*	*3/4" x 9"*	*3/4" x 9" x 1"*	*1"*
Flow Rating (gpm)	20	30	30	30	50
Continuous Flow (gpm)	15	20	20	20	30
Normal Flow Range (gpm)	1-20	2-30	2-30	2-30	3-50
Extended Low Flow (gpm)	1/4	1/2	1/2	1/2	3/4
Maximum Working Pressure (psi)	150	150	150	150	150
Maximum Working Temperature (F)	120	120	120	120	120
Length (A below)	7-1/2"	7-1/2"	9"	9"	10-3/4"
Width (B below)	3-5/8"	3-5/8"	3-5/8"	3-5/8"	4"
Height, standard register with lid (C below)	5"	5"	5"	5"	5-1/4"
Height, bottom to center line (D below)	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-3/4"
Weight (lbs)	3.95	4.0	4.1	4.6	5.25
Packed To Carton	6	6	6	4	4
Carton Weight (lbs)	25.1	25.4	26	19.8	22.4

Accuracy and Head Loss Chart





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VALVES

ELECTRIC PBI THROTTLING VALVES

PROVEN PERFORMANCE WITH A SIMPLE LOW MAINTENANCE DESIGN

1" ELECTRIC PBI THROTTLING NYLON VALVE

323 ELECTRIC PBI THROTTLING NYLON VALVE

APPLICATIONS

- Small agricultural irrigation zones
- Greenhouse and nursery irrigation
- Cooling systems
- Ultra high flow or low flow capacity irrigation systems

SPECIFICATIONS

- Available Sizes: 1", 1 1/2", 2" and 323
- Maximum Working Pressure:
  1" - 115 psi and 2" to 323 - 150 psi
- Maximum Water Temperature: 140° F
- Connections: Female Threaded NPT
- Electrical Specifications:
  Voltage - Standard 24 VAC, 60 Hz
  Inrush Current - 29mA
  Holding Current - 14mA
  Allowable Voltage Variation: 10%

MATERIALS

- Body and Bonnet: Glass Reinforced Nylon
- Spring: Stainless Steel (AISI 302)
- Nuts, Bolts, Washers: Stainless Steel (304)
- Diaphragm: Natural Rubber

PRODUCT ADVANTAGES

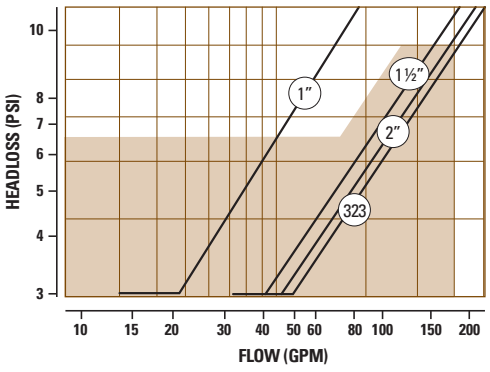
- Durable, glass reinforced nylon construction provides superb hydraulic performance.
- Large internal water passage with no moving parts in the flow path prevents clogging.
- Built-in 2-Way Solenoid with low power requirement for ease of operation and reliability.
- Simple installation either vertically or horizontally.
- High resistance to corrosive water containing fertilizer and chemicals.
- Standard with a flow control (throttling) handle.

ORDERING INFORMATION

SIZE	ITEM NUMBER	MODEL NUMBER
1"	71610-014015	61ET1PBI-BC
1 1/2"	71610-014040	61ET1.5PBI2-BC
2"	71610-014507	61ET2PBI2-BC
323	71610-015202	61ET323PBI2-BC

SOLD IN CASE QUANTITIES AND 24VAC ONLY
1" CASE QUANTITY = 20
1 1/2" AND 2" CASE QUANTITY = 8
323 CASE QUANTITY = 4

FLOW RATE VS. PRESSURE LOSS



LIGHT BROWN AREA INDICATES RECOMMENDED OPERATING RANGE.

FLOW RANGE

SIZE	GPM
1"	1 - 50
1 1/2"	1 - 125
2"	1 - 176
323	1 - 264

DIMENSIONS & WEIGHT

SIZE	LENGTH	HEIGHT	WEIGHT
1"	4 7/8"	4 7/8"	.5 LBS.
1 1/2"	7 3/8"	6"	2.0 LBS.
2"	7 7/8"	6"	2.2 LBS.
323	9 1/4"	6 5/8"	3.1 LBS.

NETAFIM USA
5470 E. Home Ave.
Fresno, CA 93727
CS 888 638 2346
www.netafimusa.com

A070 10/13

Jain is a fully integrated global food / plant production company recognized by Harvard Business to be one of five global sustainability champions, the G-20 for lifting people out of poverty, and Fortune magazine for being a "Change the World Company." Our irrigation manufacturing capabilities include everything from behind the pump to the flush valve at the end of the lateral and everything in between. We lead the industry in manufacturing technology, owning both our extrusion and mold manufacturing equipment providers.

Jain leads plant science research globally across a variety of food crops and is staffed with some of the world's leading research scientists. With the Gandhi Library, Jain now houses the leading collection of the world's best plant science knowledge in a single facility. Our agronomic knowledge is integrated from our world class plant tissue culture operations through our food processing businesses. We research, educate, advance, manufacture, finance, propagate plants, and purchase produce for processing all in an effort to fulfill the Jain mission:

"Leave This World Better Than You Found It"

Jain Irrigation, Inc.
www.jainsusa.com

Jain Customer Service
Phone: (559) 485-7171
Fax: (800) 777-6162

Jain Corporate Office
5965 S 900 E
Murray, UT 84121

Western Manufacturing Facility
2851 E. Florence Ave.
Fresno, CA 93721

Northeastern Manufacturing Facility
740 Water St.
Watertown, NY 13601

Please recycle after use.

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jainsusa @jainsusa @jainsusa

Plastic Spin Clean 4E Filters

Product Features

- No moving parts
- Unique Spin Clean action keeps the screen clean during operation
- Engineered plastic construction is light in weight and resistant to corrosion and injected chemicals
- Two piece threaded housing with O-ring seal for easy screen access and maintenance
- Pressure ratings of 80 psi available in ¾" and 1" models, 150 psi rating for ¾" to 2"
- Strong stainless steel screen elements available in 30, 50, 100, 150 (standard) and 200 mesh
- Vinyl screen collars prevent debris from by-passing filter area
- Suitable for both above and below grade in box installation
- Available with ball valve for flushing debris basin
- Only 5-8 psi pressure loss required across filter to ensure best self cleaning action

Your Natural Choice for Vineyards and Orchards

Plastic Spin Clean Filters are unique screen filters that stay clean during operation. They effectively keep debris moving across the screen element towards the basin, where it is collected and can be drained.

The 4E Plastic Spin Clean Filter is best suited for applications where the contaminants are heavy particles like sand.

Models and Specifications

Type	Inlet/Outlet Size	Inlet/Outlet Type	Basin Cap or Valve	Basin Outlet Threads	Maximum Flow Rate (gpm)	Maximum Working Pressure (psi)
4E-3/4 A	3/4"	MPT	Cap	3/4 MPT	11	80
4E-3/4 B	3/4"	MPT	Valve	3/4 MPT	11	80
4EH-3/4 A	3/4"	MPT	Cap	3/4 MPT	11	150
4EH-3/4 B	3/4"	MPT	Valve	3/4 MPT	11	150
4E-1 A	1"	MPT	Cap	3/4 MPT	20	80
4E-1 B	1"	MPT	Valve	3/4 MPT	20	80
4EH-1 A	1"	MPT	Cap	3/4 MPT	20	150
4EH-1 B	1"	MPT	Valve	3/4 MPT	20	150
4EH-1 1/2	1 1/2"	MPT	Valve	3/4 MPT	55	150
4EH-2 P	2"	MPT	Valve	3/4 MPT	120	150

Ordering Information:

Examples: Type -Screen Mesh

4E-3/4B-200 ¾" MPT w/MHT flush & Ball Valve (80psi) w/200 mesh screen
4EH-1A-30 1" MPT w/MPT flush & Ball Valve (150 psi) w/30 mesh screen
4EH-1½-150 1½" MPT w/MPT flush & Ball Valve (150 psi) w/150 mesh screen

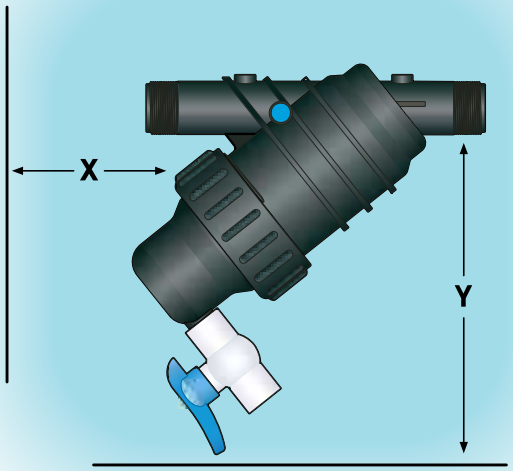
Options:

All models – Drilled and tapped 1/8" hole for pressure gauge, Shrader Valve or 1/8" mipt fitting at inlet and outlet boss 1" and larger models – BSP Threads

- Please call customer service for availability

Minimum Clearance

Size	X	Y
4E-3/4 & 1 w/cap	5"	8"
4E-3/4 & 1 w/valve	6"	12"
4EH-1-1/2	4"	15.5"
4E-02	4"	15.5"



6. Inspection Documentation

Engineers and Soil Scientists

Agri-Waste Technology, Inc.
501 N Salem Street, Suite 203, Apex, NC 27502
agriwaste.com | 919.859.0669

Sandy Plains Fire Station - WWTS
Subsurface Drip with
TS-II Pretreatment

Please consider the following information when installing this Subsurface Drip with Pretreatment System and preparing the information required for the final Engineer Certification and Authorization to Construct Meeting. Inspections (by the certifying Professional Engineer or designated representative) will be required during the system installation. Please note that representatives from Wake County Environmental Health or North Carolina Department of Environment and Natural Resources, Division of Environmental Health, On-site Water Protection may also attend or inspect the system installation. The installation inspections shall be coordinated with Agri-Waste Technology, Inc. (AWT) at 919-859-0669 at least 48 hours notice when scheduling an inspection.

Initial Inspection

The initial inspection shall be scheduled during system installation.
The approximate state of construction for this inspection is as follows:

- Tanks shall be installed and partially backfilled.
  The top of the tanks shall be left uncovered for inspection.
- Tank risers shall be installed and sealed to tank.
- All piping between tanks shall be installed.
- AdvanTex Treatment Pod installed and plumbed.
- Control Panel location shall be marked.
- Headworks Boxes placed.
- Cleanouts installed (at house).

The following items shall be verified and approved by the inspector at the initial inspection:

___ Septic Tank Size	___ Tank Risers	___ Pipe Size/Type
___ Pump Tank Size	___ Tank Testing*	___ Pipe Routing
___ Treatment Pod Size	___ Control Panel Location	

*System installer shall provide Engineer with documentation of tank leakage testing.
Photographs of the installation shall be taken by the inspector.

Comments:

_____ _____
Inspector Name and Signature Date of Inspection

Engineers and Soil Scientists

Agri-Waste Technology, Inc.
501 N Salem Street, Suite 203, Apex, NC 27502
agriwaste.com | 919.859.0669

Sandy Plains Fire Station - WWTS
Subsurface Drip with
TS-II Pretreatment

Final Inspection

The Final inspection shall be scheduled at the completion of the system installation.
The following activities shall be accomplished prior to final inspection:

- Complete system installation.
- Headworks shall be installed and plumbed to components.
- Final grading and stabilization.
- Electrical connections made.
- Water in tank to operate system.
- All meter boxes installed.
- Dripfield installed.
- UV Bulb installed.

The following items shall be verified and approved by the inspector at the final inspection:

___ Safety Nets Installed
___ Tank Lids Installed
___ Control Panel Installed/Wired
___ Effluent Filter Installed
___ Float Switch Elevations
___ Pump Operational
___ Pump Flowrate
___ System Operational
___ Meter Boxes
___ Dripfield Pressures
___ Final Site Grading

- Installer to provide pictures taken during construction.
- Photographs of the construction progress shall be taken by the inspector.

Comments:

_____ _____
Inspector Name and Signature Date of Inspection

Engineers and Soil Scientists

Agri-Waste Technology, Inc.
501 N Salem Street, Suite 203, Apex, NC 27502
agriwaste.com | 919.859.0669

Sandy Plains Fire Station - WWTS
Subsurface Drip with
TS-II Pretreatment

Installer Certification:

I (*Installer Company and Name*) _____
certify that the installation of the **Sandy Plains Fire Station - WWTS** was under my direct supervision. Further, to the best of my abilities, due care and diligence was used in the construction such that the system was built within substantial compliance and intent of the approved plans and specifications. Any deviation (to the extent there were deviations) from the approved plans is noted below.

Comments:

_____
Installer Name and Signature

_____
Date

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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ARTICLE 1. DEFINITIONS

1.1 Agreement - The Construction Agreement, these General Conditions, and any Supplementary Conditions.

1.2 AIA - The American Institute of Architects.

1.3 ASTM - The American Society for Testing and Materials.

1.4 Beneficial Occupancy – The point at which the Project can be occupied by the Owner for its intended purpose, upon achievement of Substantial Completion, as defined in 1.40.

1.5 Change Order - A written order to the Contractor signed by the Owner and the Designer authorizing an addition, deletion, or revision in the Work and/or an adjustment in the Contract Price and/or the Contract Time issued after execution of the Construction Agreement. See paragraph 14.1.

1.6 Completion Date - Those dates identified as Completion Dates in the Contract Construction Schedule or elsewhere in the Contract Documents.

1.7 Construction Agreement – The document executed by the Contractor and the Owner to formally memorialize their consent to the terms of the Agreement.

1.8 Construction Change Directive – A written order to the Contractor signed by the Owner and the Designer directing an addition, deletion, or revision in the Work after execution of the Construction Agreement, in circumstances when the parties have been unable to agree on an adjustment to the Contract Price or the Contract Time, but the Owner requests that the Contractor proceed with said Work subject to adjustment of the Contract Price and/or Contract Time under the procedures described herein.

1.9 Construction Manager(s) - The person or firm designated as the Construction Manager in the Contract Documents, or their authorized representatives. The Construction Manager(s), as referred to herein, will be referred to hereinafter as if each were of the singular number, masculine gender.

1.10 Contract Construction Schedule - That schedule described in Article 13 hereof and identified as the Contract Construction Schedule.

1.11 Contract Documents - All of the documents that make up the Agreement, plus the Drawings and Specifications that describe the scope of the Work, plus allowable Modifications to the Contract Documents.

1.12 Contract Price - The total monies payable to the Contractor under the Contract Documents pursuant to paragraph 15.1 of the Agreement.

1.13 Contract Time - The number of calendar days stated in, or computed from, the Contract Documents for the completion of the Work, or any portion thereof. See, particularly, Article 13 hereof and the Contract Construction Schedule. Time of completion as specified therein is of the essence. The time used and referred to on the Project will be that time which is

observed in Raleigh, North Carolina, being Eastern Daylight Savings Time (EDT), Eastern Standard Time (EST), or other as designated by the Designer.

1.14 Contractor - The Contractor shall be that party identified as such in the Agreement.

1.15 Days - Unless otherwise indicated, the term "days" shall mean consecutive calendar days.

1.16 Daylight Hours - The hours or portions of hours between sunrise and sunset local time.

1.17 Designer(s) – The person or firm designated as the Designer in the Contract Documents, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect, landscape architect, and/or engineer. They will be referred to hereinafter as if each were of the singular number, masculine gender.

1.18 Drawings - The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location, and dimensions of the Work, and generally including plans, elevations, sections, details, schedules and diagrams. A list of the Drawings is contained in the Supplemental General Conditions.

1.19 Field Order - A written order issued by the Designer which clarifies or interprets the Contract Documents or orders minor changes in the Work in accordance with the Contract Documents. See paragraph 14.2.

1.20 Final Completion - The point at which the Contractor has, as determined by the Designer, completed the Work, with the exception of guaranty and warranty obligations, and becomes entitled, upon the recommendation of the Designer and determination by the Owner, to final payment.

1.21 The words "furnish," "furnish and install," "install," and "provide" or words with similar meanings shall be interpreted, unless otherwise stated, to mean furnish and install complete, in place and ready for service.

1.22 Liquidated Damages – See paragraph 13.18 of these General Conditions.

1.23 Modification - (A) a written amendment to the Contract Documents signed by the Owner and the Contractor and identified therein as such, (B) a Change Order, (C) Construction Change Directive, or (D) a Field Order. A Modification may only be issued after execution of the Agreement.

1.24 Notice of Award - The written notice by the Owner to the Contractor that the Contractor is the successful Bidder and that upon compliance with the conditions precedent to be fulfilled by the Contractor within the time specified, the Owner will execute and deliver the Agreement to him.

1.25 Notice to Proceed - See paragraph 13.3.

1.26 Owner - The Owner is the person designated as such in the Agreement.

1.27 Owner's Authorized Representative - A person, or persons, employed by the Owner and designated from time to time by written notice to the Contractor to administer the Contract Documents, and to observe and monitor the Work on behalf of the Owner with authority and responsibility as herein specified.

1.28 Notice - The term "notice" or "written notice" as used herein shall mean and include all written notices, demands, instructions, and claims approvals and disapprovals furnished by the Owner or the Designer to obtain compliance with the requirements of the Contract Documents, as well as all written notices, demands, instructions and claims furnished by the Contractor as required by the Contract Documents. Where notice is required under the terms of the Contract Documents written notice shall always be required, and oral or "constructive" notice shall be insufficient and ineffective as notice. Email or other electronic delivery shall be insufficient and ineffective as notice unless specifically allowed by the Supplementary Conditions or a Modification to the Agreement. Written notice shall be deemed to have been duly served on the date that it is delivered in person to the individual or to a member of the firm, to an officer of the corporation for whom it is intended, to an authorized representative of such individual, firm, or corporation, or on the date that it is mailed by registered or certified mail, return receipt requested, addressed to the last business address of such individual, firm, or corporation known to the person giving the notice. Written notice may also be given by facsimile transmission, provided that proof of delivery is obtained. In the case of delivery in person, such delivery shall not be effective unless and until a written and signed receipt showing the date and time of delivery is obtained.

1.29 Project - The total construction of which the Work performed under the Contract Documents may be the whole or a part.

1.30 Project Expediter – As used herein, is an entity stated in the Contract Documents, designated to effectively facilitate scheduling and coordination of Work activities. For the purpose of a single prime contract, the single prime contractor is designated as the Project Expediter. For the purpose of a project involving separate prime contracts, the Contractor for general work shall be designated as the Project Expediter unless otherwise indicated in the Supplementary General Conditions. See paragraph 7.27.

1.31 Project Manager - That person designated by the Contractor in accordance with paragraph 7.2 who shall be in general charge of the Work and its performance and who shall have the authority set forth in the last sentence of paragraph 7.2.

1.32 Request for Information - A written communication from the Contractor to the Designer for any interpretation of, or information needed, required, or desired under the Contract Documents. The Owner reserves the right to determine the reasonable format and contents required for a Request for Information. In any Request for Information, the Contractor shall state a reasonable date by which a response is necessary in order to avoid delay in progress on the Work and shall make such request sufficiently in advance of such date as to avoid any such delay. The Designer shall respond in writing to the Request for Information by the date stated by the Contractor unless he cannot reasonably do so, in which case he shall prior to that date notify the Contractor of the date by which he can reasonably respond. The Contractor shall not be entitled to any additional time for the completion of the Work or any portion thereof by reason of the Designer's failure to respond

if he has not submitted his Request for Information sufficiently in advance to allow the Designer a reasonable time within which to respond.

1.33 Request for Payment - The form, in the form of AIA Document G702 (latest ed.) or other published document approved by Owner, which is to be used by the Contractor in requesting progress payments and which is to include a Schedule of Values as required by the Contract Documents and an affidavit of the Contractor that progress payments theretofore received from the Owner on account of the Work have been applied by the Contractor to discharge in full all the Contractor's obligations incurred in connection with Work covered by all prior applications for payment. See paragraph 20.2.

1.34 Resident Superintendent - That person designated by the Contractor in accordance with paragraph 7.2 who has day-to-day responsibility for the prosecution of the Work and the obtaining of proper materials and equipment, and adequate labor and who shall have the authority set forth in the last sentence of paragraph 7.2.

1.35 Schedule of Values - Any breakdown of the Contract Price which may be required by the Contract Documents, and designated as such. See paragraph 20.1.

1.36 Specifications - That portion of the Contract Documents consisting generally of the written requirements for materials, equipment, construction systems, standards, and workmanship for the Work and performance of related services.

1.37 Subcontractor - A person, firm, or corporation who has entered into a direct contract with the Contractor to perform any of the Work at the Project.

1.38 Submittal - Shop drawings, product data, samples, and other documents required by the Contract Documents to be submitted by the Contractor to the Designer.

1.39 Submittal Register - See paragraph 13.2 of these General Conditions.

1.40 Substantial Completion - The point at which the Work, and Work by other Contractors on or in connection with the Project, as determined by the Designer, is sufficiently complete in accordance with the Contract Documents that it can be beneficially occupied by the Owner, and the Work can be utilized by the Owner for its intended use, and all necessary permits and permissions for Beneficial Occupancy and utilization having been obtained by the Contractor. All operations and maintenance manuals, Owner training, and as-built drawings must be submitted prior to Substantial Completion being achieved.

1.41 Sub-subcontractor - A person or entity that has a direct or indirect contract with a Subcontractor to perform any of the Work at the Project.

1.42 Work - The construction and services required by the Contract Documents, including all labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor’s obligations.

1.43 All references in the Contract Documents to the masculine shall be interpreted as including the feminine or neuter and all references in the Contract Documents to the singular or the

plural shall be interpreted as including the other, as may be appropriate in the reasonable interpretation of the Contract Documents.

ARTICLE 2. CORRELATION, INTERPRETATION AND INTENT OF CONTRACT DOCUMENTS

2.1 It is the intent of the Specifications and Drawings and other Contract Documents to describe a complete Project in accordance with the Contract Documents.

2.2 The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If the Contractor finds a conflict, error or discrepancy in the Contract Documents, the Contractor shall notify the Designer in writing before proceeding with the Work affected thereby. In resolving such conflicts, errors and discrepancies, the Contract Documents shall be given preference in the following order: Construction Agreement, Modifications, Addenda, Supplemental Conditions, General Conditions, Specifications, and Drawings. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings. Any Work that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which, so applied, have a well known technical trade meaning shall be deemed to refer to such meaning and to incorporate any recognized standards which are a part of such meaning.

2.3 Miscellaneous items, accessories and work which are not specifically mentioned, but which are essential to produce a complete and properly operating installation, or useable structure or plant providing the indicated function shall be furnished and installed without change in the Contract Price. Such miscellaneous items and accessories shall be of the same quality standards, including material, style, finish, strength, class, weight and other applicable characteristics, as specified for the major component of which the miscellaneous item or accessory is an essential part, and shall be approved by the Designer before installation. This requirement is not intended to include major components not covered by or inferable from the Contract Documents.

2.4 The Work of all trades under the Contract Documents shall be coordinated by the Contractor in such a manner as to obtain the best workmanship possible for the entire Project and all components of the Work shall be installed or erected in accordance with the best practices of the particular trade.

2.5 The Contractor shall fully complete the Work and shall be responsible for all of the Work under the Contract Documents to which the Construction Agreement applies. If the Contractor is prevented from doing so by any limitation of the Contract Documents, the Contractor shall immediately give notice thereof to the Designer and the Owner in writing before proceeding with the construction in the area where the problem or limitation exists.

2.6 Standard specifications or manufacturers' literature, when referenced, shall be of the latest revision or printing unless otherwise stated and is intended to establish the minimum requirements acceptable.

2.7 For those materials specified without the use of brand names, the Contractor shall submit within thirty (30) days after his receiving the Construction Agreement for signatures, any product that meets the express requirements of the Specifications.

Such Submittal shall include manufacturer's data, test reports, performance data and certifications, samples, erection details, and other applicable information as required to permit determination by the Designer whether such proposed products are suitable. The Designer shall be the sole judge as to the suitability of any proposed product. The burden of proof of quality rests with the Contractor.

2.8 The Contractor is required to examine and read the complete set of Contract Documents for information concerning the Work, because some of the Work for which the Contractor will be responsible may be indicated on or in documentation applying primarily to the Work of one or more other separate prime contractors. No allowance will be made for the Contractor's failure to become familiar with the complete set of project documents.

2.9 Contractor's requests for clarification or information shall clearly define the cause(s) of Contractor's request and, as appropriate, shall include Contractor's interpretation and Contractor's proposed solution.

ARTICLE 3. FAMILIARITY WITH WORK, CONDITIONS AND LAWS

3.1 The Contractor has investigated prior to bidding and is satisfied with all conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electrical power, roads and uncertainties of weather, or similar physical conditions at the Project site, and the character of equipment and facilities needed prior to and during prosecution of the Work. The Contractor is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from inspection of the Project site, including all exploratory work done by the Owner, as well as from information presented by the Contract Documents, or any other information made available to the Contractor prior to receipt of bids. Any failure by the Contractor to become acquainted with the available information shall not relieve the Contractor from the responsibility for estimating properly the difficulty or cost of successfully performing the Work.

3.2 The Contractor shall be entitled to rely upon all information furnished to the Contractor in writing by the Owner with respect to the Project site and to make all inferences from it that would reasonably be made by a contractor having knowledge and experience with similar work; however, the Contractor shall not be entitled to infer from Owner-supplied information any fact or condition which would not be inferred by a contractor having knowledge and experience with similar work and, if the Owner-supplied information is inadequate or insufficient in any respect, the Contractor shall be required to obtain independently such other information as a knowledgeable and experienced contractor would prudently obtain in order to evaluate any such condition.

3.3 The Contractor specifically acknowledges familiarity with all Federal, State, and local laws, ordinances, rules, and regulations which may in any manner affect those engaged or

employed in the Work, or the materials or equipment in or about the Work, or in any way affect the conduct of the Work and agrees that the Contractor and the Contractor's employees, subcontractors, and suppliers will, at all times, comply with same. If the Contractor shall discover any provisions in the Contract Documents which are contrary to or inconsistent with any such law, ordinance, rule, or regulation, the Contractor shall immediately give notice thereof to the Designer and the Owner in writing, identifying any items of Work affected, and the Contractor shall not proceed until the Contractor has received written direction from the Designer with respect to these items. If the Contractor performs contrary to or inconsistently with any such law, ordinance, rule, or regulation without giving such notice, the Contractor shall bear all costs which are a consequence of such performance.

3.4 At times selected by the Designer after execution by the Contractor of the Construction Agreement, a pre-construction conference shall be scheduled and conducted for the benefit of the Project.

ARTICLE 4. BONDS

4.1 A performance bond in the full amount of the Contract Price shall be required of the Contractor to guarantee the faithful performance of the Work in compliance with the Contract Documents, in such form as may be required by law and approved by the Owner. The bond shall be dated the same date as the Construction Agreement and must be accompanied by a current copy of the power of attorney for the attorney-in-fact executing such bond on behalf of a surety company licensed to do business in the state of North Carolina.

4.2 A payment bond in the full amount of the Contract Price shall be required of the Contractor to guarantee the payment of all labor and material costs or claims in connection with compliance with the Contract. The payment bond shall be in such form as may be required by law and approved by the Owner. Said bond shall be dated and executed in the same manner as the performance bond in paragraph 4.1.

ARTICLE 5. INSURANCE AND INDEMNITY

5.1 CONTRACTOR PROVIDED INSURANCE

The Contractor shall, without limiting its obligations or liabilities, procure, pay for and maintain such insurance as is required by law and as is required by this Agreement to protect the Contractor and the Owner from claims for damages for bodily injury, including death, and from claims for property damage which may arise from the Contractor's or its representatives', consultants', Subcontractors', agents', or employees' operations under this Agreement. Such insurance shall be of the kinds and have limits of liability and coverages not less than the minimum limits hereinafter specified or required by law, whichever is greater. The Owner makes no representation as to the adequacy or sufficiency of such coverages. The following requirements shall in no way be construed to limit or eliminate the liability of the Contractor, which arises from performance of Work under the Agreement. The Contractor is strictly responsible for any losses, claims, and costs of any kind which exceed the Contractor's limits of liability, or which may be outside the coverage scope of the policies.

The insurance specified shall be provided by an insurer approved by the Owner, authorized to do such business in the State of North Carolina, and on terms approved by the Owner. Insurance companies utilized shall have a minimum rating of A- and Class VII as evaluated by the most current A.M. Best Rating Guide. If the insurer has a Best Rating less than A- and Class VII, the Contractor must receive specific written approval from the Owner prior to proceeding with any Work under the Agreement. All agents and brokers shall hold valid licenses from the State of North Carolina. Before commencing mobilization to the Project site and not later than 7 days after the receipt of the Construction Agreement by the Contractor for signatures, the Contractor shall furnish to the Owner a certificate or certificates of insurance in a form satisfactory to the Owner. Upon request of the Owner, the Contractor shall provide the Owner with certified copies of the insurance policies required by this Article, including without limitation declaration pages, conditions, exclusions and endorsements, and confirmation that each policy premium has been paid for the required term of this Agreement. A copy of the umbrella policy shall be provided to the Wake County Finance Department. Certificates shall be signed by a person authorized by that insurer to bind coverage on its behalf. In the event of any such cancellation, non-renewal, reduction, restriction, or change in any insurance, the Contractor is obligated to replace such insurance within 7 days without a gap in coverage and file accordingly such notice with the Owner, and other interested parties. Failing immediate receipt of evidence of such replacement of insurance the Owner reserves the right to procure such insurance as the Owner considers desirable and the Contractor shall pay or reimburse the cost of the premium in respect thereof. It is expressly provided, however, that any action or inaction on the part of the Owner in this respect shall in no way change or reduce the Contractor's responsibilities and liabilities under this Agreement. Self-funded, policy fronting, or other non-risk transfer insurance mechanisms are not acceptable without prior written approval of the Owner. Full disclosure of such a program must be made prior to commencing mobilization to the Project site. Failure to make a full disclosure constitutes a material breach of the Agreement, justifying termination for default.

The Contractor shall name the Owner, the Designer, the Designer’s consultants, and the Construction Manager as additional insureds under all its insurance contracts (except workers' compensation) with respect to and including without limitation liability arising out of activities performed by or on behalf of the Contractor, products and completed operations of the Contractor, and automobiles owned, hired, leased, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to additional insureds.

For any claims related to this Project, the Contractor's insurance or self insurance shall be primary and noncontributory with respect to the Owner’s insurance. Any insurance or self-insurance maintained by the Owner shall be excess and noncontributory with respect to the Contractor's insurance.

All policies of insurance shall contain a clause waiving rights of subrogation against the Owner, unless the Owner approves otherwise in writing.

Limits of coverage are not to be amended by deductible clauses of any nature without the express written consent of the Owner. The Contractor shall be solely responsible for any deductible assumptions that may exist in any insurance policies required under this

Agreement. In addition, the Contractor shall be responsible and shall not be reimbursed for any losses arising from any risk or exposure not insured as required herein, or not covered as a result of a normal policy exclusion or that falls within the self insured retention, if Contractor self insured.

The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

The claim provisions in the Contractor's insurance policies must specifically state the insurance company or Contractor's Third Party Administrator, if self insured, has both the right and duty to adjust a claim and provide defense.

The policies shall not contain any provision or definition which would serve to exclude or eliminate from coverage third party claims, including exclusions of claims for bodily or other injury to shareholders, partners, officers, directors, or employees of the insured, the premises owner, real estate manager, or the insured's Subcontractor, or any family relative of such persons.

If the policies contain any warranty stating that coverage is null and void (or words to that effect) if the Contractor does not comply with the most stringent regulations governing the Work, it shall be modified so that coverage shall be afforded in all cases except for the Contractor's willful or intentional noncompliance with applicable government regulations.

Any failure by any person to comply with reporting or other provisions of the policy including breach of warranties, shall not affect coverage provided to the Owner and its representatives, officials, and employees.

The insolvency or bankruptcy of the Insured or of the Insured's estate shall not relieve the insurance companies of their obligations under these policies. Any clauses to the contrary are unacceptable and must be stricken.

Failure to comply with these requirements shall be a material breach of this Agreement justifying termination for default.

5.1.1 Worker's Compensation and Employers' Liability Insurance

The Contractor and its Subcontractors shall procure and maintain Workers' Compensation Insurance in the amount and type required by the State of North Carolina and federal law for all employees employed under the Agreement who may come within the protection of Workers' Compensation Laws and covering all operations under the Agreement whether performed by the Contractor or by his Subcontractors. In jurisdictions not providing complete Workers' Compensation protection, the Contractor and his Subcontractors shall maintain employers' liability insurance in an amount, form, company, and agency satisfactory to the State of North Carolina and the Owner for the benefit of all employees not protected by Workers' Compensation Laws and covering all operations under the Agreement whether performed by the Contractor or by his Subcontractors.

The Contractor shall pay such assessments as will protect the Contractor and the Owner from claims under the Workers' Compensation Laws, workers' or workmen's compensation

disability benefits, and other similar employee benefit acts. The current Experience Modification Factor shall be indicated on the Certificate of Insurance.

Coverage under this section shall be as required by federal and state Workers' Compensation and Occupational Disease Statutes, and shall have minimum limits as follows:

Coverage A:		Statutory, State of North Carolina
Employers' Liability:	Each Accident	$1,000,000
	Disease - Policy Limit	$1,000,000
	Disease - Each Employee	$1,000,000

Such insurance shall include Voluntary Compensation coverage, a Waiver of Subrogation in favor of the Owner as well as other endorsements that may be required by applicable jurisdictions, i.e. United States Longshoremen and Harbor Workers Act and maritime coverage (Jones Act).

5.1.2 Automobile Liability Insurance

The Contractor shall procure and maintain automobile insurance against liability for bodily injury and property damage as described below, that may arise with respect to the Work being performed under the Agreement, and as will provide protection from claims which may arise out of or result from the Contractor's performance of the Work and the Contractor's other obligations under the Agreement, whether such performance of the Work is by the Contractor, by any representative or Subcontractor, by anyone, both officially and personally, directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

This policy of insurance shall carry the following minimum Limit of Liability:

Combined Single Limit	$1,000,000

The policy of insurance shall contain or be endorsed to include the following:

a) owned, hired, and non-owned automobile liability.

b) If the policy contains a warranty stating that coverage is null and void (or words to that effect) if the transporter does not comply with the most stringent regulations governing the Work, it shall be modified so that coverage shall be afforded in all cases except for the transporter's willful or intentional noncompliance with applicable government regulations.

Any failure by any party to comply with reporting or other provisions of the policy including breach of warranties, shall not affect coverage provided to the Owner and its representatives, officials, and employees.

No subcontracting of waste hauling shall be permitted without prior, written approval of the Owner.

5.1.3 General Liability

This policy must be written on an Occurrence basis, with the following minimum Limits of Liability:

General Aggregate per project	$2,000,000.00
Products/Completed Operations Aggregate	$2,000,000.00
Bodily Injury and Property Damage csl/each occurrence	$1,000,000.00
Personal Injury and Advertising Injury	$2,000,000.00

The policy of insurance shall contain or be endorsed to include the following:

a) Blanket Contractual Liability covering Contractor's indemnification obligations under this Agreement, in accordance with ISO policy form CG 00 01. Modifications to the standard provision will not be acceptable if they serve to reduce coverage.

b) Premises/Operations Liability.

c) Explosion, collapse, and underground fault.

d) Independent Contractors and Independent Subcontractors coverage.

e) Broad Form Property Damage.

f) Personal Injury

g) Cross Liability/Severability of Interest clause.

h) Employer's Stop-Gap Liability endorsement, if applicable.

i) Amendment of the Pollution Exclusion Endorsement to allow coverage for bodily injury or property damage caused by heat, smoke, or fumes from a hostile fire.

j) Designated General Aggregate Limit Endorsement if required by the Supplemental General Conditions.

Coverage shall remain continuously in effect and without interruption for at least 6 years from the date of the Notice of Award and shall include coverage for exposures arising from operations that have been completed. The Contractor shall furnish the Owner and each other additional insured listed in the Agreement to whom the Certificates have been issued, evidence satisfactory to the Owner of continuation of such insurance at the date of Preliminary Acceptance and each year thereafter.

5.1.4 Pollution Legal Liability (PLL)

Pollution Legal Liability coverage will be provided if required by the Supplementary General Conditions.

5.1.5 Umbrella Liability

The Contractor shall maintain an occurrence basis (as distinguished from a “claims made” basis) Umbrella Liability policy (true follow form) over the underlying General Liability, Automobile Liability, and Employer's Liability, with the following limits of liability:

Each Occurrence	$3,000,000
Aggregate	$3,000,000

On a fully insured basis such coverage will be subject to a deductible no greater than $10,000 per occurrence where coverage is not provided by the underlying insurance, but is provided by the Umbrella Liability policy.

The Contractor may use any combination of primary and umbrella insurance policies to comply with the insurance requirements, provided the resulting insurance is equivalent to the insurance stated herein.

All Occupational Disease exclusions must be deleted. Any Pollution Exclusion must be amended to allow coverage for bodily injury or property damage caused by spill, upset, overturn, heat, smoke, or fumes from a hostile fire.

5.1.6 Property Insurance

The Contractor shall purchase All Risk Property Insurance on a Completed Value Form in the names of the Owner, Contractor, Subcontractors, and sub-subcontractors as their interests may appear with limits as follows:

a) Full insurance value of the Work, or

b) Amount equal to the Contract Price for the Work, whichever is higher.

The Contractor is responsible for all physical damage to owned or rented machinery, tools, equipment, forms, and other items owned, rented or used by the Contractor and/or Subcontractor(s) in the performance of the Work. The insurance coverage evidencing such shall include a waiver of subrogation in favor of the Owner.

5.1.7 Valuable Papers And Records

The Contractor shall provide valuable papers and records insurance with coverage in an amount commensurate with project scope and set forth in the Supplementary General Conditions.

5.1.8 Claims

The Contractor shall notify the Owner within 24 hours of any claims or alleged claims received by the Contractor covered by any of the policies of insurance required in this Agreement. The Contractor shall provide a written copy of the claim or alleged claim to the Owner within 3 days of the Contractor's receipt of the claim or alleged claim. If a claim is

settled to the satisfaction of the claimant, the Contractor shall submit a copy of the claimant's release to the Owner.

If a claim or alleged claim is rejected by the Contractor and/or its insurance company, the Contractor shall immediately report this fact to the Owner.

Should 30 days elapse after the claim or alleged claim has been received by the Contractor, and the Contractor is not able to report a settlement or rejection of the claim, it shall report to the Owner the steps being taken with respect to the claim.

Without limiting the foregoing, he Contractor shall notify in writing the county risk manager of any paid or incurred claims which may impair annual aggregate or general liability.

5.1.9 Deductibles and Self-insured Retentions

Any deductibles or self-insured retentions must be declared to and approved by the Owner. At the option of the Owner, either: the insurer shall reduce to a maximum of $250,000 or eliminate such deductibles or self-insured retentions with respect to the Owner, or the Contractor shall provide evidence of collateral provided to insurers or procure a bond guaranteeing payment of losses and related investigations, claim administration, and defense expenses within the deductible or self-insured retention amount. Any self-insured retention or deductible amount on the policy shall not reduce the amount of collectible limits or liability.

5.1.10 Subcontractors

The Contractor shall include all Subcontractors as Insureds under its policies, or shall furnish separate certificates, policies, and endorsements for each Subcontractor the Contractor intends to use. If a Subcontractor does not take out insurance in his own name and the Contractor wishes to provide insurance protection for such Subcontractor and such Subcontractor's employees, the Contractor shall either (a) procure appropriate policies in the name of the Subcontractor, or (b) cause a rider or riders to be attached to the Contractor's policies which shall identify the Subcontractor thereby covered; provided, however, in the case of the latter option, such a rider need not be attached to the Contractor's workers' compensation policy if such policy by its terms is sufficiently broad to cover the employees of all Subcontractors performing Work under the Contract Documents. Except as otherwise approved by the Owner in writing, Limits of Liability and coverage scope must be at a minimum as stringent as required of the Contractor by the Contract Documents. All Work performed for the Contractor by any Subcontractor shall be pursuant to an appropriate agreement between the Contractor and the Subcontractor which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance as provided herein. Insurance monies received from any loss shall be divided as the respective interest of the parties affected shall appear.

5.2 OWNER CONTROLLED PROJECT SPECIFIC INSURANCE

In the event the Owner elects to purchase project-specific insurance affording coverage to the Contractor and Subcontractors, the terms and conditions of such coverage shall be set forth in the Supplementary Conditions.

5.3 CONTRACTOR AS JOINT VENTURE

If the Contractor is completing this Project on a joint venture basis, both joint venture partners retain all liabilities assumed by this Agreement, individually and collectively. This may include, but is not limited to, all premiums due, deductibles/self-insured retentions, coinsurance provisions, claim provisions, insurance policy conditions, and indemnification provisions hereunder.

Evidence of a Blanket Joint Venture Endorsement must be obtained from the General Liability and Contractor's Pollution Legal Liability carriers of each joint venture partner for a period of 6 years after completion of the Project, substantially as follows:

With respect to "your work", and the "products-completed operations hazard", you are an insured for your liability arising out of the conduct of any partnership or joint venture of which you were a partner or member, even though this partnership or joint venture is not shown as a Named Insured in the Declarations. This coverage is excess over any available liability purchased specifically to insure the partnership or joint venture. This coverage will not inure to the benefit of any other party except you."

5.4 INDEMNIFICATION

The Contractor, to the fullest extent not expressly prohibited by law, shall defend, indemnify, and save harmless the Owner, the Designer, the Construction Manager and their respective officials, officers, employees, and agents from and against any and all liabilities (foreseeable or unforeseeable), penalties, fines, forfeitures, demands, claims, causes of actions, suits, judgments, and costs and expenses incidental thereto, (including, without limitation, amounts paid pursuant to investigations, defense or settlements, and reasonable attorneys' fees), which any or all of them may hereafter suffer, incur, be responsible for, or pay out as a result of but not limited to:

a) bodily injury (including sickness, disease, or death) to any person including but not limited to, the Contractor's employees or its representatives while on the site of the Project; or

b) actual or alleged damage (including loss of use) to any property (public or private, including the Project or other property on the Project site); or

c) contamination of or adverse effects on the environment arising directly or indirectly out of or in connection with the performance of the Work, including but not limited to any hazardous or toxic waste, substance, or constituent of any substance subject to regulation under CERCLA, RCRA, TSCA, and other Federal and state authorities that is spilled, released, threatening to release, or disposed of or destroyed by the Contractor or its Subcontractors on or off the site of the Project or while in transport to or from the site; or

d) any violation or alleged violation of laws and regulations, arising out of or in any way connected with the Work,

caused in whole or in part by the Contractor, any Subcontractor or supplier or any representatives of the Contractor. The Contractor shall not be required to indemnify the Owner against losses resulting from a breach of this Agreement by the Owner or its other agents and contractors, or resulting from negligence, misconduct or violation of laws on the part of the Owner or its other agents and contractors.

The Contractor further agrees to obtain, maintain, and pay for such liability insurance coverages and endorsements as will insure the provisions of this paragraph. Furthermore, the Contractor agrees to be liable for and to indemnify and reimburse the Owner for all legal fees and disbursements paid or incurred to enforce the provisions of this paragraph. The indemnification obligations under this paragraph shall not be limited in any way by the amount or type of damages, compensation or benefits payable under worker's compensation acts, disability benefit acts, other employment benefit acts, or the amount of insurance carried or recovered.

The Owner acknowledges that hazardous or toxic waste, material, chemicals, compounds or substances, or other environmental hazards, contamination or pollution, (referred to hereinafter as “environmental hazards”) may be present at the Project site that were not created, generated, or released at the Project site by the Contractor or its Subcontractors, agents or employees, acting alone or in concert with others. Unless the remediation, abatement or handling of such environmental hazards is part of the scope of the Work under this Agreement, then upon the discovery of such environmental hazards, the Contractor shall immediately, and in no event more than three days later, give notice to the Owner of the environmental hazards before they are disturbed. The Owner and the Designer shall thereupon promptly investigate the environmental hazards, and make such changes in the Drawings and/or Specifications as they may find necessary to abate, remediate, isolate or handle the environmental hazards. Any increase or decrease in the Contract Price or the Contract Time resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional Work and changes. It is agreed that the Contractor shall have no liability under this Agreement for any environmental hazards existing prior to the date that Work commences under this Agreement unless the Contractor or its Subcontractors, agents or employees, acting alone or in concert with others, by their own negligence or misconduct, release or expose the Owner or third parties to the environmental hazards.

The provisions of this paragraph shall survive the termination or cancellation or completion of this Agreement.

ARTICLE 6. OTHER RECORD DOCUMENTS AND SUBMITTALS

6.1 The Designer shall furnish to the Contractor the number of copies of Drawings and Specifications stated in the Supplementary General Conditions. Additional copies of Drawings and Specifications may be obtained at the cost of reproduction and handling.

6.2 The Contractor shall submit to the Designer all Submittals required by the Contract Documents. The Contractor shall submit three (3) reproducible prints of all shop drawings plus the number of copies sufficient for his requirements. The Contractor shall submit samples in quantities required by the Contract Documents. The Contractor shall submit product data in five (5) copies, plus the number of copies sufficient for the Contractor's requirements. All shop drawings shall be reviewed by the Contractor and shall bear the Contractor's stamp of approval before being forwarded to the Designer. Submittals shall be submitted in such time as to cause no delay to the Work or any part thereof and in accordance with the Contract Construction Schedule and Submittal Register. The Designer shall review the submittal with reasonable promptness, noting desired corrections, if any. The Designer shall retain two (2) copies of the submittal and shall return the balance of the reviewed submittal to the Contractor for action. The Contractor shall furnish any corrected submittal to the Designer. The Designer shall retain two (2) copies of the corrected submittal and will return the balance of the reviewed submittal to the Contractor.

No substitutions will be accepted after the bids have been received. All substitutions prior to the receipt of bids shall be in accordance with the Contract Documents. Refer to Instructions to Bidders, Paragraph 3, Substitutions.

The Contractor acknowledges that the processing of shop drawings and other submittals is directly impacted by the clarity, completeness, and accuracy of said documents and that it is the Contractor's responsibility to (i) review and coordinate each submittal with all other related or affected Work and (ii) approve each submittal before submitting same to the Designer for approval.

6.3 No substitutions and no deviations from any requirement of the Contract Documents shall be deemed allowed unless the Contractor has specifically informed the Designer and the Owner in writing of such deviations at the time of submittal and the Designer and the Owner have given written and specific approval to the substitutions or deviations. In proposing a deviation or substitution the Contractor warrants to the Owner, notwithstanding any review, allowance or approval by the Designer or the Owner that the deviation or substitution is at least equal to or better in quality and for the purpose intended, and that Contractor shall not by reason of any such review, allowance or approval be relieved from any obligation or responsibility contained in the Contract Documents.

6.4 Review of submittal by the Designer shall not be construed as relieving the Contractor from responsibility for compliance with terms or designs of the Contract Documents nor from responsibility for errors of any sort in the submittal.

6.5 The Contractor shall keep one record copy marked "As-Built" of all Specifications, Drawings, Addenda, Modifications, and Submittals at the Project in good order and annotated at least monthly to show all changes made during the construction process. Such monthly annotations and their approval by the Designer shall be a condition precedent to approval by the Designer of each monthly Request for Payment. Said record copy shall be stored at the Project and fully protected from damage by fire or other hazard. This record copy shall be available to the Designer and Owner for inspection at all times and shall be delivered to the Designer for the Owner's purposes prior to the Designer's certifying Substantial Completion of the Work.

6.6 At completion of the Project and before Final Payment, the Contractor shall assemble and deliver to the Owner one complete set of all as-built drawings and one complete set of all approved submittals, product data, and samples which were reviewed by the Designer. These drawings and submittals shall be on paper, or in electronic or other media if required by the Supplementary Conditions. These drawings and submittals shall be categorized and packaged as directed by the Designer.

ARTICLE 7. CONTRACTOR

7.1 The Contractor shall supervise and direct the Work efficiently and with the Contractor's best skill and attention. Except as may be set forth specifically in the Contract Documents, the Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs in connection with the Work. The Contractor shall be responsible to see that the finished Work complies accurately with the Contract Documents.

7.2 The Contractor shall appoint a Project Manager and shall keep on the Project at all times during its progress a competent Resident Superintendent and necessary assistants who shall not be replaced without prior written approval by the Owner except under extraordinary circumstances, in which event immediate written notice shall be given to the Designer and the Owner. The Project Manager and the Resident Superintendent may be the same person or different persons. At any time, the Owner, in its sole and absolute discretion, may require the Contractor to replace the Project Manager or Resident Superintendent with an experienced and competent person or persons upon seven (7) days written notice from the Owner to the Contractor. Such replacement shall be at the Contractor's expense and at no cost to the Owner.

Both the Project Manager and the Resident Superintendent shall have authority to act on behalf of the Contractor, and instructions, directions or notices given to either of them shall be as binding as if given to the Contractor.

7.3 The Contractor shall provide sufficient competent and suitably qualified personnel, equipment, and supplies to lay out the Work and perform construction as required by the Contract Documents. The Contractor will at all times maintain good discipline and order at the site, and will comply with all applicable OSHA standards.

Any person employed by the Contractor, any Subcontractor, or any sub-subcontractor who, in the opinion of the Designer or the Owner, does not perform his Work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Owner or Designer, be removed forthwith by the Contractor, Subcontractor, or sub-subcontractor employing such person without cost to the Owner, and shall not be employed again in any portion of the Work without the written approval of the Owner or Designer.

Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work within three (3) days after written order, the Owner may withhold further payment by written notice until compliance with such order.

7.4 If, in the opinion of the Designer or the Owner, any Subcontractor on the Project is incompetent or otherwise unsatisfactory, he shall be replaced by the Contractor with no increase in the Contract Price if and when directed by the Designer or the Owner in writing.

7.5 The Contractor shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools appliances, fuel, light, heat, and all other facilities and incidentals necessary for the execution, maintenance, initial operation, and completion of the Work, other than those specifically excluded by the Contract Documents and to be furnished by the Owner or others. When use or storage of hazardous materials or equipment or methods of more than ordinary risk are necessary in accomplishing the Work, the Contractor shall give the Owner and Designer reasonable advance notice.

If any materials are to be furnished or installed by the Owner or others under the terms of the Contract Documents, said materials shall be made available to the Contractor at the location(s) specified in the Contract Documents. All costs of handling, transportation from the specified location to the Project, storage, and installing of Owner-furnished materials shall be included in the Contract Price. The Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies which may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner shall deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good any such damage, loss, or deficiency.

All equipment which is proposed to be used in the Work shall be of sufficient size and in such mechanical condition as to meet the requirements of the Work and produce a satisfactory quality of work. Equipment used on any portion of the Work shall be such that no injury to previously completed Work, adjacent property, or existing facilities shall result from its use.

When the methods and equipment to be used by the Contractor accomplishing the Work are not prescribed in the Contract Documents, the Contractor shall be free to use any methods or equipment that will accomplish the Work in conformity with the requirements of the Contract Documents.

When the Contract Documents specify the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Designer. If the Contractor desires to use a method or type of equipment other than specified in the Contract Documents, the Contractor may request authority from the Designer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it shall be on the condition that the Contractor shall be fully responsible for producing Work in conformity with the requirements of the Contract Documents. If, after trial use of the substituted methods or equipment, the Designer determines that the Work produced does not meet the requirements of the Contract Documents, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining Work with the specified methods and equipment at no additional cost to the Owner. The Contractor shall remove any deficient Work and replace it with Work of specified quality, or take such other corrective action as the Designer may direct. No change in the Contract Price or in Contract Time shall be made as a result of authorizing a change in methods or equipment under this paragraph.

7.6 All materials and equipment shall be new, except as otherwise provided in the Contract Documents. When special makes or grades of material which are normally packaged by the supplier or manufacturer are specified or approved, such materials shall be delivered to the Project site in their original packages or containers with seals unbroken and labels intact.

Materials shall be so stored as to assure the preservation of their quantity, quality and fitness for the Work. Stored materials, even though approved before storage, may again be inspected by the Designer or Owner prior to their use in the Work and shall meet the requirements of the Contract Documents at the time they are incorporated into the Work. Stored materials shall be located so as to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Designer and the Owner. Materials to be stored at the Project or on the Owner's property shall not create an obstruction to the Owner's or other contractor's reasonable activities. Private property shall not be used for storage purposes without written permission of the owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Owner a copy of the property owner's permission. All storage sites on private or the Owner's property shall be restored to their original condition by the Contractor at his entire expense, except as otherwise agreed to (in writing) by the owner or lessee of the property.

7.7 All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, or processor, except as otherwise provided in the Contract Documents.

7.8 The Contractor will be fully responsible for all acts and omissions of his Subcontractors and of persons directly or indirectly employed by them and of persons for whose acts any of them may be liable to the same extent that the Contractor is responsible for the acts and omissions of the Contractor’s own employees. Nothing in the Contract Documents shall create any contractual relationship between any Subcontractor or supplier and the Owner or the Designer, or any obligation on the part of the Owner or the Designer to pay or see to the payment of any money due any such Subcontractor or material furnisher except as may otherwise be required by law. The Owner or the Designer may furnish to any Subcontractor or supplier, to the extent practicable, evidence of amounts paid to the Contractor on account of specific Work done.

7.9 The divisions and sections of the Specifications and the identifications of any Drawings shall not control the Contractor in dividing the Work among Subcontractors.

7.10 The Contractor agrees to bind specifically every Subcontractor to the terms and conditions of the Contract Documents for the benefit of the Owner and to furnish written evidence thereof to the Designer and the Owner within seven (7) days after written request by the Owner.

7.11 The Contractor shall attend job progress conferences and all other meetings or conferences as directed by the Designer. The Contractor shall be represented at these job progress conferences by a representative having the authority of the Project Manager and by such other representatives as the Designer may direct. Job progress conferences shall

be open to Subcontractors, suppliers and any others who may contribute beneficially toward maintaining required job progress, and such personnel shall be encouraged by the Contractor to attend. It shall be the principal purpose of job progress conferences to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the Project on schedule and to complete the Work and the Project by the specified Completion Dates. The Contractor shall be prepared to assess progress of the Work as required in the Contract Documents and to recommend remedial measures for correction of progress as may be appropriate. The Designer shall preside as chairman and arrange for minutes to be taken and circulated.

In the event that the prosecution of the Work is discontinued for any reason, the Contractor shall notify the Designer and the Owner at least forty-eight (48) hours in advance of resuming operations.

Should the terms of the Contract Documents require completion of one or more portions of the Work for the Beneficial Occupancy of the Owner prior to completion of the entire Work, the Contractor shall complete such portion(s) of the Work on or before the date specified. Such completion shall include the obtaining of all government or other permits, permission, and/or approvals necessary to occupancy. The Contractor shall independently estimate the difficulties involved in arranging the Work to permit such Beneficial Occupancy and shall not claim any additional compensation or time extension by reason of any delay or increased cost due to completing such portion(s) of the Work. The Owner's possession and use of such portion(s) of the Work shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents. The Owner shall be responsible for the security, maintenance, utilities, and insurance of all portions of the Work completed and beneficially occupied by the Owner.

7.12 The Contractor shall pay all license fees and royalties, and assume all costs incident to the use of any invention, design process, or device which is the subject of patent rights or copyrights held by others, except for inventions, design processes, or devices specified by the Designer in the Contract Documents. The Contractor shall indemnify and hold harmless the Owner, the Designer, and anyone directly employed by either of them, from and against all claims, damages, losses and expenses, including attorney's fees and costs of defense, arising out of any infringement or alleged infringement of such rights during or after completion of the Work, and shall defend all such claims in connection with any actual or alleged infringement of such rights.

7.13 The Contractor shall secure and pay for all permits, including without limitation construction permits and licenses, and will pay all governmental charges and inspection fees necessary for the prosecution of the Work.

7.14 The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to the Work and shall protect and indemnify the Owner and the Owner’s officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or by the Contractor’s employees, Subcontractors, sub-subcontractors, or their employees.

7.15 The Contractor shall be responsible for the entire site of the Project and for its reasonable and necessary protection and security, as required by laws or ordinances governing such conditions, or by custom or sound construction practices, and shall share such responsibilities as may be agreed upon among them, or in the absence of such agreement, as may be directed by the Contract Documents, Owner, or Designer. The Contractor shall be responsible for any damage to the Owner's property, or that of others, by the Contractor or the Contractor's employees, Subcontractors, sub-subcontractors, or their employees or agents, and shall make good such damages. The Contractor shall be responsible for and pay for any such claims against the Owner.

7.16 The Contractor shall protect all landscaping designated to remain in the vicinity of the operations and barricade all walks, roads, and areas as necessary to keep the public away from the construction.

7.17 The Contractor shall provide cover and/or protect all portions of the Work and provide all materials necessary to protect the Work whether performed by the Contractor or any of the Subcontractors or sub-subcontractors. Any Work damaged through the lack of proper protection, or from any other cause, shall be repaired or replaced without extra cost to the Owner or extension to the Contract Time.

The Contractor shall maintain the Work during construction and until the Work is accepted. This maintenance shall constitute continuous and effective effort prosecuted day by day, with adequate equipment and forces so that the Work is maintained in satisfactory condition at all times. All costs of maintenance shall be included in the Contract Price and the Contractor will not be paid an additional amount for such effort. Should the Owner or Designer observe that the Contractor at any time has failed to maintain the Work as provided herein, the Designer may immediately notify the Contractor of such non-compliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. Should the Contractor fail to properly respond to the Designer's notification, the Owner may, at the Contractor's expense, take such action as it may deem appropriate to remedy the defective maintenance, including suspension of the Contractor's Work or any part thereof. Any such expense incurred by the Owner shall be deducted from monies due or to become due the Contractor.

Parking lots, streets, and walks connecting to the Project area shall be protected by the Contractor from deposits of mud, sand, stone, litter, or debris in any form.

Pedestrian traffic areas around the construction limits must be maintained in a clean and safe condition at all times with required barricades and covered walkways. When excavation or other operations outside the Project limits is required, the Contractor shall, immediately following that work, return the area to its original condition.

All catch basins and storm drain lines in the vicinity of the Project site shall be protected at all times from entry of dirt, rubble and other debris. The residue from the cleaning of trucks, wheelbarrows, concrete buggies, etc. must be prevented from entering the drainage system, and if cleaning is done, the residue must be contained and removed from the Project site with other refuse.

7.18 No burning of refuse or debris shall be allowed inside or around the Project during the course of construction without written authority from authorities having jurisdiction and the Owner.

7.19 The Contractor shall provide for and maintain necessary safety measures and safety programs for the protection of all persons involved with the Work. Such measures and programs shall include the requirements of the most current edition of the CAGC Safety and Health Manual [or the AGC Accident Prevention Manual in Construction], or equivalent requirements, and shall fully comply with all Federal, State, and local laws, rules, regulations, and building code requirements relating to the prevention of accidents or injuries to persons on or about the location of the Work.

All trenches, excavations, or other hazards in the vicinity of the Work shall be well barricaded, and properly lighted at night. When Work requires closing of an area normally used by the Owner or the public, the Contractor shall furnish, erect, and maintain temporary barricades, and properly light the area. The Contractor shall comply with any directions and public authorities in this respect.

7.20 The Contractor shall designate a responsible officer or employee as safety inspector, whose duties shall include accident prevention on the Project as well as implementation of the Contractor's safety measures and safety programs on the Project. The name of the safety inspector shall be made known to the Designer and the Owner at the pre-construction conference.

7.21 In emergencies affecting the safety of persons, the Work, or property at the Project site or adjacent thereto, the Contractor is obligated to act in the Contractor's discretion to prevent threatened damage, injury, or loss. As soon as practicable, the Contractor shall notify the Designer and Owner of such emergency. The Contractor shall give the Designer and the Owner prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused by such emergency. If the Contractor believes that additional work done in an emergency entitles the Contractor to an increase in the Contract Price or an extension of the Contract Time, the Contractor may make a claim therefore as provided in Articles 14 and/or 15.

7.22 The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by the Work. At least weekly and at the completion of the Work, the Contractor shall remove all waste materials and rubbish from and about the Project. At the completion of the Work, the Contractor shall remove all tools, construction equipment, machinery, and surplus materials. The Contractor shall leave the Work in condition for occupancy by the Owner such that no cleaning or other operations are required. Material cleared from the Project and deposited on adjacent property shall not be considered as having been disposed of satisfactorily. If the Contractor fails to keep the Project clean of waste materials or rubbish, fails to satisfactorily clean-up weekly or at the completion of the Work, the Owner may do so and the costs thereof may be deducted from any amounts due the Contractor.

7.23 Utilities, temporary facilities, and signs shall be provided as described in the Contract Documents. Absent a contrary direction in the Supplementary Conditions, the Contractor shall pay all bills for water, electricity, or other public utility service to the Project site.

7.24 The Contractor shall indemnify and hold the Owner, the Designer, the Designer's consultants, and their officers, agents, and employees harmless against all costs, damages, and expenses, including attorney's fees and costs of defense, arising out of claims by any separate contractor or by any Subcontractor, sub-subcontractor, or supplier engaged by or employed by the Contractor or employed by any of the Subcontractors claiming through him, including without limitation damages, losses, and expenses arising out of or relating to any inconvenience, delay, interference, or other action or non-action of the Contractor or the Contractor's Subcontractors on the Project.

The Contractor acknowledges that should the Contractor or any of the Contractor's Subcontractors be damaged by any breach of contract by any other separate prime contractor on the Project, the Contractor may invoke applicable dispute resolution procedures with said other separate prime contractor or bring a direct civil action against said other separate prime contractor. The Contractor hereby expressly agrees that neither the Owner nor its officers, agents, or employees shall have any liability of any kind or nature whatsoever to the Contractor, its Subcontractors, sub-subcontractors, or suppliers arising out of or relating to any breach, inconvenience, delay, interference, or other action or non-action by any other separate prime contractor. The Contractor covenants not to sue the Owner for any loss or damage caused by any breach, inconvenience, delay, interference, or other action or non-action by any other separate prime contractor, notwithstanding whatever rights at law the Contractor might have to bring a civil action against the Owner for any breach, inconvenience, delay, interference, or other action or non-action of any other separate prime contractor. The Contractor agrees to look exclusively to the other prime contractor for relief or remedy.

Nothing contained herein or appearing anywhere in the Contract Documents shall obligate or require the Owner to exercise any right or privilege, or to take any action or to refrain from taking any action under any contract it may have with any other prime contractor or party to the Project for the benefit of the Contractor or any Subcontractor, sub-Subcontractor, or supplier claiming through the Contractor.

7.25 Prior to completion of the Work and Final Payment of the Contract Price, excepting only those portions of the Work deemed accepted in accordance with the Contract Documents, the Contractor shall have charge and care of the Work, and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the Work. The Contractor shall as required by the Owner replace, rebuild, repair, restore, and make good all injury or damage to any portion of the Work occasioned by any of the above causes before Final Completion and shall bear the expenses thereof.

7.26 In the event that the Work, or any portion thereof, is suspended at any time pursuant to an order of the Owner, the Contractor shall obey all instructions of the Owner regarding storage of materials, drainage, protection of the Work, and erection of temporary structures during the suspension period.

7.27 The Project Expediter for the Project shall be responsible for the coordination of the Work of itself and any other separate contractors, both as to space and time. The Project Expediter shall coordinate the implementation of the Contract Construction Schedule, all

construction activities and close-out of the Project, including but not limited to all testing, inspection, certifications, and approvals required by public agencies.

The Contractor and the Project Expediter shall each be required to notify the Designer and the Owner promptly of any event or condition which could affect the conduct or progress of the Work and shall cooperate fully with all other contractors on the Project site.

7.28 The Owner hereby delegates to the Project Expediter all of its duties to coordinate and to expedite the Work not expressly reserved to the Owner by other provisions of the Contract Documents.

7.29 All Work performed pursuant to the Contract Documents shall conform in all respects to the North Carolina State Building Code and all other state, local, and national codes in effect at the time of and applicable to this Work.

7.30 The Contractor shall provide for and maintain necessary safety measures and safety programs for the protection of all persons at the Project site, and shall comply at all times with the requirements of the most current edition of the CAGC Safety and Health Manual [or the AGC Accident Prevention Manual in Construction], or the equivalent requirements of the Contractor's safety program, and shall fully comply with all Federal, State, and local laws, rules, regulations, and building code requirements so as to prevent accidents or injuries to persons on or about the Project site. The Contractor shall clearly mark or post signs warning of existing hazards, and shall barricade excavations, elevator shafts, stairways, and similar hazards. The Contractor shall protect against damage or injury resulting from falling materials, and shall maintain all protective devices and signs throughout the progress of the Work.

7.31 The Contractor shall adhere to the rules, regulations, and interpretations of the North Carolina Department of Labor's Occupational Safety and Health Standards for the Construction Industry (29 CFR Part 1926 as adopted in 13 NCAC 07F.0201, including 29 CFR Part 1910 General Industry Safety and Health Standards applicable to construction) and N.C. Gen. Stat. §95-126 through 155 (Occupational Safety and Health) as well as all revisions and amendments to such standards or statutes as may occur throughout the performance of the Work.

7.32 Any land disturbing activity performed by the Contractor in connection with the Project shall comply with all erosion control measures set forth in the Contract Documents and any additional measures which may be required in order to ensure that the Project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15 North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 NCAC 4A, 4B, and 4C), and as may be revised or amended in the future. Upon receipt of notice that a land-disturbing activity is in violation of said Act, the Contractor shall be responsible for ensuring that all steps or actions necessary to bring the Project in compliance with said Act are promptly taken. The Contractor shall be responsible for all penalties assessed pursuant to N.C. Gen. Stat. 113A-64 with respect to its Work, and shall indemnify and hold harmless the Owner from all costs and expenses, including attorney's fees and costs of defense arising out of or related to the enforcement of the Act against any party or person described in this Article.

7.33 Any mechanical or electrical work such as sleeves, inserts, chases, etc. located in the Work of the Contractor for general work shall be built in by that Contractor. On multiple prime projects, the mechanical and electrical contractors shall set all sleeves, inserts, and other devices built into the structure in cooperation and under the supervision of the Contractor for general work. The responsibility for exact location of such items shall be that of the mechanical, plumbing, or electrical prime contractor.

7.34 The Contractor shall be responsible for permanently fixed service facilities and systems in use during progress of the Work and shall strictly adhere to the following procedures:

a) Prior to acceptance of the Work by the Owner, the Contractor shall remove and replace any part of the permanent building systems damaged through use during construction.

b) Temporary filters shall be installed in each of the heating and air conditioning units, return air grilles, and other locations to prevent intrusion of dust, dirt, and debris during construction. Temporary filters shall be removed and replaced with new filters immediately prior to Substantial Completion.

c) Extra effort shall be maintained to keep the building clean and under no circumstances shall air systems be operated if finishing operations are creating dust in excess of what would be considered normal if the building were occupied.

d) When the permanent lighting system is used during construction, lamps shall be replaced and shall be new on the date of Substantial Completion.

ARTICLE 8. OWNER

8.1 The Owner shall issue communications and notices to the Contractor through the Designer to the extent contemplated by the Contract Documents.

8.2 In case of termination of the employment of the Designer, the Owner shall appoint as Designer a qualified person who shall have and assume all rights and duties held by the original Designer.

8.3 The Owner shall have the right to take possession of and use any portion of the Work notwithstanding the fact that the time for completion of such portion of the Work may not have expired, but such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents.

8.4 A waiver on the part of the Owner of any breach of any part of the Contractor shall not be held to be a waiver of any other or subsequent breach.

8.5 The Owner shall pay all permanent acreage fees, governmental impact fees, and meter deposits for permanent utilities.

ARTICLE 9. CONSTRUCTION MANAGER

9.1 The Owner may employ one or more Construction Managers for the purpose of assisting the Owner, Designer, and Contractor in developing and administering budgets and cost controls, in evaluating constructability and value engineering proposals, in establishing and maintaining a critical path method (CPM) schedule, in coordinating and/or expediting the Work with other projects being constructed by the Owner or others adjacent or near the Work, or for such other purposes as the Owner may deem appropriate. From time to time the Owner may identify such Construction Managers(s) to the Contractor in writing identifying any tasks assigned to such Construction Managers(s).

ARTICLE 10. DESIGNER

10.1 The Designer is charged with the responsibility of interpretation of the Contract Documents. The Designer's decisions relating to aesthetic matters shall be final.

10.2 All Work completed under the Contract Documents shall be subject to review by the Designer. No Work is to be covered without the Designer's review or prior authorization. Any Work so covered without the Designer's review or prior authorization shall be uncovered at the Contractor's expense. The Contractor shall notify the Designer in writing at least twenty-four (24) hours in advance of covering any Work.

10.3 The Designer shall not be responsible for the construction means, methods, techniques, sequences, procedures, or the safety precautions and programs incident thereto, and shall not be responsible for the Contractor's failure to perform the Work in accordance with the Contract Documents, but shall be entitled to enforce any requirements in the Contract Documents specifying particular means, methods, techniques, sequences, or procedures.

10.4 The Designer shall be an Owner's representative during the construction period. The duties, responsibilities and authority of the Designer as the Owner's representative during construction are as set forth in the Contract Documents.

ARTICLE 11. TESTING AND SURVEYING

11.1 Laboratory and field tests to determine compliance of construction with the Contract Documents shall be made by the Owner or testing consultants employed by the Owner except those required elsewhere in the Contract Documents to be paid for by the Contractor. The costs and expenses of providing samples for and assistance in any testing shall be borne by the Contractor and are included in the Contract Price. Any Work in which untested materials are used without approval or written permission of the Designer shall be removed and replaced at the Contractor's expense. Work found to be unacceptable or unauthorized will not be paid for and, if directed by the Designer shall be removed and replaced at the Contractor's expense. Unless otherwise designated, tests in accordance with the cited standard methods of ASTM or other generally recognized or specifically authorized methods which are current on the date of advertisement for bids shall be made at the expense of the Owner; provided, however, in the event that after such testing any Work is found to be defective or does not meet the requirements of the Contract Documents, the costs of retesting such Work and the costs of inspection services shall be paid by the Contractor. Samples shall be taken by a testing laboratory employed by the Owner. All materials being used are subject to inspection, tests, or rejection at any time prior to or during incorporation into the Work. Copies of all Owner test reports will be

furnished to the Contractor at his written request. Copies of Contractor test reports shall be furnished to the Designer upon written request.

11.2 The Owner shall have the right to deduct the costs of additional testing as described in paragraph 11.1 from any money due the Contractor; or if no money is due the Contractor, the Owner shall have the right to recover these costs from the Contractor, from its sureties, or from both.

11.3 All layouts and surveying shall be accomplished by properly qualified personnel duly licensed in the State of North Carolina.

ARTICLE 12. SEPARATE CONTRACTS

12.1 It is expressly understood that the Owner may deploy the Owner's own employees or engage other separate prime contractors to perform Work as a part of the Project whose work will be performed simultaneously and sequentially with the performance of the Work by the Contractor. It shall be necessary for the Contractor to coordinate construction activities with such other contractors, particularly with respect to access to work areas, storage of materials, and use of elevators and other common facilities. The Contractor shall diligently and in good faith cooperate with the Owner, the Designer, and all other contractors with respect to such matters and shall regularly and faithfully attend any and all meetings called by the Owner or the Designer with respect to such matters. Any disputes between the Contractor and any other separate prime contractor with respect to such matters shall be resolved in accordance with the claim and dispute resolution procedures in the Agreement.

ARTICLE 13. CONTRACT TIME

13.1 Within fourteen (14) days after receipt of the Construction Agreement by the Contractor for signatures, the Project Expediter shall prepare and submit to the Designer and Owner for review and approval a preliminary progress schedule for the Work pursuant to the requirements stated in the Contract Documents.

13.2 Within fourteen (14) days after initial receipt of the Construction Agreement for signatures the Contractor shall submit to the Designer a Submittal Register listing all Submittals the Contractor is required to make or proposes to make under the Contract Documents, the dates on which the Contractor proposes to make such Submittals and the dates by which the Contractor reasonably requires a response from the Designer with respect to each Submittal. The dates submitted shall be incorporated into the Contract Construction Schedule as Completion Dates when they have been approved or modified by the Owner. The Designer shall not be required to review any Submittal from the Contractor until a Submittal Register acceptable to and approved by the Owner has been submitted by the Contractor.

13.3 Not later than thirty (30) days following execution and delivery of the Construction Agreement by Owner to Contractor, the Owner shall deliver to the Contractor a Notice to Proceed. The Notice to Proceed shall state a commencement date on which it is expected that the Contractor will begin the Work to be performed under the Agreement. The Contract Time shall be measured from said specified commencement date. The commencement

date stated in the Notice to Proceed shall not be earlier than three (3) days after the Notice to Proceed is served on the Contractor.

If, other than by mutual agreement, said specified commencement date is more than thirty (30) days after the date of execution and delivery of the Agreement from Owner to Contractor and the Contractor believes said delay justifies an increase in Contract Price and/or an extension of Contract Time, the Contractor may make a claim therefore as provided in Article 14 and/or Article 15.

No Work shall be done prior to the date specified in the Notice to Proceed.

A final Contract Construction Schedule shall be submitted for approval by the Contractor, Designer, and Owner no later than fourteen (14) days after Notice to Proceed. No payments shall be due the Contractor until this schedule is approved by all parties.

13.4 The Contract Construction Schedule is a Contract Document. The Contractor represents that the Contract Construction Schedule has been reviewed in detail, that the Contractor participated in its preparation, that all of the activities which impact, limit, or otherwise affect the time of completion of the Work are shown in the Contract Construction Schedule and that all of the activities of others which impact, limit, or otherwise affect the start, duration, or completion of the Contractor's activities are also shown. The Contractor further represents that the Contractor can and will complete each activity within the time shown for that activity. Time is of the essence with respect to each such activity and Completion Date.

13.5 If the Contractor submits a construction schedule, progress report, or any other document that indicates or otherwise expresses an intention to achieve completion of the Work prior to any Completion Date required by the Contract Documents or prior to expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created or implied.

13.6 If the Contractor, for reasons beyond the Contractor's control, is delayed in beginning any activity, the Contractor shall, nevertheless, have the same number of days as is shown in the Contract Construction Schedule for the activity, and the affected activity and any succeeding activity that is dependent upon that activity shall be adjusted accordingly; provided that at any time the Owner, by means of a Change Order, may require the Contractor to work overtime, to increase labor forces or to take any necessary or appropriate action to decrease the time required for any activity, and the Contractor shall be entitled to an adjustment in the Contract Price computed in accordance with Article 15 of these General Conditions.

13.7 At any time, the Owner may order the Contractor, on seven (7) days written notice, to begin any activity earlier than the starting date shown on the Contract Construction Schedule.

13.8 Should the Contractor fail to start any activity on the start date shown in the Contract Construction Schedule or as it may have been adjusted in accordance with paragraphs 13.5 or 13.6 above, or become delayed, the Contractor shall, without being entitled to any increase in the Contract Price or other compensation, work overtime, increase labor forces or take such other action as may be necessary or appropriate to complete the activity by

the Completion Date shown on the Contract Construction Schedule, or as such Completion Date may have been adjusted.

13.9 The Designer and Owner or his Construction Consultant shall monitor progress of the Work at all times and the Contractor shall cooperate with such monitoring and provide any and all information with respect to the progress of the Work and scheduling as the Owner may reasonably require.

13.10 On a monthly basis, the Contractor shall revise the Contract Construction Schedule, showing any adjustments made in accordance with paragraphs 13.5 or 13.6, above, by any Change Order, the progress of the Work, and any days gained or days lost with respect to any activity, and shall furnish copies thereof to the Owner and Designer.

13.11 Should any monthly revision of any Contract Construction Schedule show that the Contractor is behind on any activity, the late completion of which could delay Substantial Completion of the Work, the Owner shall be entitled to withhold from the next Progress Payment due the Contractor an amount not exceeding the amount the Owner would be entitled to in Liquidated Damages, should Substantial Completion be delayed by the same number of days that the Contractor is currently behind schedule. If, subsequently, the Contractor's progress, as shown by any succeeding monthly revision to the Contract Construction Schedule, is such that the anticipated delay no longer exists, the Owner shall pay with the Progress Payment next due to the Contractor such amounts as have been withheld in accordance with this paragraph.

13.12 The Owner shall have the right to perform Work, hire and employ labor and craftsmen, rent equipment, subcontract with other parties, or do anything that the Owner deems necessary or appropriate to remedy or cure any delay by the Contractor in the progress of the Work. Such action by the Owner shall not, in any way, affect, void or limit any warranty, guaranty or other responsibility of the Contractor under the Contract Documents. Such action may be taken by the Owner only after three (3) days written notice to the Contractor. All costs incurred by the Owner in taking any such action shall be charged to the Contractor and deducted from any amounts remaining due under the Agreement.

13.13 The Contractor may be entitled to an extension of the Contract Time (but no increase in the Contract Sum) for delays arising from unforeseen causes beyond the control and without the fault or negligence of the Owner, the Contractor or the Contractor’s Subcontractors as follows:

a) Labor disputes and strikes that directly impact the critical path activities of the Contract Construction Schedule;

b) Acts of God, tornado, fire, hurricane, blizzard, earthquake, typhoon, or flood that damage completed Work or stored materials.

c) Acts of the public enemy; acts of the State, Federal, or local government in their sovereign capacities.

d) Abnormal inclement weather as defined in Article 13.14.

13.14 On any day that the Contractor considers that the Project is delayed by adverse weather conditions, the Contractor shall identify in writing to the Designer and the Owner the adverse weather conditions affecting each activity, the specific nature of the activity affected, the number of hours lost, and the number of and identity (by responsibility or trade) of workers affected and shall obtain from the Designer written recognition of the delay. The time for performance of this Contract includes an allowance for a number of calendar days which may not be suitable for construction Work by reason of adverse weather. The Contract Time will be extended only if the number of calendar days of adverse weather recognized by the Designer exceeds the number of inclement weather days set forth below, and the Contractor demonstrates how this adverse weather impacts activities on the critical path of the Contract Construction Schedule.

Month	Number of Inclement Weather Days
January	10
February	10
March	10
April	9
May	10
June	9
July	11
August	10
September	8
October	7
November	8
December	9

13.15 If the Contractor believes that the progress of the Work has been adversely affected by adverse weather recognized by the Designer during a particular month, the Contractor shall submit a written request for extension of time to the Designer. Such a request for time extension of the Contract Time shall be submitted by the tenth (10th) day of the month following that month in which the adverse weather is encountered. The request shall include, but is not limited to, the following information:

a) Detailed description of weather's effect on scheduled activities and its net effect on the critical path of the Project, and

b) Weather records from the official weather station nearest the Project site and records of actual observation as contained in daily reports, correspondence, or other documentation.

13.16 The Contractor specifically recognizes that a delay by the Contractor in achieving any Completion Date can have the effect of delaying the Substantial Completion of the Project, that such delay in Substantial Completion of the Project will necessarily cause damages, losses, and expenses to the Owner, including, but not limited to and by way of illustration only, increased capitalized costs and interests for the Project, increased and extended Project overhead, Designer's and Consultant's fees, increased costs of construction, increased and extended operation costs of other facilities, and inefficiency and loss of productivity, and that such damages, losses, and expenses may not be readily identifiable or ascertainable at the time they are incurred or at any time. Therefore, and in recognition

of these factors and the likelihood that actual damages from his delay will not be readily ascertainable, the Contractor agrees to pay to the Owner, as Liquidated Damages and not as a penalty, the sum identified in the Supplemental Conditions hereto as the Liquidated Damages per Day, for each day by which the failure to meet any Completion Date shown in the Contract Construction Schedule, adjusted in accordance with this Article, delays the Substantial Completion of the Project.

13.17 The Contractor shall not be entitled to any adjustment in the Contract Price or other compensation from the Owner for any delay in the completion of or progress on the Work that is caused by a force majeure condition or is otherwise not caused by the sole and direct act or omission of the Owner and the Owner's employees or agents.

13.18 The sum for Liquidated Damages is the amount stipulated in the Supplementary General Conditions per day per Prime Contractor as Liquidated Damages reasonably estimated in advance to cover the losses to be incurred by the Owner by reason of failure of said Contractor(s) to complete the Work within the time specified, such time being in the essence of this contract and a material consideration thereof.

ARTICLE 14. CHANGES IN THE WORK

14.1 Without invalidating the Contract Documents, the Owner may, at any time, or from time to time order additions, deletions, or revisions in the Work. Said additions, deletions, or revisions shall be authorized only by written Change Orders, Construction Change Directives or Field Orders. Upon receipt of a Change Order, Construction Change Directive or Field Order, the Contractor shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any change causes an increase or decrease in the Contract Price and/or an extension or shortening of the Contract Time, adjustments shall be made as provided in Article 14 and/or Article 15.

In order to expedite the Work and avoid or minimize delay in the Work that might affect the Contract Price or Contract Time, the Designer may issue a Change Order in the form of a Construction Change Directive which when signed by the Owner and Designer, directs the Contractor to proceed promptly with the Work involved. Any claim for an adjustment in Contract Price or Time, if not defined in the Construction Change Directive, shall be promptly made in writing in accordance with the procedures defined in Article 15.2.

14.2 The Designer may authorize minor changes or alterations in the Work not involving change in the Contract Price or in the Contract Time and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order. Such alterations shall not invalidate the Contract Documents nor release the surety. If the Contractor believes that any minor change or alteration authorized by the Designer entitles him to an increase in the Contract Price and/or an extension of Contract Time, he may make a claim therefore as provided in Article 14 and/or Article 15.

14.3 Except in an emergency endangering life or property, no change shall be made by the Contractor except upon prior written Change Order, Directive or Field Order authorizing such Change.

14.4 Increases in the Contract Price and/or extensions of the Contract Time for additional Work performed by the Contractor shall only be in accordance with a written Change Order signed by the Owner and Designer. The Contractor shall not be entitled to additional time or to additional compensation for any Work performed or material supplied which is claimed to have been authorized or settled by an "oral" change, or by a "constructive" or "implied" change, or by a course of conduct, or by any action or non-action by the Owner, Designer, or any other persons, or by any means whatsoever other than by a written Change Order for such Work or material signed by the Owner and the Designer.

14.5 Changes in the Work resulting from emergency shall not invalidate the Contract Documents nor release the surety.

14.6 Neither the Owner nor the Designer shall be responsible for verbal instructions which have not been confirmed in writing, and in no case shall such instructions be interpreted as permitting a departure from the Contract Documents unless such instruction is confirmed in writing and supported by a proper Change Order, Construction Change Directive or Field Order, whether or not the cost is affected.

14.7 The Owner, in its sole discretion, may require that the Contractor notify the Contractor's sureties of any changes affecting the general scope of the Work or change in the Contract Price, and that the amount of applicable bonds shall be adjusted accordingly. If this requirement is exercised, the Contractor shall furnish proof of such adjustment to the Designer and the Owner.

If this requirement is exercised, the Change Orders shall require written consent of the Contractor's surety. At the time of signing a Change Order, the Contractor shall be required to certify as follows:

> "I certify that all sureties have been notified that my contract has been altered by the amount of this Change Order, and that a copy of the approved Change Order will be mailed to all sureties upon its receipt by me."

If this requirement is exercised, no payment to the Contractor on account of any Change Order shall become due or payable until written evidence of the surety's consent to the Change Order has been furnished to the Designer and to the Owner, and the furnishing of such written consent is a condition precedent to such payment.

14.8 The Contractor shall support all requests for Change Orders with a detailed cost breakdown showing cost of materials, labor, equipment, transportation, other items, Contractor's overhead and profit, and total cost, in accordance with methods defined in this Article, and, if the request seeks an extension of the Contract Time, with a time-related diagram which demonstrates specifically why an increase in construction time is needed.

14.9 When a request for a Change Order involves a Subcontractor, the Contractor shall provide quotation from same on Subcontractor's letterhead. The Subcontractor's quote shall list materials, equipment, and labor separately, and show overhead and profit in the manner provided in paragraph 14.8.

ARTICLE 15. CHANGE OF THE CONTRACT PRICE

15.1 The Contract Price constitutes the total compensation payable to the Contractor for performing all Work under the Contract Documents. All duties, responsibilities, and obligations assigned to or undertaken by the Contractor shall be at his expense without change in the Contract Price. The Contract Price may only be changed by a Change Order.

15.2 Any claim for an adjustment in the Contract Price shall be in writing and written notice of any event, action, or non-action which may become the basis of a claim shall be delivered to the Owner and the Designer within three (3) days of the occurrence, or the beginning of the occurrence, of any such event, action or non-action giving rise to the claim. Such written notice is a condition precedent to the making of a claim, and such notice shall describe the basis of the potential claim with reasonable detail and clarity.

A claim shall be made in writing and shall be delivered to the Designer and the Owner no later than fourteen (14) days after such notice. The claim shall describe in detail the basis for the claim, with specific reference to any provisions of the Contract Documents, by paragraph, drawing number, or other specific identification, and shall state the amount claimed and how it is calculated. If the Contractor, at the time the claim is made, is unable to state the amount claimed with accuracy, the Contractor shall so state and provide the estimated amount and the basis on which the amount is to be calculated. At the earliest date practicable, but in no event more than thirty (30) days after Contractor's notice of claim, the Contractor shall supplement the claim with an accurate statement of the amount claimed and how it has been calculated. The Contractor shall provide, in writing, in support of the claim all such explanations, arguments, data, receipts, expert opinions, or other documents or information as the Contractor deems appropriate to be considered in support of the claim. A claim may properly be rejected by the Owner by reason of the Contractor's failure to submit adequate or accurate documentation or information, except that within seven (7) days after being given notice that the claim has been rejected on this basis, the Contractor may submit additional documentation or information. No claim for a change of the Contract Price shall be considered or granted (except solely at the discretion of the Owner) unless a claim is so made, nor shall the Contractor be entitled to any increase in the Contract Price unless the Contractor has given notice and made such a written claim within the times required. The Owner shall decide, after obtaining the advice of the Designer, whether an increase in Contract Price is warranted, and the amount of such increase shall be determined as provided in paragraph 15.4 through 15.5, below. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

The Owner shall advise the Contractor of its decision with respect to the claim within fourteen (14) days of its receipt, or of the receipt of additional documentation or information if the absence of such has previously been the basis of rejection of the claim; provided, however, that if, in its sole discretion, the Owner deems that review or consideration of any part of the claim or any matter related thereto by its governing Board is necessary or appropriate, it shall so advise the Contractor and shall provide its decision to the Contractor within seven (7) days after such Board consideration, review or action. Any claim on which the Owner has not provided its decision to the Contractor within the applicable time period shall be deemed denied.

If the Contractor is not satisfied with the decision of the Owner, the Contractor may within seven (7) days of receipt of the Owner's decision initiate the mediation process as described in Appendix A to the General Conditions of the Contract for Construction.

15.3 In determining the amount of a Contract Price adjustment, the parties shall apply the following methods, as appropriate:

(A) Change in Work: The Owner and Contractor shall negotiate in good faith and attempt to agree upon the value of any change (extra or decrease) in Work prior to the issuance of a Change Order covering said Work. Such Change Order shall set forth the corresponding adjustment to the Contract Price. In the event the Owner and the Contractor are unable to agree, the Owner shall grant an equitable adjustment in the Contract Price.

(B) Emergency Work: In the event of emergency endangering life or property, the Contractor may be directed by the Designer to proceed on a time and material basis, whereupon the Contractor shall so proceed and keep accurately, in such form as may be required by the Designer, a correct account of costs together with all proper invoices, payrolls, and supporting data therefore.

15.4 Where the Contract Price is to be adjusted, the following limitations shall apply in determining the amount of adjustment:

(A) In the case of extra or emergency work, the Contract Price shall not be increased by more than the reasonable, actual, and documented net cost of the extra or emergency work plus ten percent (10%) of such net cost on Work performed by the Contractor and five percent (5%) thereof on any subcontracted Work for overhead and profit combined.

(B) In the case of a decrease in Work, the Contract Price shall not be decreased by less than the net cost of the deleted Work plus five percent (5%) of such direct net cost for profit and overhead.

The term 'net cost' as used herein shall include, as applicable, and shall be limited to, all direct labor, direct material, direct equipment, labor burden, sales taxes, shipping and handling charges, permits and fees, and insurance and bond premium adjustments, if any, attributable to the change. All other items of cost shall be considered as overhead and covered by the percentages allowed in sections A and B of this paragraph.

The Contractor shall provide worksheets or tabulations describing the method by which the direct net cost was calculated, and shall provide all data needed to support the calculation of the direct net cost, all in a form acceptable to the Owner.

15.5 Where the Contract Price is to be adjusted by negotiation, the Owner may authorize and designate the Designer to negotiate with the Contractor on behalf of the Owner; provided, however, any agreement reached between the Contractor and Designer shall be subject to approval by the Owner.

ARTICLE 16. UNFORESEEN CONDITIONS

16.1 Should the Contractor encounter unforeseen conditions at the Project site materially differing from those shown on the Drawings or indicated in the Specifications or differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Agreement, the Contractor shall immediately, and in no event more than three days later, give notice to the Owner of such conditions before they are disturbed. The Owner and the Designer shall thereupon promptly investigate the conditions and if they find that they materially differ from those shown on the Drawings or indicated in the Specifications, they shall at once make such changes in the Drawings and/or Specifications as they may find necessary. Any increase or decrease in the Contract Price resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional Work and changes. However, neither the Owner nor the Designer shall be liable or responsible for additional work, costs, or changes to the Work that could have been reasonably determined from any reports, surveys, and analyses made available for the Contractor's review or that could have been discovered by the Contractor through the performance of its obligations pursuant to the Contract Documents.

ARTICLE 17. CORRECTION OF WORK BEFORE FINAL PAYMENT

17.1 The Owner has the authority to stop or suspend work, and the Designer has the authority to order Work removed or to order corrections of defective Work or Work not in compliance with the Contract Documents where such action may be necessary to ensure successful completion of the Work.

Any work, materials, fabricated items, or other parts of the Work which have been found by the Designer to be defective or not in accordance with the Contract Documents shall be condemned and shall be removed from the Project by the Contractor, and immediately replaced by new Work in accordance with the Contract Documents at no additional cost to the Owner. Work or property of the Owner or others damaged or destroyed by virtue of such condemned Work shall be made good at the expense of the Contractor.

Correction of condemned Work described above shall be commenced by the Contractor within twenty-four (24) hours after notice from the Designer or the Owner and shall be pursued to completion. Should the Contractor fail to proceed reasonably with the above-mentioned corrections, the Owner may, three (3) days after the notice specified in the preceding sentence, proceed with correction, paying the cost, including costs of uncovering such condemned Work, of such corrections from amounts due or to become due to the Contractor.

Condemned Work removed shall be the property of the Contractor and shall be removed from the Project by him within ten (10) days after notice to remove it, and if not then removed, thereafter may be disposed of by the Owner without compensation to the Contractor and the cost of such disposal shall be deducted from amounts due or to become due to the Contractor.

Should the cost of correction of the Work and, if applicable, disposal of the condemned Work by the Owner exceed amounts due or to become due the Contractor, then the Contractor and the Contractor's sureties shall be liable for and shall pay to the Owner the amount of such excess.

ARTICLE 18. CORRECTION OF WORK AFTER SUBSTANTIAL COMPLETION; WARRANTIES AND GUARANTIES

18.1 Neither the final certificate, Final Payment, occupation of the premises by the Owner, nor any provision of the Contract Documents, nor any other act or instrument of the Owner or the Designer shall relieve the Contractor from responsibility for negligence, defective material or workmanship, or failure to comply with the Contract Documents.

18.2 The Contractor shall, at the Contractor's sole cost and expense, make all necessary repairs, replacements, and corrections of any nature or description, interior or exterior, structural or non-structural, that shall become necessary by reason of defective workmanship or materials which appear within a period of one (1) year from the date of Substantial Completion; provided, however that notwithstanding the preceding, if any longer guarantee period is specified for any particular materials or workmanship under the Contract Documents, or under any subcontract, or in connection with any manufactured unit which is installed in the Project, or under the laws of the State of North Carolina, the longer guarantee period shall govern.

18.3 If, within any guarantee period, repairs or changes are required in connection with the Work, which are rendered necessary as the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract Documents, the Contractor shall, promptly upon receipt of notice from the Designer and without expense to the Owner:

a) Completely repair or replace the Work so that it conforms to the Contract Documents;

b) Correct all defects therein;

c) Make good all damage which, in the opinion of the Designer, is the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract Documents; and

d) Make good any Work or material, or any equipment or contents disturbed in fulfilling any such guarantee.

If, in fulfilling the requirements of the Contract Documents or of any guarantee embraced therein or required thereby, the Contractor disturbs any work, facility, premises, or construction belonging to the Owner, the Contractor shall restore such disturbed work to a condition satisfactory to the Owner, and shall guarantee such restored work to the same extent as if it were Work under the Contract Documents.

If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected, and the Contractor and the

Contractor's sureties shall be liable for all expenses incurred. "Promptly" is defined as within twenty-four (24) hours for systems necessary to normal operation of the building and within seventy-two (72) hours for all other items. All special guarantees applicable to definite parts of the Work that may be shown in or required by Contract Documents shall be subject to the terms of this paragraph during the first year of the life of such special guarantee. Manufacturer's standard guarantees or warranties which do not comply with the time limit specified herein shall be extended by the Contractor automatically without further action on the part of the Owner or the Designer.

18.4 In the eleventh calendar month after the date of Substantial Completion, and at the request of the Owner, the Contractor, the Owner and the Designer shall make an inspection of the Work for the purpose of identifying defective workmanship and/or materials. If the Contractor, having been requested to do so by the Owner, fails to participate in such inspection, the Contractor shall be conclusively bound by any decision or ruling by the Designer as to any defective workmanship or material and as to the Contractor's responsibility for its repair or replacement.

ARTICLE 19. OWNER'S RIGHT TO DO WORK

19.1 If, during the progress of the Work or during any period of guarantee, the Contractor fails to prosecute the Work properly or to perform any provision of the Contract Documents, the Owner, after three (3) days written notice to the Contractor from the Designer, or from the Owner after Final Payment, may perform or have performed that portion of the Work and may deduct the cost thereof from any amounts due or to become due the Contractor. Notwithstanding any action by the Owner under this paragraph, all warranties and bonds given or to be given by the Contractor shall remain in effect or shall be given by the Contractor.

19.2 Should the cost of such action by the Owner exceed the amount due or to become due the Contractor, the Contractor and his sureties shall be liable for and shall pay to the Owner the amount of such excess.

ARTICLE 20. PARTIAL PAYMENTS

20.1 Within thirty (30) days after his initial receipt of the Construction Agreement for signatures, the Contractor shall submit to the Designer a Schedule of Values. The Schedule of Values shall indicate the value of the Work, including applicable overhead and profit, for each Division and section of the Project Specifications. The Designer and Owner shall be provided with the Contractor's estimate papers, Subcontractor agreements, supplier quotes, or other documents substantiating these values if so requested in writing by the Designer. The Contractor shall provide the requested documentation within seven (7) days after receipt of the Designer's written request. The Schedule of Values shall be subject to approval by the Owner, and if the Owner and the Contractor cannot agree upon the Schedule of Values, the Designer shall prepare it, and the Schedule of Values as prepared by the Designer shall be binding on the Owner and the Contractor. No Request for Payment shall be certified by the Designer until the Designer has issued approval of said Schedule of Values.

20.2 Not later than the fifth (5th) day of each calendar month the Contractor shall submit to the Designer a Request for Payment for Work done during the previous calendar month. The Request for Payment shall be in form of AIA Document G702 (latest edition) and shall show substantially the value of Work done (including the value of material delivered to the Project or stored by the Contractor at another site, subject to the conditions hereinafter set forth) during the previous calendar month, and shall sum up the financial status of the Work with the following information:

a) Total Contract Price, including any adjustment thereto made pursuant to the Contract Documents.

b) Value of Work completed and materials properly stored to date.

c) Less amount retained.

d) Less previous payments.

e) Current amount due.

f) Balance remaining.

The Contractor, upon request of the Designer, shall substantiate the request with invoices, vouchers, payrolls, or other evidence.

20.3 When payment is requested or made on an account of stored materials, such materials must be stored on the Owner's property at such places and in such a manner as may be designated by the Designer. However, in the sole discretion of the Owner, with permission in writing from the Designer and Owner and under such circumstances as may be determined by the Owner, such materials may be stored in a bonded warehouse. The location and conditions for storage of such materials away from the Owner's property in a bonded warehouse shall be within the sole discretion of the Owner. Requests for Payment on account of stored materials shall be accompanied by paid invoices, bills of sale, warehouse receipts, or other documentary evidence establishing Owner's title to such materials, evidence that the stored materials are insured against loss and damage, and such other documentation as required by the Designer. Responsibility for the quantity, quality, and condition of such stored materials, whether stored on the Owner's property or away from the Owner's property, shall remain with the Contractor regardless of ownership or title. No payment shall be made on account of materials stored in a bonded warehouse unless the Contractor has acquired written permission from the Designer for such storage of materials and has complied with all conditions set forth in such permission regarding such storage of materials in a bonded warehouse.

20.4 Any Request for Payment received by the Designer on or before the fifth (5th) of the calendar month shall be certified for payment or returned for re-submission to the Contractor on or before the fifteenth (15th) of the calendar month. The Designer's certification shall be for the amount which was requested or that which the Designer has decided was justly due, and shall state in writing to the Contractor and Owner the reasons for withholding payment of any or all of the amount requested.

20.5 The Designer may fail to certify all or part of any payment requested for any of the following reasons:

a) Defective Work not corrected.

b) Suits, actions, or claims of any character filed against the Contractor, or due to the operations of the Contractor, or information or notice that a suit, action, or claim will be filed or has been made.

c) Information or notice that a Subcontractor or a supplier has not received payment.

d) The balance unpaid of the Contract Price is insufficient to complete the Work in the judgment of the Designer or Owner.

e) Damage to the Owner or another contractor.

f) Inability of the Contractor to meet a Completion Date, including an anticipated failure to meet a Completion Date entitling the Owner to withhold anticipated Liquidated Damages in accordance with paragraphs 13.16 and 13.18 hereof.

g) Failure to furnish Submittal as required by the Contract Documents on a timely basis in accordance with the Submittal Register.

h) Such other reason as to the Designer may appear prudent, proper, or equitable.

When grounds for withholding certification have been corrected, the Designer shall so certify to the Owner and the Owner shall make any payment due with respect to such certification as a part of his next payment after such certification.

20.6 No certificate issued or progress payment made shall constitute an acceptance of the Work or any part thereof.

20.7 The amount certified by the Designer for payment shall be ninety-five percent (95%) of the value of Work completed and materials stored since the Designer's last certification as shown on the Request for Payment, less any amounts not certified in accordance with paragraph 20.4, and this amount shall be paid by the Owner on or before the last business day of the month, but payment shall not be past due until not paid within fifteen (15) days thereafter.

20.8 After certification by the Designer that the Work is fifty percent (50%) complete, based on a determination that the Contractor's gross project invoices, excluding the value of materials stored off-site, equal or exceed fifty percent (50%) of the value of the Contract, (except the value of materials stored on-site shall not exceed twenty percent (20%) of the Contractor's gross project invoices for the purpose of determining whether the Project is fifty percent (50%) complete) and the Contractor has provided to the Owner the written consent of its sureties to the cessation of further percentage retention, the amount certified for payment with respect to subsequent Requests for Payment shall be one hundred percent (100%) of the value of Work completed and materials stored since the Designer's last certification as shown on the Request for Payment, less any amounts not certified in accordance with

paragraphs 20.4 and 20.5; provided, however, that the aggregate of periodic payments shall not exceed ninety-seven and one half percent (97.5%) of the Contract Price. If the Owner determines that the Contractor's performance under the Contract is unsatisfactory, the Owner may resume withholding percentage retention from each subsequent periodic payment application up to the maximum amount of five percent (5%) of the Contract Price.

ARTICLE 21. FINAL PAYMENT

21.1 If the Work of the Contractor is limited to demolition, pilings, caissons and/or structural steel, the remaining unpaid balance of the Contractor's Contract Price, less a sum equal to five-tenths percent (0.5%) of the Contract Price, shall be paid within sixty days following receipt of the following documents, all of which must be received before payment shall become due: (i) request for payment from the Contractor; (ii) receipt of consent from the Contractor's surety to the payment; and (iii) approval or certification from the Designer that the work performed by the Contractor is acceptable and in accordance with the Contract Documents.

21.2 Except as set forth in paragraph 21.1, within forty five days after Substantial Completion of the Project, the remaining unpaid balance of the Contract Price shall be paid to the Contractor, less an amount equal to two and one-half times the value of punch list work or other work remaining to be completed or corrected, as reasonably estimated by the Owner.

21.3 Upon Substantial Completion, the Designer shall prepare and submit to the Contractor a deficiency list identifying all portions of the Work which are known by the Designer at that time to be incomplete or defective. Within thirty (30) days of receipt of this deficiency list, the Contractor shall complete and correct all items on that list along with all other Work required to achieve Final Completion of the Work. At any time prior to completion of the period of warranty, the Designer may submit to the Contractor a supplemental deficiency list, in which case the Contractor shall complete or correct any and all new items identified on the Supplemental deficiency list within the time period stipulated in paragraph 18.3.

21.4 Final Payment of any remaining balance of the Contract Price shall not be due to the Contractor until the Contractor achieves Final Completion of the Project.

21.5 The making and acceptance of Final Payment shall constitute a waiver of all claims by the Owner except:

a) Claims arising from unsettled liens or claims against the Contractor.

b) Defective Work or materials appearing after Final Payment.

c) Failure of the Contractor to perform the Work in accordance with the Contract Documents.

d) As conditioned in the Performance Bond.

e) Claims made prior to Final Payment which remain unsettled.

f) Amounts due arising under Articles 18 and 28.

g) Claims for recovery of overpayment based upon incorrect measurement, estimate, or certificate.

21.6 The making and acceptance of Final Payment shall constitute a waiver of all claims by the Contractor except those claims previously made in writing pursuant to paragraph 15.2 and not finally resolved.

21.7 The Designer shall not authorize Final Payment until all of the Work under the Contract Documents has been certified by the Designer as completed, proper and suitable for occupancy and use, and has been approved by all federal, state and local agencies having jurisdiction.

21.8 The final Request for Payment shall be identified on its face as such and shall be presented by the Contractor to the Designer within thirty (30) days of completion of the Work. Final payment of the retained amount due the Contractor shall be made by the Owner within thirty (30) days after the later of (i) full and Final Completion of all Work required by the Contract Documents, and certification of such Work in accordance with paragraph 20.4; (ii) submission of the affidavits of other documentation required by Article 22; (iii) submission by the Contractor of a Request for Payment identified on its face as final and including the Designer's certification.

ARTICLE 22. CONTRACTOR, SUBCONTRACTOR AND SUPPLIER AFFIDAVIT

22.1 The Final Payment due the Contractor on account of the Contract Documents shall not become due until the Contractor has furnished to the Owner through the Designer: (A) an affidavit by the Contractor signed, sworn, and notarized to the effect that all payments for materials, services, or for any other reason in connection with the Work or performance of the Contract Documents have been satisfied and that no claims or liens exist against the Contractor in connection with the same; (B) affidavits from each Subcontractor and supplier signed, sworn, and notarized to the effect that (i) each such Subcontractor or supplier has been paid in full by the Contractor for all Work performed and/or materials supplied by him in connection with the Project, and (ii) that all payments for materials, services, and for any other reason in connection with the subcontract or supply contract have been satisfied and that no claims or liens exist against the Subcontractor or supplier in connection therewith; and (C) the written consent of the Contractor’s sureties to Final Payment. In the event that the Contractor cannot obtain an affidavit, as required above, from any Subcontractor or supplier, the Contractor shall state in the Contractor’s affidavit that no claims or liens exist against such Subcontractor or supplier to the best of the Contractor's knowledge, and that if any appear afterwards, the Contractor shall save the Owner harmless for all costs and expenses, including attorneys fees, on account thereof.

ARTICLE 23. ASSIGNMENTS AND SUBCONTRACTS

23.1 The Contractor shall not assign any portion of this Agreement nor subcontract the Work in its entirety without the prior written consent of the Owner. Except as may be required under terms of the bonds required by the Contract Documents, no funds or sums of money due or to become due to the Contractor under the Contract Documents may be assigned.

ARTICLE 24. MEASUREMENTS

24.1 Before ordering material or doing Work which is dependent for proper size or installation upon coordination with building conditions, the Contractor shall verify all dimensions and shall be responsible for the correctness of same. No consideration will be given for any claim based on differences between the actual dimensions and those indicated in the Contract Documents. Any discrepancies between the Contract Documents and the existing conditions shall be referred to the Designer for adjustment before any Work affected thereby is begun.

ARTICLE 25. CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS

25.1 Within thirty (30) days after initial receipt of the Construction Agreement for signatures the Contractor shall submit to the Designer and Owner for acceptance a current list of the names of Subcontractors and such other persons and organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for any and all portions of the Work. The Contractor shall provide this list at this time even if the Contractor was required to submit a list of proposed Subcontractors with the Contractor's bid. The Designer shall promptly reply to the Contractor in writing stating whether or not the Owner or the Designer, after due investigation, has objection to any such proposed person or entity or if it needs additional information to evaluate the persons on the list. Failure of the Designer to reply within ten (10) days after the Contractor has furnished all required information shall constitute notice of no objection.

The Contractor shall not contract with any such proposed person or entity to whom the Owner or the Designer has made reasonable objection. If the Designer or Owner has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner and the Designer have no reasonable objection. The Contractor shall make no substitution for any Subcontractor, person, or entity previously allowed without first notifying the Designer and Owner in writing and no substitution may be made if the Owner or Designer makes a reasonable objection to such substitution.

25.2 The Contractor agrees that the terms of the Contract Documents, including all portions thereof, shall apply to all Subcontractors of the Contractor as if they were the Contractor, and that the Subcontractors of the Contractor shall, by means of their subcontracts, be bound by all the terms of the Contract Documents including, but not limited to, Article 26 of these General Conditions.

25.3 Payments to Subcontractors shall be made in accordance with the provisions of N.C. Gen. Stat. §143-134.1.

ARTICLE 26. USE OF PREMISES

26.1 The Contractor shall confine apparatus, the storage of materials, the operations of workers, and the disposal of material to limits indicated by law, ordinances, permits, and directions of the Designer, if any.

26.2 The Contractor shall not load or permit any part of the Work to be loaded with a weight that will endanger its safety, intended performance, or configuration.

26.3 The Contractor shall enforce all of the Designer's instructions, including, but not limited to, those regarding signs, advertisements, fires, and smoking.

ARTICLE 27. CUTTING, PATCHING AND FITTING

27.1 The Contractor shall do all cutting, fitting, and patching of the Work that may be required to make its several parts come together properly and fit it to receive or to be received by Work shown in or which can be reasonably implied from the Contract Documents.

ARTICLE 28. DISPUTE RESOLUTION

28.1 The laws of the State of North Carolina shall apply to the interpretation and enforcement of this Agreement. Any and all suits or actions to enforce, interpret, or seek damages with respect to any provision of, or the performance or nonperformance of, this Agreement shall be brought in the General Court of Justice of North Carolina sitting in Wake County, North Carolina, and it is agreed by the parties that no other court shall have jurisdiction or venue with respect to such suits or actions. Appendix A shall be a part of the Contract Documents. Prior to initiating an action under this Article, any party to this Agreement shall initiate the mediation process as provided in Appendix A to these General Conditions of the Contract for Construction.

28.2 Any person or firm that expressly or impliedly agrees to perform labor or services or to provide material, supplies, equipment, work, performance or payment bonds, insurance or indemnification for the construction of the Project or the Work shall be deemed a party to this Agreement solely for the purpose of this Article 28. The Contractor, by means of its subcontracts, shall specifically require its Subcontractors to be bound by this Article.

ARTICLE 29. TAXES

29.1 The Contractor has included in the Contract Price and shall pay all taxes assessed by any authority on the Work or the labor and materials used therein. The Contractor shall maintain all tax records during the life of the Project and furnish the Owner with a complete listing of all taxes paid by taxing authority, invoice number, date, amount, etc. in a form acceptable to the Owner. The Contractor is required to maintain a file showing taxes paid on the Project for three (3) years after Final Payment or turn said documents over to the Owner for his files.

29.2 The following is a list of requirements to be followed by the Contractor in maintaining proper records and reporting the North Carolina Sales and Use Tax and Local Sales and Use Tax. The Contractor shall comply fully with the requirements outlined below, in order that the Owner may recover the amount of the tax permitted under the law.

a) It shall be the Contractor's responsibility to furnish the Owner documentary evidence showing the materials used and sales and use tax paid by the Contractor and each of his Subcontractors. Such evidence shall be transmitted to the Owner with each pay request irregardless of whether taxes were paid in that period.

b) The documentary evidence shall consist of a certified statement by the Contractor and each of the Contractor's Subcontractors individually, showing total purchases of materials from each separate vendor and total sales and use taxes paid to each vendor. Certified statements must show the invoice number, or numbers, covered, and inclusive dates of such invoices.

c) Materials used from Contractor's or Subcontractor's warehouse stock shall be shown in a certified statement at warehouse stock prices.

d) The Contractor shall not be required to certify the Subcontractor's statements.

ARTICLE 30. OPERATION OF OWNER'S FACILITIES

30.1 The Contractor agrees that all Work done under the Contract Documents shall be carried on in such a manner so as to ensure the regular and continuous operation of the adjoining or adjacent facilities. The Contractor further agrees that the sequence of operations under the Contract Documents shall be scheduled and carried out so as to ensure said regular and continuous operation. The Contractor shall not close any areas of construction until so authorized by the Designer. The Contractor shall control operations to assure the least inconvenience to the public. Under all circumstances, safety shall be the most important consideration.

ARTICLE 31. THIRD PARTY BENEFICIARY CLAUSE

31.1 It is specifically agreed between the parties executing the Agreement that, with the specific exception set forth paragraph 7.24 hereof, and that exception only, the Contract Documents and the provisions therein are not intended to make the public, or any member thereof, a third-party beneficiary of the Agreement, or to authorize anyone not a party to the Contract Documents to maintain a suit for personal injuries or property damage pursuant to the terms of provisions of the Contract Documents.

ARTICLE 32. MEASUREMENT OF QUANTITIES

32.1 All Work completed under the Contract Documents shall be measured by the Contractor using United States customary units of measurement. The method of measurement and computations to be used in determination of quantities of material furnished and of Work performed under the Contract Documents shall be those methods set forth in the Contract Documents or, if not specifically set forth therein, the method generally recognized as conforming to good engineering practice.

ARTICLE 33. TERMINATION BY THE OWNER FOR CAUSE

33.1 If the Contractor fails to begin or complete the Work under the Contract Documents within the time specified, or fails to perform the Work with sufficient labor and equipment or with sufficient materials to insure the prompt completion of said Work, or shall perform the Work unsuitably or shall discontinue the prosecution of the Work for three (3) days, or if the Contractor shall become insolvent, be declared bankrupt, commit any act of bankruptcy or insolvency, allow any final judgment to stand against the Contractor or its affiliated

companies unsatisfied for a period of forty-eight (48) hours, make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the Work in an acceptable manner, the Owner may give notice in writing to the Contractor and the Contractor's sureties of such delay, neglect, or default, specifying the same, and if the Contractor within a period of three (3) days after such notice shall not proceed in good faith and with reasonable speed to correct such delay, neglect, or default in accordance with such notice, the Owner shall have full power and authority, to the extent permitted by law, without violating the Contract Documents, to take the prosecution of the Work out of the hands of the Contractor, to appropriate or use any or all materials and equipment at the Project as may be suitable and acceptable, and may enter into an agreement for the completion of the Work or pursue such other methods as in the Owner's opinion shall be necessary or appropriate for the completion of the Work in an acceptable manner. All costs and charges incurred by the Owner in proceeding in accordance with the preceding sentence, including attorney's fees, and all costs incurred by the Owner in completing the Work shall be deducted from any money due or which becomes due the Contractor. If such costs and expenses incurred by the Owner shall be less than the sum which would have been payable under Contract Documents if it had been completed by the Contractor, then the Contractor shall be entitled to receive the difference, but if such costs and expenses shall exceed the sum which would have been payable under the Contract Documents, the Contractor and the Contractor's surety shall be liable to the Owner for and shall pay to the Owner the amount of such excess.

ARTICLE 34. TERMINATION OR SUSPENSION BY THE OWNER FOR CONVENIENCE

34.1 The Owner may, without cause, order the Contractor to terminate, suspend, delay, or interrupt the Work in whole or in part for such period of time as the Owner may determine.

34.2 If the Contractor is subsequently ordered by the Owner to resume the Work, any cost or expenses to which the Contractor may be entitled by reason of the suspension, delay, or interruption shall be recovered by means of a Change Order in accordance with Articles 13 and 14 hereof and the Contract Construction Schedule shall be adjusted in accordance with Article 13 hereof.

34.3 The Owner shall terminate the Work or portion thereof by written notice when the Contractor is prevented from proceeding with the Work as a direct result of an executive order of the President with respect to the prosecution of war or in the interest of national defense.

34.4 In the event of termination by the Owner under this Article, the Contractor shall be entitled to receive the reasonable and documented direct costs incurred prior to termination, including the cost of materials purchased for the Work which purchases cannot be canceled or which material cannot reasonably be used by the Contractor on other work, and the cost of closing down the Project in a safe and efficient manner, plus ten percent (10%) thereof for overhead and profit, subject to the following conditions:

a) When the Contract is terminated before completion of all items of Work, payment shall be made for the actual number of units or items of Work completed at the applicable contract prices, or as mutually agreed for items of Work partially complete. If a mutual agreement cannot be reached, the Owner shall have the

authority to make such equitable adjustment as it deems warranted and the Final Payment shall be made accordingly.

b) Reimbursement for organization of any Work and moving equipment to and from the job shall be considered when not otherwise provided for in the Contract Documents where the volume of completed Work is too small to compensate the Contractor for those expenses under unit prices. If a mutual agreement cannot be reached, the Owner will have the authority to make such equitable adjustments as it deems warranted and the Final Payment will be made accordingly.

c) Materials obtained by the Contractor for the Work that have been inspected and accepted by the Designer and that are not incorporated in the Work shall, at the request of the Contractor, be purchased from the Contractor at the Contractor's actual cost as shown by receipted bills and actual costs records at such points of delivery as may be determined by the Owner.

d) No payment shall be made by Owner to Contractor except as herein above provided. No claim for loss of anticipated profits shall be considered or allowed.

e) Termination of the Contract shall not relieve the Contractor of his responsibilities for any completed portion of the Work nor shall it relieve his sureties of their obligation for and concerning any just claims arising out of the Work performed.

The Contractor shall not be entitled to any other compensation, including compensation for lost profit, lost opportunity, or any other direct or consequential cost, loss, or damage.

ARTICLE 35. MINORITY BUSINESS ENTERPRISE PROGRAM

35.1 The Contractor shall at all times comply with the latest edition of the Wake County Minority Business Enterprise Policy. All documentation substantiating compliance with the requirements of this program shall be delivered to the Owner as stipulated in the Contract Documents. A copy of the Wake County Minority Business Enterprise Policy is included in the Project Manual.

ARTICLE 36. GENERAL

36.1 If any provision of the Agreement shall be declared invalid or unenforceable, the remainder of the Agreement shall continue in full force and effect.

36.2 The titles to Articles herein are for convenience only, are not substantive parts of the General Conditions, and are not to be considered in interpreting the Contract Documents.

END OF GENERAL CONDITIONS OF THE
CONTRACT FOR CONSTRUCTION

SECTION 06 22 00 – MILLWORK

PART 1 - GENERAL

1.1 SCOPE:

A. Provide all of the labor, materials, equipment and services required to furnish and install the millwork.

1.2 QUALITY ASSURANCE:

A. In addition to complying with all pertinent codes and regulations, the latest edition "Architectural Woodwork Standards" of the Architectural Woodwork Institute shall apply and by reference are hereby made a part of these Contract Documents. Any reference to "premium", "custom", or "economy" shall be defined in the latest edition of AWI "Architectural Woodwork Standards".

1.3 SUBMITTALS:

A. Prior to fabrication, submit to the Architect for review the following:
   1. Shop drawings that at a minimum shall show the following:
      a. All materials (solid wood, plywood, fiberwood board, plastic laminate, solid surface, and hardware).
      b. All thicknesses and dimensions.
      c. Specie, grade and cut of woods and veneers.
      d. Jointing and bolting.
      e. The name of the manufacturer and the model number of all factory fabricated items.
      f. Full size details drawn in related and dimensioned positions to facilitate checking of intersecting and string dimensions.
      g. Clear description of work to be done in the shop and work to be done in the field.
   2. Manufacturer's literature of specialty items not manufactured by the architectural woodworker.
   3. Physical samples:
      a. Plastic laminate in all colors and patterns for the Architect's selection.
      b. Upon request, provide one unit of each type and finish of hardware

B. Certification: Submit copies of certificate signed by woodwork shop certifying that millwork complies with quality grades and other requirements indicated. Form of certificate shall be approved by the Architect.

1.4 PRODUCT HANDLING:

A. Millwork shall not be delivered until the building and storage areas are sufficiently conditioned so that the millwork will not be damaged by excessive changes in moisture content.

PART 2 - PRODUCTS

2.1 INTERIOR OF CASEWORK, SHELVES – White Melamine:

A. AWI quality grade: Custom
   1. White Melamine

B. Interior exposed surfaces – general purpose plastic laminate: 0.048 inches (1.2mm) nominal approximately 1/16" thick high-pressure plastic laminate; Vertical Surface Laminate Product 0.028 inch (0.7 mm) nominal and High Definition Laminate 0.039 inch (1.0 mm) nominal as required by AWI quality grade and conforming to NEMA LD 3, Grade HGS, VGS, VGP & HGP and ISO 4586, Grade HGS, VGS, VGP & HGP. Abrasion Class I.

C. Interior casework body members (ends, divisions, fixed shelves, bottoms, tops, bases, rails, backs, drawer sides, drawer bottoms) to be made of cabinet-grade plywood per AWI standards.

D. **NO PARTICLE BOARD IS ALLOWED ON SITE.**

E. Provide all vertical and horizontal filler material required for a complete installation

F. Edge-banding shall be HPDL or .03 mm flat PVC color to coordinate with face laminate.

G. Grain pattern of laminate shall be in the same direction on all interior components.

2.2 FACE OF CASEWORK – STAINED **ST-1**

A. AWI quality grade: Custom ANSI/AWI 400 Factory Finish standards
   1. Acceptable Manufacturers:
      a. See Finish Schedule for basis of design
         i- species
         ii- stain

B. casework members (doors, drawers, end filler, face frames, bases, toe kicks, exposed ends) to be made of stain and cabinet grade plywood per AWI standards.

C. Drawer fronts and cabinet doors with dimensions up to 30” width x 80” height shall be constructed from 3/4” minimum Stain-grade Plywood or panel product.

D. Provide all vertical and horizontal filler material required for a complete installation

E. Grain pattern of wood shall be in the same direction on all exterior components and filled as necessary.

F. Stain shall be dry and sealed before transporting to job site.

A. CR-1- White oak, stained. Chair rail, with ST-1.

2.4 SOLID SURFACE COUNTER: **SSF-1, SSF-2**

A. Basis of Design, **(SSF-1)** Wilsonart, reference Interior Finish Legend A700.

Non-porous solid surface 1/2" thickness unless otherwise noted on drawings.

All other manufacturers to closely match aesthetics. Acceptable Manufacturers:
a. Corian.
b. Wilsonart
c. HI-MACS

3. See drawings for locations of solid surface and profile trim where applicable.

B. Solid Surface Counter support where applicable:
1. Counter to be installed on square tube stock or angle iron support framing when not over cabinetry or casework. Support framing to include perimeter supports, perimeter supports at cutouts, and cross supports where necessary.
a. Maximum deflection of solid surface to be 1/8" (3 mm) over 10 feet (3 m)
2. Where underlayment is indicated, install solid surface over ¾" plywood underlayment. If spacers are required, they are to be moisture-resistant MDF or moisture-resistant plywood.
3. All counter surfaces that do not have cabinets below require a ¾" plywood substrate underlayment to avoid future cracking of the solid surface counter.
4. Solid surface counter edges at overhangs to be built-up construction unless noted otherwise.

2.5 WINDOW SILLS: (SSF)

A. Non-porous solid surface 1/2" thickness unless otherwise noted on drawings.

1. Basis of Design, (SSF-2) Wilsonart, reference Interior Finish Legend A700.
2. All other manufacturers to closely match aesthetics. Acceptable Manufacturers:
a. Corian.
b. Wilsonart
c. HI-MACS
e. See drawings for locations of solid surface and profile trim where applicable.

B. Solid Surface Counter support where applicable:

1. Counter to be installed on square tube stock or angle iron support framing when not over cabinetry or casework. Support framing to include perimeter supports, perimeter supports at cutouts, and cross supports where necessary.
a. Maximum deflection of solid surface to be 1/8" (3 mm) over 10 feet (3 m).
2. Where underlayment is indicated, install solid surface over ¾" plywood underlayment. If spacers are required, they are to be moisture-resistant MDF or moisture-resistant plywood.
3. All counter surfaces that do not have cabinets below require a ¾" plywood substrate underlayment to avoid future cracking of the solid surface counter.
4. Solid surface counter edges at overhangs to be built-up construction unless noted otherwise.

2.6 CASEWORK HARDWARE:

A. All cabinet hardware shall be furnished and installed by the casework manufacturer.
1. Drawer slides:
a. Full extension slides for file drawers
b. White Euroslides for typical drawers

c. Manufacturers: Accuride, Mepla, Hafele, or Knape & Vogt.

2. Line boring with metal shelf clips.

3. Hinges: 120-degree concealed casework hinges with self-closing feature.
   a. Provide number of hinges per manufacturer's recommendations. In no case less than:
      i. Three (3) hinges per door with a height 40" or greater or a weight between 15-30 lbs
      ii. Four (4) hinges per door with a height 60" or greater or a weight between 30-45 lbs
      iii. Five (5) hinges per door with a height of 80" or greater or a weight between 45-60 lbs
   b. Where wheelchair accessibility is required for base cabinets with sink, provide 170-degree concealed casework hinges with magnetic catches.
   c. Manufacturers: Blum, Salice, Hafele or Grass.

4. Pulls: Richelieu; 7516192170AB 7 9/16" width, in stainless steel finish.

5. Locks: Cam locks where noted on drawings.
   a. All locks to be separately keyed with a master key provided.
   b. Manufacturers: National or approved equal

6. Silencers: Provide a minimum of 2 silencers for each cabinet door and drawer.

PART 3 - EXECUTION

3.1 PREPARATION FOR FINISHING:

A. Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing of concealed surfaces and similar preparations for finishing of millwork as applicable to each unit of work.

B. Shop Finishing: to the greatest extent possible, finish millwork at shop or factory. Defer only final touch-up, cleaning and polishing for times after delivery and installation.

3.2 PREPARATION FOR INSTALLATION:

A. Condition millwork to average prevailing humidity conditions in installation areas prior to installing.

B. Coordinate installation of backing for support, before walls are built.

3.3 INSTALLATION:

A. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level; and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.

B. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

C. Anchor millwork to anchors or built-in blocking. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete

installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with millwork, and matching final finish where transparent finish is indicated.

3.5 CASEWORK:

A. Set and secure casework in place rigid, plumb and square.

B. Use purpose designed fixture attachments for wall-mounted components. Attach wall-mounted cabinets in order that they can withstand all superimposed loading.

C. Use thread steel concealed joint fasteners to align and secure adjoining cabinet units and counter tops.

D. Permanently fix cabinet and counter bases to floor using appropriate angles and anchorages.

E. Counter-sink semi-concealed anchorage devices used to wall mount components, and conceal with solid plugs of species to match surrounding wood. Place flush with surrounding surfaces.

F. Carefully scribe cabinetwork which is against other building materials leaving gaps of 1/32" maximum. Seal gaps with sealant tinted to match adjacent surfaces. Do not use additional overlay trim for this purpose.

G. Install and adjust cabinet hardware to ensure smooth and correct operation.

3.6 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

A. Repair damaged and defective millwork wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace millwork. Adjust joinery for uniform appearance.

B. Clean hardware, lubricate and make final adjustments for proper operation.

C. Clean millwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

D. Provide final protection and maintain conditions, in a manner acceptable to fabricator and installer, which ensures millwork being without damage or deterioration at time of Substantial Completion.

END OF SECTION 06 22 00

SECTION 26 32 13 – ENGINE GENERATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:

1. Engine and engine accessory equipment.
2. Alternator (generator).
3. Generator set control system.
4. Generator set weatherproof sound attenuated enclosure.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 36 00 - Transfer Switches.

1.3 REFERENCE STANDARDS

A. ASTM D975 - Standard Specification for Diesel Fuel Oils; 2015b.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

C. NECA/EGSA 404 - Standard for Installing Generator Sets; National Electrical Contractors Association; 2014.

D. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2014.

E. NFPA 30 - Flammable and Combustible Liquids Code; National Fire Protection Association; 2015.

F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; National Fire Protection Association; 2015.

G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 110 - Standard for Emergency and Standby Power Systems; National Fire Protection Association; 2013.

I. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.

J. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

K. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.

a. Transfer Switches: See Section 26 36 00.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.

5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

B. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

C. Evidence of qualifications for installer.

D. Evidence of qualifications for maintenance contractor (if different entity from installer).

E. Manufacturer's factory emissions certification.

F. Source quality control test reports.

G. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:

1. Certified prototype tests.

2. Torsional vibration compatibility certification.

3. NFPA 110 compliance certification.

4. Certified rated load test at rated power factor.

H. Manufacturer’s detailed field testing procedures.

I. Field quality control test reports.

J. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

K. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

L. Maintenance contracts.

M. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

N. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Fuses: One of each type and size.
2. Extra Filter Elements: One of each type, including fuel, oil and air.

O. Generator Power Calculation: Manufacturer shall provide a complete report utilizing loads as shown in the contract documents to demonstrate the rated generator size shall be able to accommodate the startup and continuous operation of the building for 48 hours.

P. Generator platform: Manufacturer shall provide all dimensions, materials of generator platform in coordination with the height of the belly tank.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).
2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
4. NFPA 30 (Flammable and Combustible Liquids Code).

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

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Packaged Engine Generator Set:

1. Generac Industrial Power; www.generac.com
2. Caterpillar Inc; www.cat.com.
3. Cummins Power Generation Inc: www.cumminspower.com.

2.2 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:

1. Application: Level 1 Class 2 (+33%) Type 10 Emergency Generator.

2. Configuration: Single packaged engine generator set with weatherproof enclosure operated independently (not in parallel).

D. Packaged Engine Generator Set:

1. Type: Diesel (compression ignition).

2. Power Rating: As indicated on drawings.

3. Voltage: As indicated on drawings.

4. Main Line Circuit Breakers:

a. Type: Electronic trip with long time and short time delay and instantaneous pickup.

b. Trip Ratings: As indicated on drawings.

E. Generator Set General Requirements:

1. Prototype tested in accordance with NFPA 110 for Level 1 systems.

2. Factory-assembled, with components mounted on suitable base.

3. List and label engine generator assembly as complying with UL 2200.

4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.

5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.

6. Main Line Circuit Breakers: Provide (2) factory-installed line side connections for (2) circuit breakers with suitable lugs for load side connections. One breaker shall be rated 800A and the second shall be rated for 200A. Provide all necessary components for mounting these circuit breakers with the generator set.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:

1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.

2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.

3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).

4. Maximum Load Step: Supports 100 percent of rated load in one step.

5. Motor Starting Capability: Supports starting of motor load indicated with a maximum voltage dip of 30 percent.

H. Exhaust Emissions Requirements:

1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.

2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.3 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System -

1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.

2. Fuel Storage: Above ground double-wall belly tank

3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.

4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.

5. Above ground double wall belly tank:

a. Provide an above ground double-wall belly tank with secondary listed and labeled as complying with UL 142.

b. Tank Capacity: Size for minimum of 48 hours of continuous engine generator operation at 100 percent rated load (133% of low-fuel sensor quantity – ref NFPA 110 5.5.3).

c. Features:

1) Direct reading fuel level gauge.

2) Normal atmospheric vent.

3) Emergency pressure relief vent.

4) Fuel fill opening with lockable cap.

5) Dedicated electrical conduit stub-up area.

6) Low fuel level switch.

7) Leak detection switch; located within secondary containment interstitial space for detection of primary tank fuel leak.

8) Manufacturer provided spill protection/ spill containment means

9) Overfill prevention valve

10) Fuel fill drop tube

C. Engine Starting System:

1. System Type: Electric, with DC solenoid-activated starting motor(s).

2. Battery(s):

a. Battery Type: Lead-acid.

b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.

c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.

3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.

4. Battery Charger:

a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.

b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.

c. Recognized as complying with UL 1236.

d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.

e. Provide integral DC output ammeter and voltmeter with five percent accuracy.

f. Provide alarm output contacts as necessary for alarm indications.

5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):

1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.

2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:

1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:

1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.

2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

G. Engine Air Intake and Exhaust System:

1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.

2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.4 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:

1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.

2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.

3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

2.5 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:

1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.

2. Generator Set Control Functions:

a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).

b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.

c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.

d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.

e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.

f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).

g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.

3. Generator Set Status Indications:

a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.

b. Current (Amps): For each phase.

c. Frequency (Hz).

d. Real power (W/kW).

e. Reactive power (VAR/kVAR).

f. Apparent power (VA/kVA).

g. Power factor.

h. Duty Level: Actual load as percentage of rated power.

i. Engine speed (RPM).

j. Battery voltage (Volts DC).

k. Engine oil pressure.

l. Engine coolant temperature.

m. Engine run time.

n. Generator powering load (position signal from transfer switch).

4. Generator Set Protection and Warning/Shutdown Indications:

a. Comply with NFPA 110; configurable for NFPA 110 Level 1 and NFPA 99 systems including but not limited to the following protections/indications:

1) Overcrank (shutdown).

2) Low coolant temperature (warning).

3) High coolant temperature (warning).

4) High coolant temperature (shutdown).

5) Low oil pressure (shutdown).

6) Overspeed (shutdown).

7) Low fuel level (warning).

8) Low coolant level (warning/shutdown).

9) Generator control not in automatic mode (warning).

10) High battery voltage (warning).

11) Low cranking voltage (warning).

12) Low battery voltage (warning).

13) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:

1) High AC voltage (shutdown).

2) Low AC voltage (shutdown).

3) High frequency (shutdown).

4) Low frequency (shutdown).

5) Overcurrent (shutdown).

6) Fuel tank leak (warning), where applicable.

c. Provide contacts for local and remote common alarm.

d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:

a. Event log.

C. Remote Annunciator:

1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Generator Set Status Indications:
    a. Generator powering load (via position signal from transfer switch).
    b. Communication functional.
3. Generator Set Warning/Shutdown Indications:
    a. Comply with NFPA 110 for Level 1 systems including but not limited to the following indications:
        1) Overcrank (shutdown).
        2) Low coolant temperature (warning).
        3) High coolant temperature (warning).
        4) High coolant temperature (shutdown).
        5) Low oil pressure (shutdown).
        6) Overspeed (shutdown).
        7) Low fuel level (warning).
        8) Low coolant level (warning/shutdown).
        9) Generator control not in automatic mode (warning).
        10) High battery voltage (warning).
        11) Low cranking voltage (warning).
        12) Low battery voltage (warning).
        13) Battery charger failure (warning).
    b. Provide audible alarm with silence function.
    c. Provide lamp test function that illuminates all indicator lamps.

2.6 GENERATOR SET ENCLOSURE

A. Enclosure Type: Weather protective Type 2 sound attenuated enclosure, 75 dBA at 100% load at 23 feet.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

J. Enclosure Lighting: Integral AC/DC enclosure lighting kit.

K. Enclosure Heater: The ambient air temperature in the EPS equipment room or outdoor housing containing Level I rotating equipment shall be not less than 4.5°C (40°F).

2.7 SOURCE QUALITY CONTROL

A. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

B. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1.

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized 6 inch high concrete pad constructed in accordance with Section 03 30 00. Provide suitable vibration isolators, where not factory installed.

F. Provide required support and attachment in accordance with Section 26 05 29.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide engine exhaust piping in accordance with Section 23 51 00, where not factory installed.

1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.

2. Do not exceed manufacturer's maximum back pressure requirements.

3. Ensure piping is safely directed away from occupied area and critical equipment

I. Install exhaust silencer in accordance with Section 23 51 00, where not factory installed.

J. Provide grounding and bonding in accordance with Section 26 05 26.

K. Identify system wiring and components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

B. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

E. Preliminary inspection and testing to include, at a minimum:

1. Inspect each system component for damage and defects.

2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.

3. Check for proper oil and coolant levels.

F. Prepare and start system in accordance with manufacturer's instructions.

G. Perform acceptance test in accordance with NFPA 110.

H. Inspection and testing to include, at a minimum:

1. Verify compliance with starting and load acceptance requirements.

2. Verify voltage and frequency; make required adjustments as necessary.

3. Verify phase sequence.

4. Verify control system operation, including safety shutdowns.

5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).

6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

7. Provide Generator capacity load tests at 50, 75, and 100 % loads.

8. Provide a pressure test on tank witnessed by the owner prior to any fuel being delivered to tank

I. Provide field emissions testing where necessary for certification.

J. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

K. Submit detailed reports indicating inspection and testing results and corrective actions taken to the engineer of record and Wake Couty

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of four hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

C. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.6 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

END OF SECTION

SECTION 26 51 19 – LED INTERIOR LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.

2. LED electronic drivers.

3. Lighting fixture supports.

4. Luminaire Accessories.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.

2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaires.

4. Include emergency lighting units, including batteries and chargers.

5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.

6. Photometric data and adjustment factors based on laboratory tests complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project; IES LM-79 and IES LM-80.

    a) Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

    b) Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

7. Certificates for Dimming Drivers: Manufacturer's documentation of compatibility with dimming controls to be installed.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting luminaires.

2. Suspended ceiling components.

3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.

4. Structural members to which equipment and/or luminaires will be attached.

5. Initial access modules for acoustical tile, including size and locations.

6. Items penetrating finished ceiling, including the following:

    a) Other luminaires.

    b) Air outlets and inlets.

    c) Speakers.

d) Sprinklers.

e) Access panels.

f) Ceiling-mounted projectors.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of luminaire.

E. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

F. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. Replaceable LED Modules or LED lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.

3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.

2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

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.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

B. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Provide five year warranty for all LED Luminaires, including LED modules, luminaires, and drivers.

C. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE 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.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Recessed Fixtures: Comply with NEMA LE 4.

E. Bulb shape complying with ANSI C79.1.

F. Lamp base complying with ANSI C81.61.

G. CRI of minimum 90. CCT of [3500 K]

H. Rated lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 1 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: Universal multi-volt (120-277V)

1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

L. Housings:

1. Formed steel housing or aluminum as per fixture schedule and aluminum heat sink. Provide with painted after fabrication finish.

2.3 EXIT SIGNS

A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single or double as indicated on the drawings or as required for the installed location.

2. Directional Arrows: As indicated on the drawings or as required for the installed location.

B. Accessories:

1. Provide compatible accessory high impact polycarbonate vandal shields where indicated.

2. Provide compatible accessory wire guards where indicated.

2.4 ELECTRONIC LED DRIVERS

A. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

3. Driver shall be available in a plastic/metal can or metal can construction to meet plenum requirements.

4. Driver shall be provided with poke-in wire trap connectors or integral leads color per ANSI C82.11

5. Performance:

    a) Driver shall operate from 60Hz input source of 120V with sustained variations of plus or minus 10 percent (voltage and frequency) with no damage to the Driver.

    b) Driver output shall be regulated to +/- 5% across published load range.

    c) Driver shall operate LED's at a frequency of 60Hz

    d) Driver shall have a Power Factor greater than 0.90 for primary application.

    e) Driver input current shall have Total Harmonic Distortion (THD) of less than 20 percent.

    f) Driver shall have a Class A sound rating.

    g) Driver shall have a minimum operating temperature of -40 degrees Fahrenheit.

    h) Driver shall tolerate sustained open circuit and short circuit output conditions without damage and without need for external fuses or trip devices.

6. Regulatory Requirements:

    a) Driver shall not contain and Polychlorinated Biphenyl (PCB)

    b) Driver shall be Underwriters Laboratories (UL) listed, Class 2 outdoor.

    c) Driver shall comply with ANSI C62.41 Category A for transient protection.

    d) Driver shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 15, Non-consumer (Class A) for EMI/RFI (conducted and radiated).

7. Other Requirements:

    a) Driver shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

    b) Driver shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 90C.

    c) Manufacturer shall have fifteen year history of producing electronic drivers for the North American market.

    d) Dimmable drivers shall be controlled by a Class 2 low voltage 0-10VDC controller.

2.5 LED LIGHT SOURCES

A. Light Sources - General Requirements:

1. Unless explicitly excluded, provide new, compatible, operable light sources in each luminaire.

2. Verify compatibility of specified light source with luminaires to be installed. Where light sources are not specified, provide light sources per luminaire manufacturer's recommendations.

3. Minimum Efficiency: Provide light sources complying with all current applicable federal and state light source efficiency standards.

4. Color Temperature Consistency: Unless otherwise indicated, for each type of light source, furnish products which are consistent in perceived color temperature. Replace light sources that are determined by the Architect to be inconsistent in perceived color temperature.

B. Light Source - Sustainable Design Requirements:

1. The light source in the luminaire and associated shielding shall provide a high efficacy for energy savings to meet the requirements of LEED certification.

2. Minimum Rated Life:

a) LED light sources shall have a minimum life of 50,000 hours based on three hours per start.

C. Linear LED light sources: Wattage and light source type as indicated for luminaire.

1. LED Modules:

a) LED single point diodes or arrays shall be manufactured by Acuity, Cree, Nichia, Lumileds or Osram. Provide a sample of the fixture to be used, if requested.

b) The array shall have color temperature of 3500>, +/- 100 degrees Kelvin. The LED bin codes shall be consistent for LED Modules used with a higher level of efficiency.

c) Provide a listing of the bin code information in the submittal for review. Driver shall be of a high efficiency type with 0-10Volt dimming control available as standard.

d) Photometric performance of fixture shall be in compliance with IES LM-79 and stated predicted lifetime shall be tested so that lumen depreciation shall be in compliance with IES LM-80.

e) Solid state lighting shall be in compliance with ANSI C78.377 for chromaticity specifications.

2. LED Lamps:

a) LED self-contained lamps with integral drivers.

b) Medium base (E-26) or candelabra type base (E-12).

c) Dimmable Standard A-19 frosted type design or various shaped Edison-style filament vintage lamp design.

2.6 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.

2. Sheet metal components shall be steel unless otherwise indicated.

3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Prismatic acrylic

2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

3. Glass: Annealed crystal glass unless otherwise indicated.

4. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Formed steel housing or aluminum as per fixture schedule and aluminum heat sink.

2. Provide with painted after fabrication finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a) "USE ONLY" and include specific lamp type.

b) Lamp diameter, shape, size, wattage, and coating.

c) CCT and CRI for all luminaires.

2.7 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.8 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.

2. Able to maintain luminaire position after cleaning and relamping.

3. Provide support for luminaire without causing deflection of ceiling or wall.

4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.

2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.

3. Trim ring flush with finished surface tight to mounting surface with no visible light leakage.

4. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

5. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls

2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two or as required 5/32-inch diameter aircraft cable supports adjustable to architect selected length.

2. Ceiling mount with pendant mount at architect selected height.

3. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.

2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.

3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.

4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.

2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

a) In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.

b) See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

J. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports and provide to the engineer of record and Wake County

D. Exit signs and emergency lighting shall be tested in coordination with the building official.

3.6 STARTUP SERVICE

A. Comply with manufacturer’s requirements for startup.

3.7 CLEANING OF FIXTURES

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.

2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 26 51 19

SECTION 26 56 19 – LED EXTERIOR LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.

2. Luminaire supports.

3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.

2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaire.

4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.

5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The

adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

a) Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

b) Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.

7. Photoelectric relays.

8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture indicated with factory-applied finish.

D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.

2. Structural members to which luminaires will be attached.

3. Underground utilities and structures.

4. Existing underground utilities and structures.

5. Above-grade utilities and structures.

6. Existing above-grade utilities and structures.

7. Building features.

8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Product Certificates: For each type of the following:

1. Luminaire.

2. Photoelectric relay.

D. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

E. Source quality-control reports.

F. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires [and photoelectric relays] to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.

2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.

3. Diffusers and Lenses: One for every 100of each type and rating installed. Furnish at least one of each type.

4. Globes and Guards: One for every 20of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

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

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a) Structural failures, including luminaire support components.

b) Faulty operation of luminaires and accessories.

c) Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 PRODUCTS

2.1 LUMINAIRE 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.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61

F. Bulb shape complying with ANSI C79.1.

G. CRI of minimum 80. CCT as indicated on the drawings.

H. L70 lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 277 V

L. In-line Fusing: On the primary for each luminaire

M. Lamp Rating: Lamp marked for outdoor use.

N. Source Limitations: Obtain luminaires from single source from a single manufacturer.

O. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

P. Ballast and Driver of fixtures shall be capable of operation in below 32 degree Fahrenheit weather.

2.2 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

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

1. Cooper Lighting, an Eaton business.

2. GE Lighting Solutions.

3. Lithonia Lighting; Acuity Brands Lighting, Inc.

4. Philips Lighting Company.

B. Comply with UL 773 or UL 773A.

C. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.

2. Adjustable window slide for adjusting on-off set points.

2.3 LUMINAIRE TYPES

A. Refer to Lighting Fixture Schedule on drawings.

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: As indicated on the drawings. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping

and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

2. Glass: Annealed crystal glass unless otherwise indicated.

3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.

2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.

2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a) "USE ONLY" and include specific lamp type.

b) Lamp diameter, shape, size, wattage and coating.

c) CCT and CRI for all luminaires.

2.5 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.

3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

    a) Color: Per architect.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a) Color: As selected from manufacturer's standard catalog of colors.

    b) Color: Match Architect's sample of manufacturer's standard color.

    c) Color: As selected by Architect from manufacturer's full range.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, for suitable conditions where luminaires will be installed.

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

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.

2. Able to maintain luminaire position after cleaning and relamping.

3. Support luminaires without causing deflection of finished surface.

4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Coordinate layout and installation of luminaires with other construction.

I. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

J. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 05 33 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 BOLLARD LUMINAIRE INSTALLATION:

A. Align units for optimum directional alignment of light distribution.

1. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00 "Cast-in-Place Concrete."

3.5 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00 "Cast-in-Place Concrete."

3.6 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a) IES LM-5.

b) IES LM-50.

c) IES LM-52.

d) IES LM-64.

e) IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

F. Exit signs and emergency lighting shall be tested in coordination with the building official.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.

2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3. Adjust the aim of luminaires in the presence of the Architect and engineer.

END OF SECTION 26 56 19

SECTION 28 31 11 – DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Magnetic door holders.
7. Remote annunciator.
8. Addressable interface device.
9. Digital alarm communicator transmitter.
10. System printer.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.5 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a) Trained and certified by manufacturer in fire-alarm system design.

b) NICET-certified fire-alarm technician, Level III minimum.

c) Licensed or certified by authorities having jurisdiction.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.

2. Include voltage drop calculations for notification appliance circuits.

3. Include power supply calculations. Provide 25% spare capacity on each power supply.

4. Include battery-size calculations. Provide 25% spare capacity on each battery system.

5. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

6. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Complete drawings including the following shall be submitted by the contractor for the proposed system:

1. Provided contractor provided usable electronic floor plan drawings in a usable format such as AutoCAD, floor plans shall be provided identifying all initiating, end of line, supervisory, indicating appliances, and output control devices; including circuit interface panels, annunciators, remote panels and the main CPU locations. Raceways shall be shown, with the size identified, the number of conductors with type and size, meeting the percentage of allowable National Electric Code fill used.

2. Wiring diagrams showing points of connection and terminals used for all electrical connections to the system devices and panels.

E. A complete proposed system database including a description of all logic strings, control by event programming and point identification labels on a CD’s and in a formatted printed form, required for off site editing, uploading and downloading shall be submitted for evaluation by the owner. A programming manual shall accompany the submitted program and shall be adequate to allow understanding, operation and editing by the system owner.

F. Copies of required approved drawings by the “Authority Having Jurisdiction” (AHJ).

1. Prior to commencing with the installation of the fire alarm system, this contractor shall submit the plans for the fire alarm system to the local authority having jurisdiction for approval. This contractor shall pay all fees associated with this approval including the fee for

all inspections. An original “Stamped Approved Drawing” along with the Fire Marshall’s inspection certificate shall be delivered to the building owner prior to submitting for final payment.

G. Qualification Data: For qualified Installer.

H. Field quality-control reports.

I. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.

3. Record copy of site-specific software.

4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

a) Frequency of testing of installed components.

b) Frequency of inspection of installed components.

c) Requirements and recommendations related to results of maintenance.

d) Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.

6. Abbreviated operating instructions for mounting at fire-alarm control unit.

7. Copy of NFPA 25.

J. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

2. Program Software Backup: On magnetic media or compact disk, complete with data files.

3. Device address list.

4. Printout of software application and graphic screens.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

B. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

C. 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.

D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.7 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.8 EXTRA MATERIALS

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

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.

2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.

3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.

4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.

5. Keys and Tools: One extra set for access to locked and tamperproofed components.

6. Audible and Visual Notification Appliances: One of each type installed.

7. Fuses: Two of each type installed in the system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

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

1. Siemens

2. SimplexGrinnell LP; a Tyco International company.

3. Notifier

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Verified automatic alarm operation of smoke detectors.
6. Automatic sprinkler system water flow.
7. Heat detectors in elevator shaft and pit.
8. Fire-extinguishing system operation.
9. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate voice/alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
9. Activate emergency shutoffs for gas and fuel supplies.
10. Record events in the system memory.
11. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.

3. Loss of primary power at fire-alarm control unit.

4. Ground or a single break in fire-alarm control unit internal circuits.

5. Abnormal ac voltage at fire-alarm control unit.

6. Break in standby battery circuitry.

7. Failure of battery charging.

8. Abnormal position of any switch at fire-alarm control unit or annunciator.

9. Fire-pump power failure, including a dead-phase or phase-reversal condition.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

a) System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.

b) Include a real-time clock for time annotation of events on the event recorder and printer.

2. Addressable initiation devices that communicate device identity and status.

a) Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.

b) Temperature sensors shall additionally test for and communicate the sensitivity range of the device.

3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 2 line(s) of 80 characters, minimum.

2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

a) Initiating Device Circuits: Style D.

(i) The system shall have an interconnecting riser loop or network (Style 6 supervision) for interconnection between fire alarm control panels and transponder panels.

b) Notification Appliance Circuits: Style Z.

(i) Submit Loading calculations for all Notification Appliance Circuits (NAC) complete with the spare capacities as identified herein. The maximum load on a single NAC shall not exceed 1.0 amperes. It shall be possible to install Audible Notification Appliances (Horns) and Visual Notification Appliances (Strobes) on the same circuit and maintain the ability to “Silence” the Audible Appliances while the Visual Appliances continue to “Flash”. An NAC shall be zoned by “Level” or “Floor” and at no time be allowed to serve multiple “Levels” or “Floors”.

c) Signaling Line Circuits: Style 6.

d) Install no more than 50 addressable devices on each signaling line circuit. Provide a minimum of one circuit per floor.

2. Serial Interfaces: Two RS-232 ports for printers.

D. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.

2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.

3. Record events by the system printer.

4. Sound general alarm if the alarm is verified.

5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

E. Notification Appliance Circuit: Operation shall sound in a temporal patten.

F. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

G. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

I. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands

initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

J. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

K. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium. Provide 25% spare capacity on each battery system.

2. The battery supply shall be calculated to operate its load in a supervisory mode for twenty-four (24) hours with no primary power applied and, after that time, operate in the alarm mode for five (5) minutes.

L. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.

2. Station Reset: Key- or wrench-operated switch.

3. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.

2. Detectors shall be four-wire type.

3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.

5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

    a) Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.

    b) Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.

    c) Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a) Primary status.

    b) Device type.

    c) Present average value.

    d) Present sensitivity selected.

    e) Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a) Primary status.

    b) Device type.

    c) Present average value.

    d) Present sensitivity selected.

    e) Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

   a) Primary status.

   b) Device type.

   c) Present average value.

   d) Present sensitivity selected.

   e) Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.

4. Each sensor shall have multiple levels of detection sensitivity.

5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.

6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.

   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.

   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F

   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.

   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.

B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:

a) 15, 30, 75, 110 or 177 cd, selectable in the field.

b) As part of this contract the candela (cd) of the visual notification appliances shall be set as identified by Chapter 7 of NFPA 72 for the area of coverage at no time will the 15/75 cd comprise be allowed.

c) As part of one’s submittal, floor drawings shall be provided identifying the candela of each appliance.

2. Mounting: Wall mounted unless otherwise indicated and “Listed” for such. Units shall be available for Ceiling Mounted and “Listed” for such applications. All appliances shall be semi-flush where ever possible with the manufacturer’s prescribed surface back box at those locations identified on the contract drawings as surface mounted.

3. Weatherproof Locations: Appliance shall be Listed for such applications and be complete with a Weatherproof Back Box.

4. Provide wire guards as shown on the contract drawings to prevent physical damage. Light output ratings shall be determined with guards in place.

5. Flashing shall be synchronized with other units.

6. Strobe Leads: Factory connected to screw terminals.

7. Mounting Faceplate: Factory finished white.

E. Voice/Tone Notification Appliances (Speakers):

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.

2. High-Range Units: Rated 2 to 15 W.

3. Low-Range Units: Rated 1 to 2 W.

4. Mounting: Semi-flush where ever possible with the manufacturer’s prescribed surface back box at those locations identified on the contract drawings as surface mounted.

5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

6. Provide wire guards as shown on the contract drawings to prevent physical damage.

7. Weatherproof Locations: Appliance shall be Listed for such applications and be complete with a Weatherproof Back Box.

2.8 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.

2. Wall-Mounted Units: Flush mounted unless otherwise indicated.

3. Rating: 24-V ac or dc.

4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.9 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.12 SYSTEM PRINTER

A. Printer shall be listed and labeled by an NRTL as an integral part of fire-alarm system.

2.13 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

2.14 FIRE ALARM WIRE AND CABLE

A. Fire Alarm Power Branch Circuits: Building wire as specified herein.

B. Initiating, Signal Circuits, Data and 24 VDC Power Cables: Building wire as specified. Non-power limited, fire-protective signaling cable, copper conductor, 150 volt insulation rated 60 degree C; Power limited fire-protective signaling cable, copper conductor, 300 volts insulation rated 105 degree C.

1. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.

2. All fire alarm cable shall be installed in an “Approved” metallic clad raceway.

3. Wiring for the analog loop circuits and the network data circuits shall be 18 AWG twisted and shielded FPL type, West Penn Wire number 975.

4. Wiring for the visual appliances, audible appliances and remote annunciator power circuits shall be a 14 AWG type FPL, West Penn Wire number 994.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on concrete base with tops of cabinets not more than 72 inches above the finished floor. Comply with requirements for concrete base specified in Division 03 Section "Cast-in-Place Concrete."

1. Install seismic bracing. Comply with requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.

D. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.

2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.

3. Smooth ceiling spacing shall not exceed 30 feet.

4. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

5. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

H. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

I. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.

K. Device Location-Indicating Lights: Locate in public space near the device they monitor.

L. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.

M. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated air-conditioning duct systems.

2. Alarm-initiating connection to elevator recall system and components.

3. Alarm-initiating connection to activate emergency lighting control.

4. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.

5. Supervisory connections at valve supervisory switches.

6. Supervisory connections at elevator shunt trip breaker.

7. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.

8. Supervisory connections at fire-pump engine control panel.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

   a) Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

   b) Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

4. Test audible appliances for the private operating mode according to manufacturer's written instructions.

5. Test visible appliances for the public operating mode according to manufacturer's written instructions.

6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

7. A copy of all tests shall be provided to the engineer of record and Wake County.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports and provide to owner/AHJ.

H. A fire services trade permit is required for the fire alarm installation. Please apply for permit through the Wake County portal. Shop drawings, battery calculations, and device specs shall be attached in permit.

I. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

J. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

PLUMBING FIXTURE COUNT:

TOTAL OCCUPANTS: 81
M: 40
W: 41

PER 2018 NCBC
TABLE 2902.1 R-1, B, & S-2 OCCUPANCY

(R-1) RESIDENTIAL: 6 TOTAL (3 MALE/ 3 FEMALE)
MALES = WC: 1 PER 10 (0.3)
FEMALES = WC: 1 PER 10 (0.3)
MALES = LAV: 1 PER 10 (0.3)
FEMALES = LAV: 1 PER SLEEPING UNIT (0.3)
SHOWERS/ BATHTUBS= 1 PER 8 (.75)
DRINKING FOUNTAIN = 1 PER 100 (0.06)
1 SERVICE SINK

(S-2) STORAGE: 23 TOTAL (11 MALE/ 12 FEMALE)
MALES = WC: 1 PER 100 (0.11)
FEMALES = WC: 1 PER 100 (0.12)
MALES = LAV: 1 PER 100 (0.11)
FEMALES = LAV: 1 PER 100 (0.12)
DRINKING FOUNTAIN = 1 PER 1000 (0.023)
1 SERVICE SINK

(B) BUSINESS: 52 TOTAL (26 MALE/ 26 FEMALE)
MALES = WC: 1 PER 30 1ST 30 (0.86)
FEMALES = WC: 1 PER 30 1ST 30 (0.86)
MALES = LAV: 1 PER 40 1ST 80 (0.65)
FEMALES = LAV: 1 PER 40 1ST 80 (0.65)
DRINKING FOUNTAIN = 1 PER 100 (0.52)
1 SERVICE SINK

REQUIRED
WC (MALE): 2 (0.3 + 0.86 + 0.11 = 1.00)
WC (FEMALE) : 2 (0.3 + 0.86 + 0.12 = 1.01)
LAV (MALE): 1 (0.3 + 0.65 + 0.11 = 0.79)
LAV (FEMALE): 1 (0.3 + 0.65 + 0.12 = 0.80)
SHOWERS/ BATHTUBS= 1 (0.75)
DF = 1 (0.06 + 0.52 + 0.023 = 0.603)
SERVICE SINK = 1

PROVIDED
WC (MALE): 2
WC (FEMALE): 2
WC (UNISEX): 4
LAV (MALE): 2
LAV (FEMALE): 2
LAV (UNISEX): 4
DF = 2
SHOWER = 4
SERVICE SINK = 1

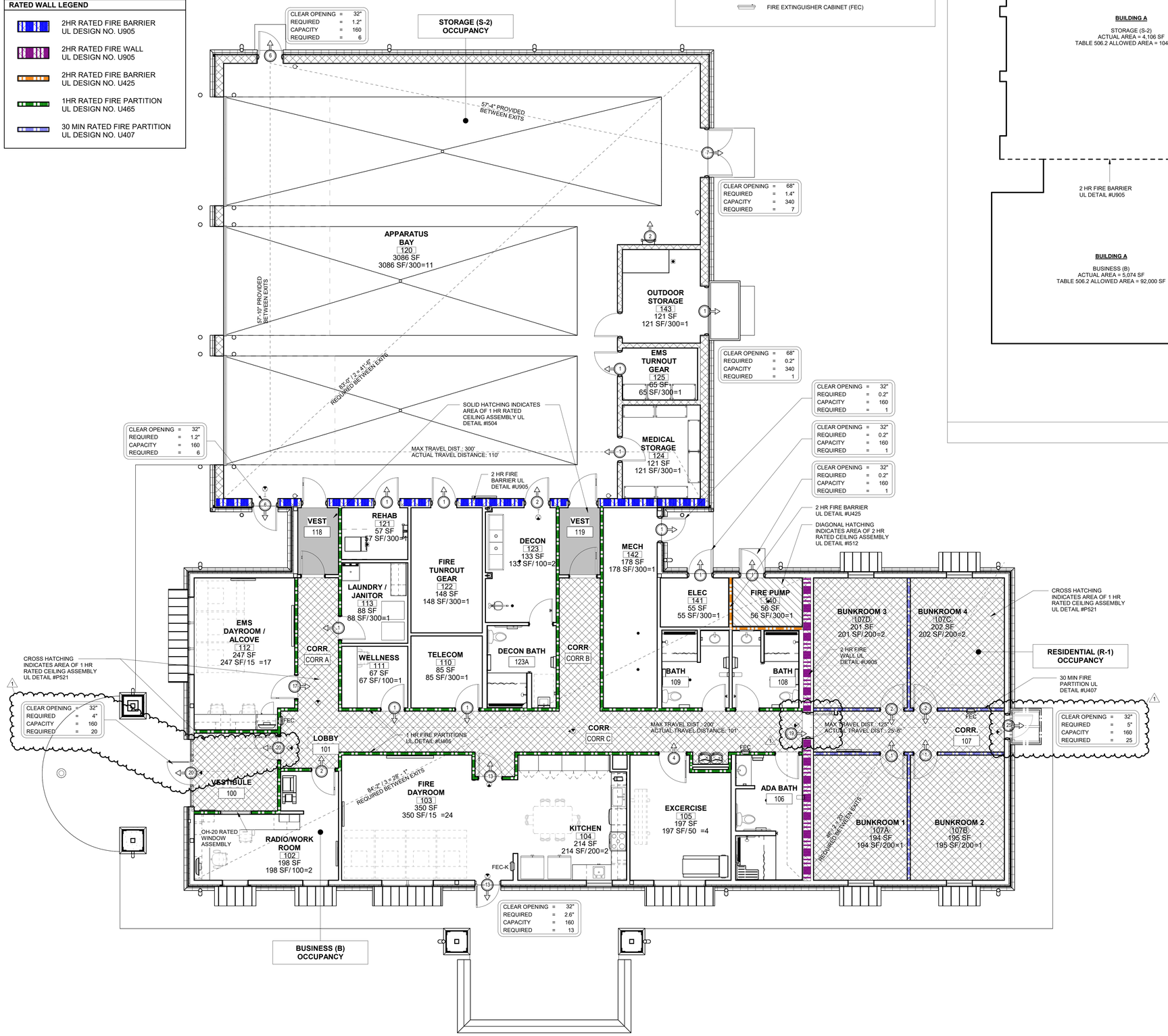
RATED WALL LEGEND

- 2HR RATED FIRE BARRIER — UL DESIGN NO. U905
- 2HR RATED FIRE WALL — UL DESIGN NO. U905
- 2HR RATED FIRE BARRIER — UL DESIGN NO. U425
- 1HR RATED FIRE PARTITION — UL DESIGN NO. U465
- 30 MIN RATED FIRE PARTITION — UL DESIGN NO. U407

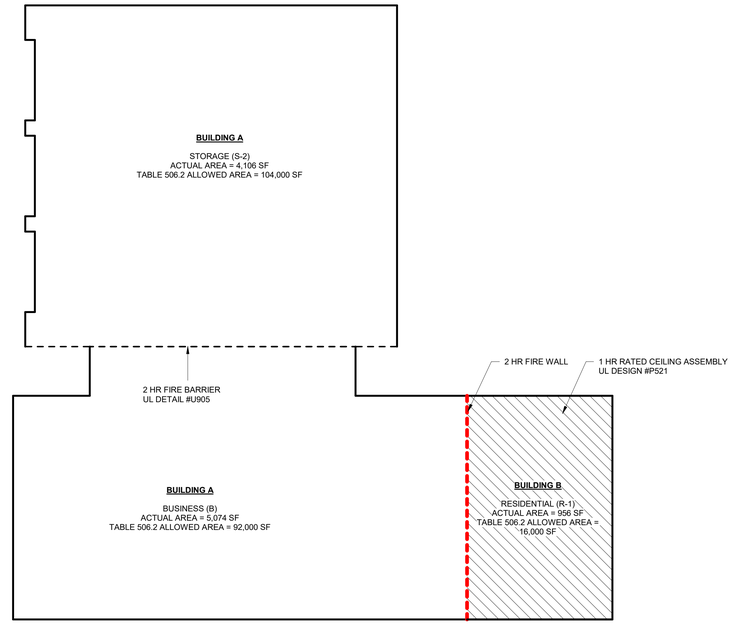
LIFE SAFETY PLAN LEGEND:

CLEAR OPENING = X"
REQUIRED = X"
CAPACITY = X
REQUIRED = X
— DOOR EGRESS LOAD CALCULATION

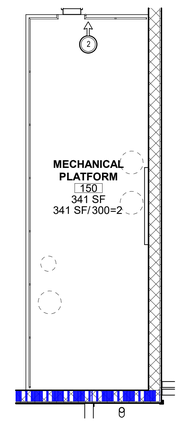
- MAXIMUM TRAVEL DISTANCE
- n = MAXIMUM NUMBER OF OCCUPANTS, CALCULATED PER TABLE 1004.1
- EXIT LIGHT - CEILING MOUNTED, SEE ELEC DWGS
- EXIT LIGHT - WALL MOUNTED, SEE ELEC DWGS
- FIRE EXTINGUISHER CABINET (FEC)



FIRST FLOOR LIFE SAFETY PLAN 3/16" = 1'-0" 1



ALLOWABLE AREA DIAGRAM 3/32" = 1'-0" 3



MEZZANINE LIFE SAFETY PLAN 3/16" = 1'-0" 2

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Wake Forest, NC
27587

LIFE SAFETY PLAN

DATE: 07.17.25
PROJECT NO: 23029

REVISIONS

NO:	DATE:	DESCRIPTION:
1	7/31/25	Addendum #1

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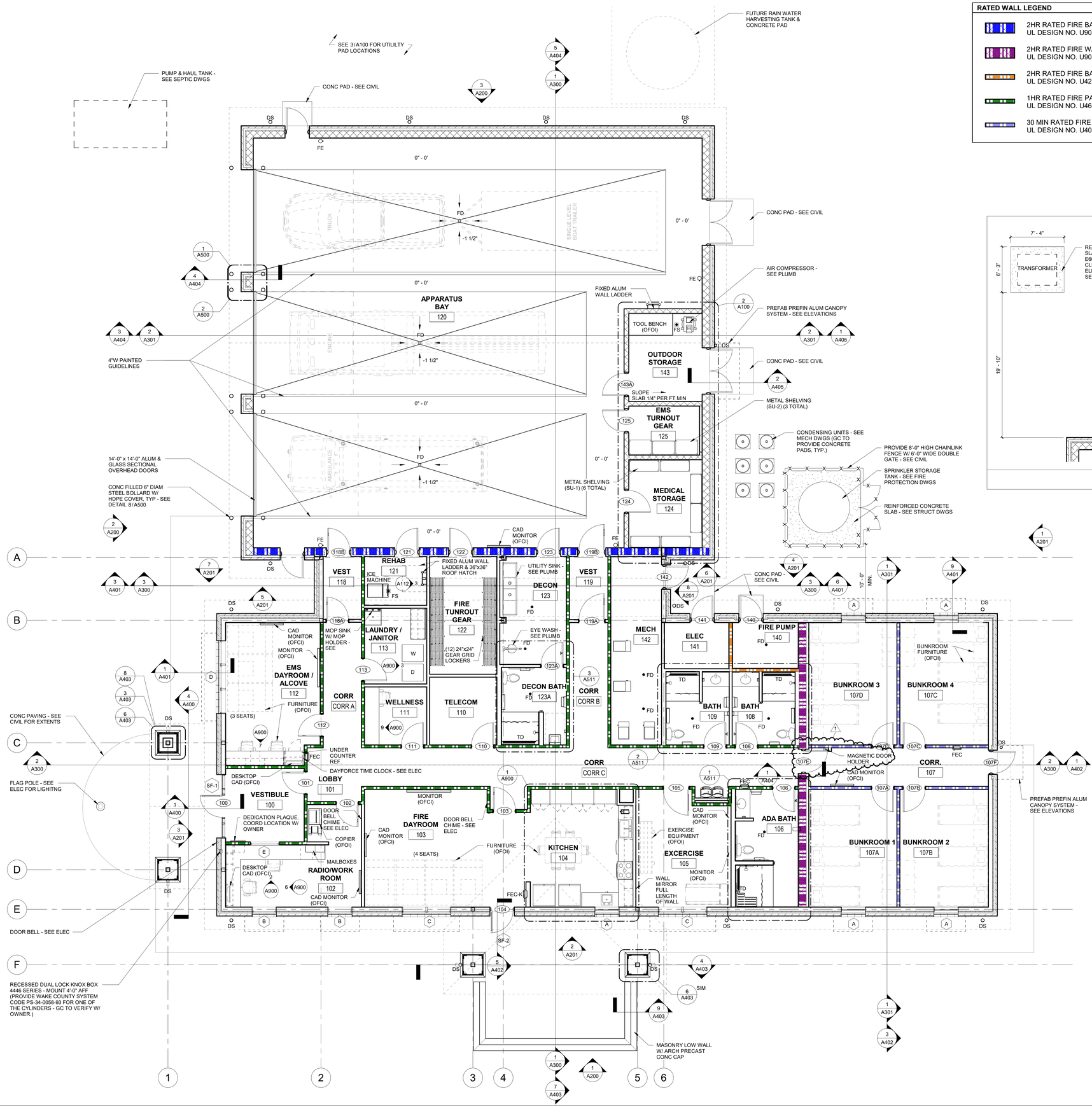
MICHAEL A. ESPOSITO REGISTERED ARCHITECT 8927 10-25 CHARLOTTE, N.C.

SHEET NUMBER:

A003

8/4/2025 8:48:41 AM



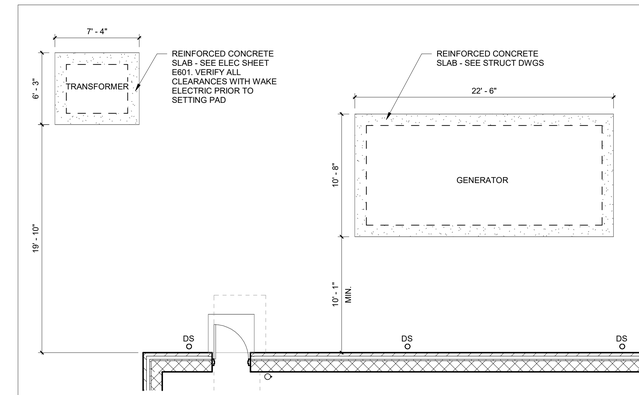
OVERALL FIRST FLOOR PLAN 3/16" = 1'-0" 1

RATED WALL LEGEND

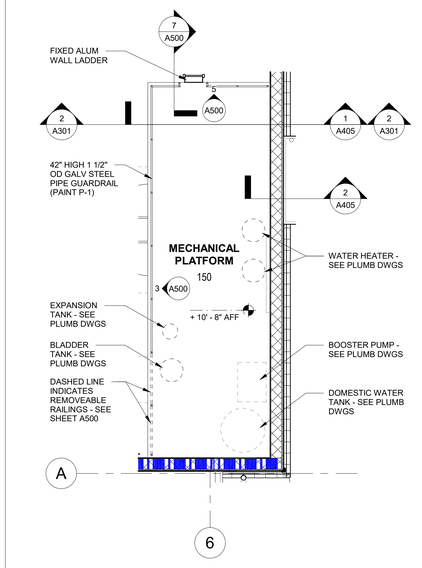
- 2HR RATED FIRE BARRIER UL DESIGN NO. U905
- 2HR RATED FIRE WALL UL DESIGN NO. U905
- 2HR RATED FIRE BARRIER UL DESIGN NO. U425
- 1HR RATED FIRE PARTITION UL DESIGN NO. U465
- 30 MIN RATED FIRE PARTITION UL DESIGN NO. U407

GENERAL SHEET NOTES

1. ALL ARCHITECTURAL COMPONENTS ARE TO BE ATTACHED AS REQUIRED BY ASCE 7-05 CHAPTER 13 SEISMIC DESIGN FOR NONSTRUCTURAL COMPONENTS. EACH INDIVIDUAL CONTRACTOR RESPONSIBLE FOR THE COMPONENT MUST PROVIDE PROJECT SPECIFIC DESIGN AND DOCUMENTATION PREPARED BY A LICENSED ENGINEER. CHAPTER 13 DEFINES THE FORCE REQUIRED TO SUPPORT THE COMPONENT FOR THE ANCHORAGE AND BRACING. THE COST OF PREPARING THIS INFORMATION AND DESIGN SHALL BE INCLUDED IN EACH CONTRACTOR'S BID PROVIDING THE COMPONENT.
2. FIELD VERIFY ALL CONDITIONS. GENERAL CONTRACTOR MUST NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO START OF WORK AFFECTED BY SUCH DISCREPANCY.
3. DO NOT SCALE DRAWINGS. IF DIMENSIONS ARE IN QUESTION, OBTAIN CLARIFICATION FROM ARCHITECT.
4. PROVIDE BLOCKING WITHIN STUD WALLS AS REQUIRED FOR SUPPORT OF CABINETS, SHELVING, WALL STOPS, COUNTERTOPS, MARKERBOARDS, TACKBOARDS, AV EQUIPMENT, GRAB BARS AND SIMILAR.
5. PLACE CONTROL JOINTS IN SIDEWALK AND PAVING PER MINIMUM REQUIREMENTS STATED IN CIVIL DOCUMENTS. GENERAL LAYOUT TO BE COORDINATED BY G.C.
6. ALL INTERIOR DIMENSIONS ARE TO FACE OF STUD U.N.O.
7. SEE SPEC FOR TOTAL QUANTITY OF MARKERBOARDS AND TACKBOARDS. LOCATIONS TO BE FIELD VERIFIED W/ OWNER



UTILITY YARD 3/16" = 1'-0" 3



ENLARGED MECH PLATFORM 3/16" = 1'-0" 2

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OVERALL FIRST FLOOR PLAN

DATE: 07.17.25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7/31/25	Addendum #1

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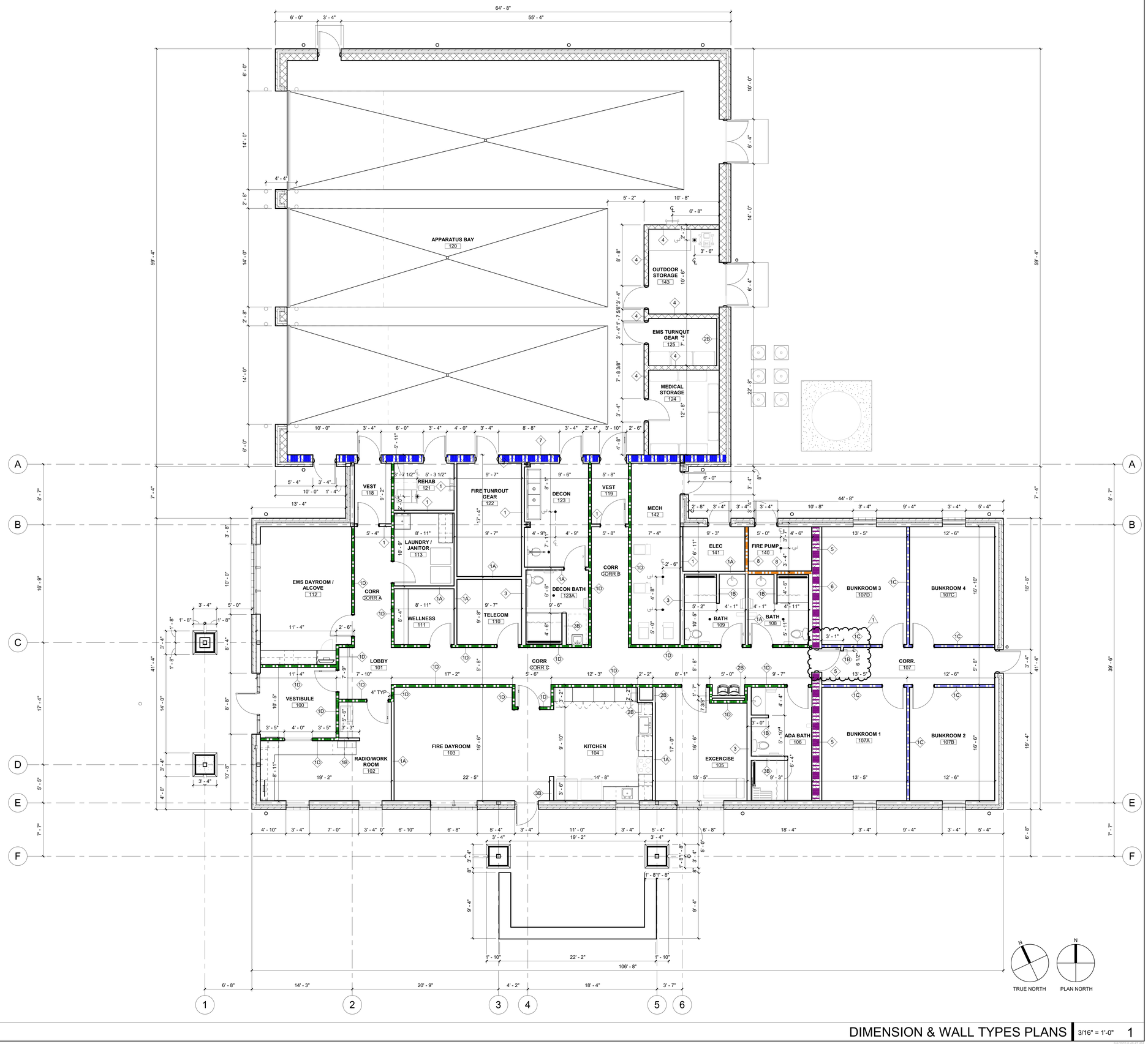
SHEET NUMBER:

A100

8/4/2025 8:48:45 AM

RATED WALL LEGEND

- 2HR RATED FIRE BARRIER
  UL DESIGN NO. U905
- 2HR RATED FIRE WALL
  UL DESIGN NO. U905
- 2HR RATED FIRE BARRIER
  UL DESIGN NO. U425
- 1HR RATED FIRE PARTITION
  UL DESIGN NO. U465
- 30 MIN RATED FIRE PARTITION
  UL DESIGN NO. U407



DIMENSION & WALL TYPES PLANS | 3/16" = 1'-0" | 1

8/4/2025 8:48:47 AM

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Wake Forest, NC
27587

DIMENSIONS & WALL TYPES PLAN

DATE: 07.17.25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7/31/25	Addendum #1

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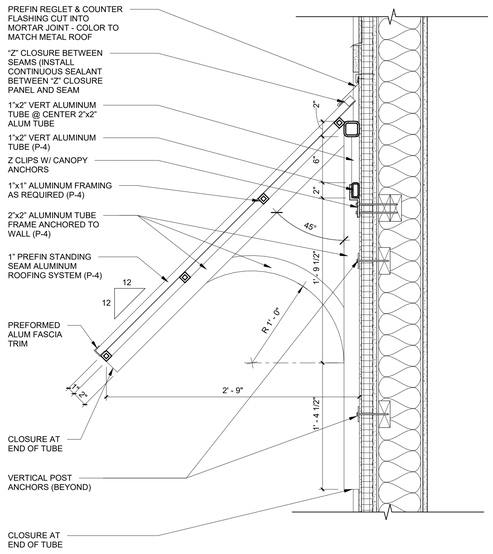
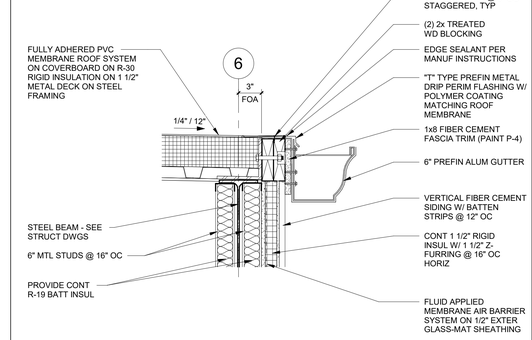
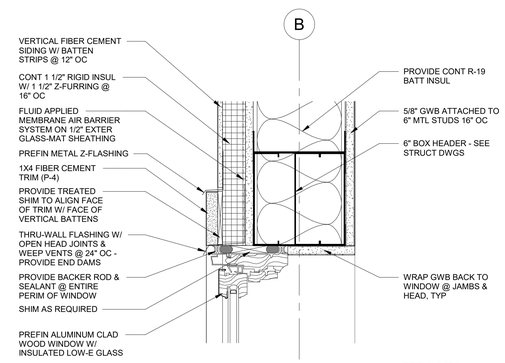
A101



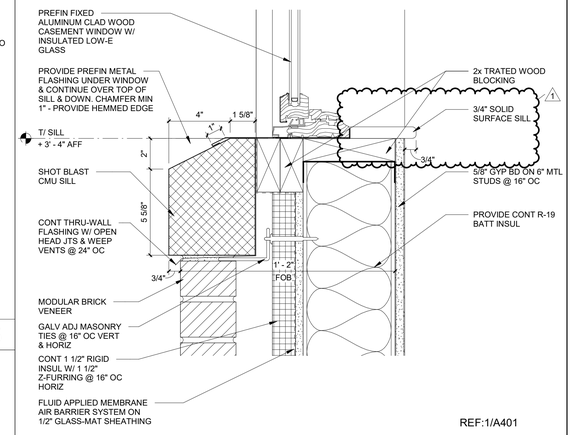
AWNING DETAIL 1 1/2" = 1'-0" 10



ROOF EDGE DETAIL 1 1/2" = 1'-0" 8

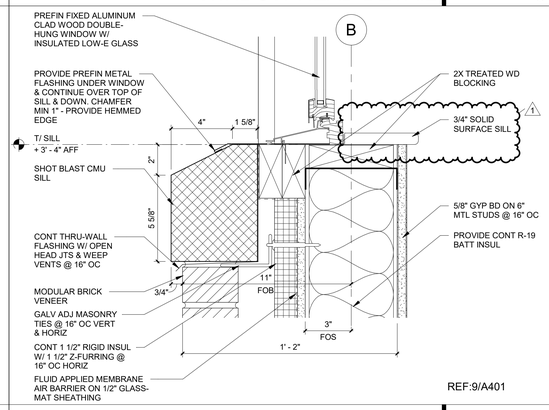


WINDOW HEAD DETAIL 3" = 1'-0" 5

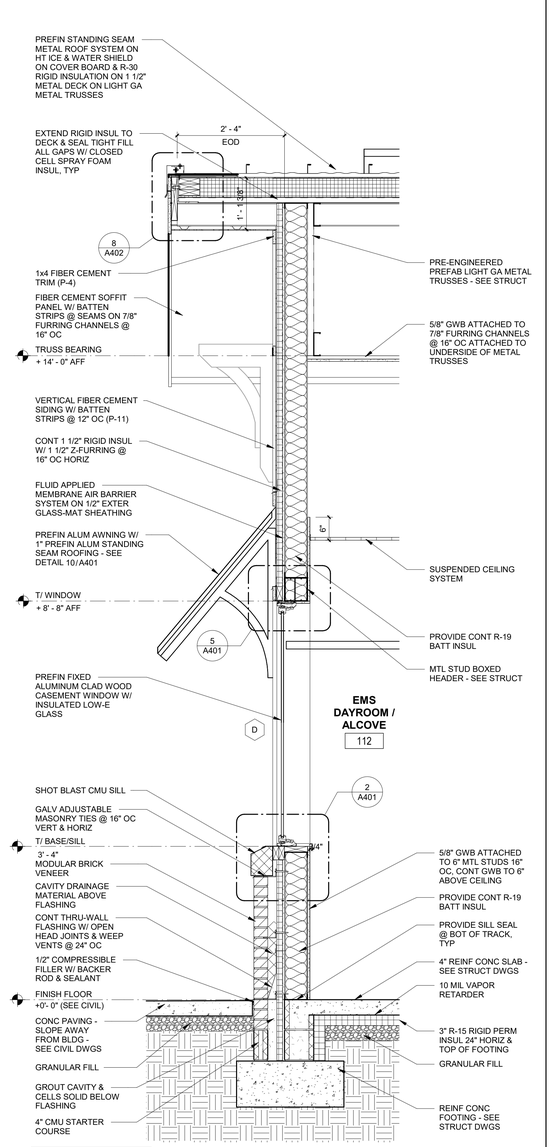


CASEMENT WINDOW SILL DETAIL 3" = 1'-0" 2

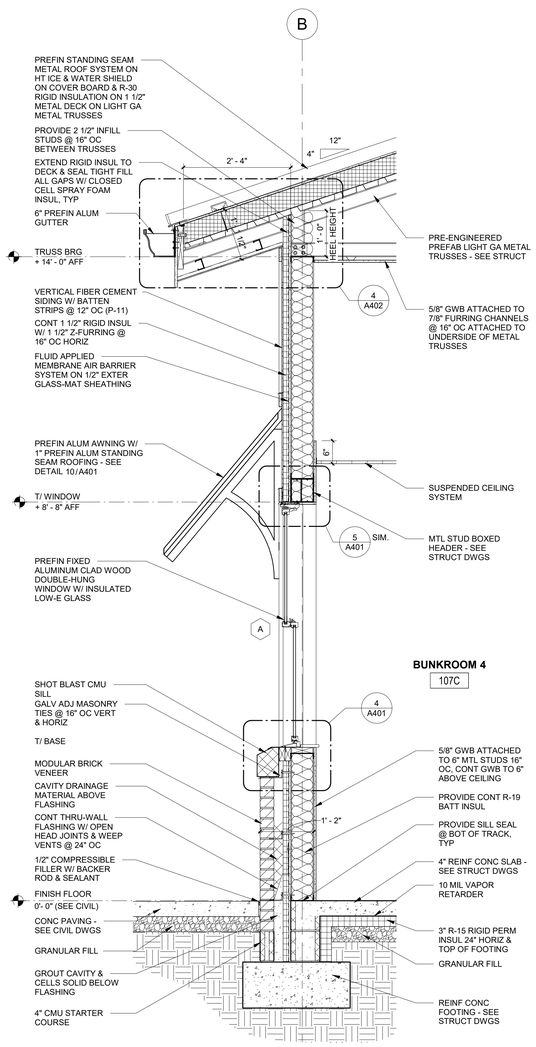
SHED ROOF TRIM DETAIL 1 1/2" = 1'-0" 7



DOUBLE-HUNG WINDOW SILL DETAIL 3" = 1'-0" 4



WALL SECTION 3/4" = 1'-0" 1



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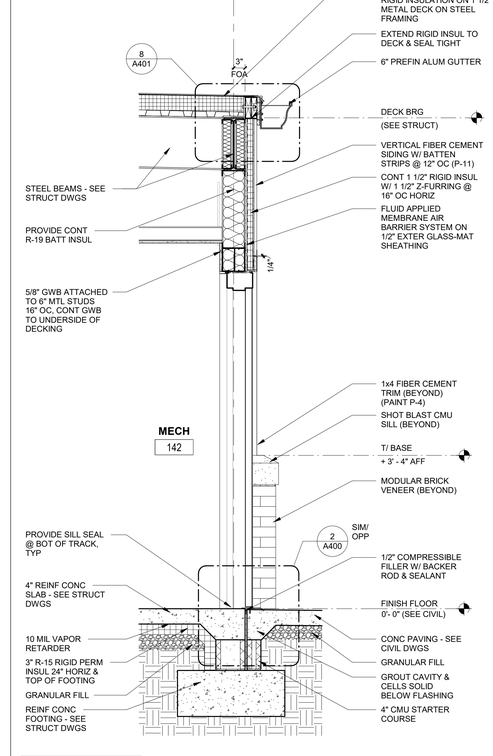

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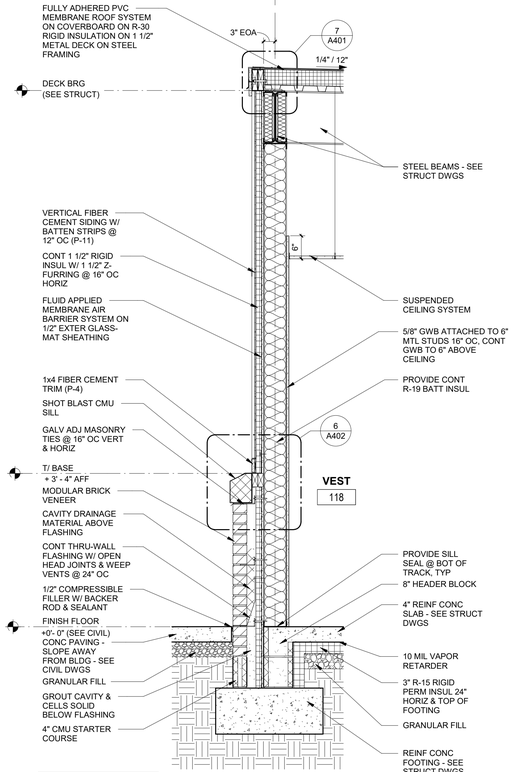

WALL SECTION 3/4" = 1'-0" 3

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WALL SECTIONS

DATE: 07.17.25
PROJECT NO: 23029

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1	7/31/25	Addendum #1

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MICHAEL A. ESPOSITO REGISTERED ARCHITECT 8927 10-25 CHARLOTTE, N.C.

SHEET NUMBER:

A401

8/4/2025 8:48:49 AM

DOOR, FRAME AND HARDWARE SCHEDULE

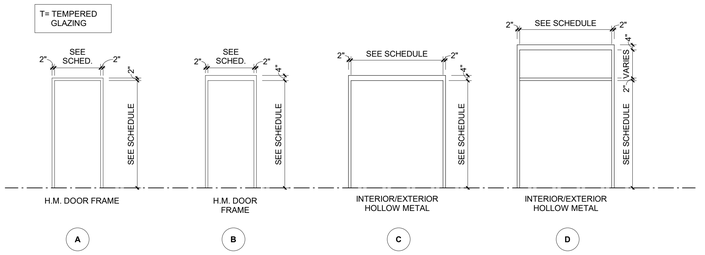
DOOR #	ROOM NAME	RATING / LABEL	DOOR						FRAME					HARDWARE					HW SET	REMARKS	DOOR #
			ELEVATION	COUNT	WIDTH	HEIGHT	MATERIAL	FINISH	ELEVATION	MATERIAL	FINISH	HEAD	JAMB	ACCESS CONTROL	CLOSER	PANIC	THRESHOLD	SMOKE SEAL			
100	VESTIBULE		6	SINGLE	3' - 0"	7' - 0"	ALUM/ GLASS	PREFINISHED	SF1	ALUM	PREFINISHED	H1	J1	YES	YES	YES	YES	—	1.1	1, 2, 4, 6, 7	100
101	LOBBY	20 MIN	4	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	YES	YES	YES	—	YES	24.0	2, 4, 5	101
102	RADIO/WORK ROOM	20 MIN	4	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	12.0		102
103	FIRE DAYROOM	20 MIN	4	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	YES	—	YES	8.0		103
104	FIRE DAYROOM		6	SINGLE	3' - 0"	7' - 0"	ALUM/ GLASS	PREFINISHED	SF2	ALUM	PREFINISHED	H1	J1A/J1B	YES	YES	YES	—	—	1.0	1, 2, 4, 6	104
105	EXCERCISE	20 MIN	5	SINGLE	3' - 6"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	15.0		105
106	ADA BATH	20 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	10.0		106
107A	BUNKROOM 1	30 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	17.0		107A
107B	BUNKROOM 2	30 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	17.0		107B
107C	BUNKROOM 4	30 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	17.0		107C
107D	BUNKROOM 3	30 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	17.0		107D
107E	CORR.	90 MIN	1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H7	J8	—	YES	YES	—	YES	8.1	8	107E
107F	CORR.		1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	A	HM	PAINTED	H6	J7/J9	YES	YES	—	YES	—	3.0	2, 4, 6	107F
108	BATH	20 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	10.0		108
109	BATH	20 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	10.0		109
110	TELECOM	20 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	YES	YES	—	—	YES	18.0	4, 6	110
111	WELLNESS	20 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	10.0		111
112	EMS DAYROOM / ALCOVE	20 MIN	4	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	15.0		112
113	LAUNDRY / JANITOR	20 MIN	2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	—	—	YES	14.0		113
118A	VEST		4	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	YES	—	—	9.0		118A
118B	VEST	90 MIN	3	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H4	J4	YES	YES	YES	YES	YES	19.0	3, 4, 6	118B
119A	VEST		4	SINGLE	3' - 6"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	YES	YES	—	—	9.0		119A
119B	VEST	90 MIN	3	SINGLE	3' - 6"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H4	J4	YES	YES	YES	YES	YES	19.0	3, 4, 6	119B
120A	APPARATUS BAY		7		14' - 0"	14' - 0"	ALUM/GLASS	PREFINISHED		STEEL	PREFINISHED	6/A404	1/A500	YES	—	—	YES	—	23.0		120A
120B	APPARATUS BAY		7		14' - 0"	14' - 0"	ALUM/GLASS	PREFINISHED		STEEL	PREFINISHED	6/A404	1/A500	YES	—	—	YES	—	23.0		120B
120C	APPARATUS BAY		7		14' - 0"	14' - 0"	ALUM/GLASS	PREFINISHED		STEEL	PREFINISHED	6/A404	1/A500	YES	—	—	YES	—	23.0		120C
120D	APPARATUS BAY	90 MIN	1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H5	J5/J6	YES	YES	YES	YES	YES	3.1		120D
120E	APPARATUS BAY		1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H5	J5/J6	YES	YES	YES	YES	YES	3.0		120E
120F	APPARATUS BAY		1	PAIR	3' - 0"	7' - 0"	INSUL MTL	PAINTED	D	HM	PAINTED	H5	J5/J6	—	—	—	YES	—	7.0	6	120F
121	REHAB	90 MIN	1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H4	J4	—	YES	—	—	YES	21.0	3	121
122	FIRE TUNROUT GEAR	90 MIN	1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H4	J4	—	YES	—	YES	YES	21.0	3	122
123	DECON	90 MIN	1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H4	J4	—	YES	—	YES	YES	21.0	3	123
123A	DECON BATH		2	SINGLE	3' - 0"	7' - 0"	S.C. WOOD	STAINED	A	HM	PAINTED	H2	J2	—	—	—	—	—	11.0		123A
124	MEDICAL STORAGE		1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H3	J3	YES	YES	—	YES	—	25.0	3, 4, 6	124
125	EMS TURNOUT GEAR		1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H3	J3	—	—	—	YES	—	20.0	3	125
140	FIRE PUMP		1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	A	HM	PAINTED	H6	J7/J9	—	YES	—	YES	—	6.0	6	140
141	ELEC		1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	A	HM	PAINTED	H6	J7/J9	—	—	—	YES	—	6.1	6	141
142	MECH		1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	A	HM	PAINTED	H6	J7/J9	—	—	—	YES	—	6.1	6	142
143A	OUTDOOR STORAGE		1	SINGLE	3' - 0"	7' - 0"	INSUL MTL	PAINTED	B	HM	PAINTED	H3	J3	—	—	—	YES	—	22.0	3	143A
143B	OUTDOOR STORAGE		1	PAIR	3' - 0"	7' - 0"	INSUL MTL	PAINTED	C	HM	PAINTED	H5	J5/J6	—	—	—	YES	—	7.0	6	143B

GENERAL NOTES

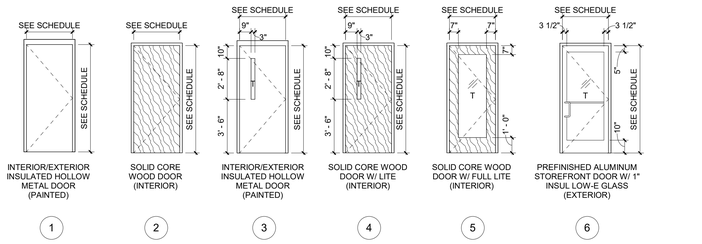
1. ALL DOORS LOCATED 6" OFF OF ADJACENT WALL (U.N.O.)
2. PROVIDE NON-REMOVABLE PINS AT EXTERIOR (U.N.O.)
3. PROVIDE SOFT FILLER MATERIAL INSIDE METAL FRAME TO ACCOMMODATE ATTACHMENT OF WEATHER STRIPPING & METAL DRIP.
4. ALL THRESHOLDS TO BE ADA COMPLIANT: THE FINISHED FLOOR ELEVATION ON BOTH SIDES OF A DOOR SHALL NOT BE MORE THAN 1/2" LOWER THAN THE THRESHOLD OF THE DOORWAY.
5. SEE STRUCTURAL DRAWINGS FOR REINFORCING AT DOOR HEADS.
6. FILL JAMB AND HEADER STUDS WITH INSULATION (TYP. IN WALLS SCHEDULED TO RECEIVE INSULATION)
7. MAXIMUM DOOR OPENING EFFORTS (2018 NCSBC SECTION 1010.1.3)
   1. A 5 LB. FORCE SHALL OPEN INTERIOR SWINGING EGRESS DOORS (OTHER THAN FIRE DOORS)
   2. A 15 LB. FORCE SHALL RELEASE A LATCH
   3. A 30 LB. FORCE SHALL SET DOOR IN MOTION
   4. A 15 LB. FORCE SHALL SWING DOOR FULLY OPEN
8. ALL DOORS PROVIDED WITH LATCHING HARDWARE SHALL BE EQUIPPED WITH SINGLE EFFORT, NON-GRASP HARDWARE (I.E. LEVEL - UNLESS PROVIDED WITH PANIC HARDWARE.)
9. LEVER & PANIC HARDWARE SHOULD BE MOUNTED BETWEEN 34" AND 48" ABOVE FINISHED FLOOR.
10. ALL REQUIRED EXIT HARDWARE TO COMPLY WITH THE NCSBC & CHAPTER 10 OF THE NCSFC.
11. ALL EXTERIOR THRESHOLDS TO HAVE INTEGRAL WATER STOPS.
12. EXTERIOR DOORS MUST MEET A LEAKAGE RATE IN ACCORDANCE WITH ASTM 283.
13. EXTERIOR DOORS, WALLS, ENVELOPE AND GLAZING SHALL COMPLY WITH APPENDIX B THERMAL ENVELOPE INFORMATION.
14. 30 MIN. RATED GLAZING @ 20 MIN. DOORS.

REMARKS:

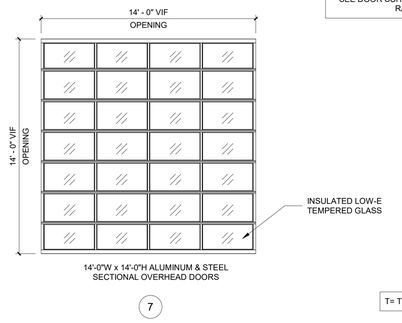
1. CONCEALED CLOSER & PANIC DEVICE
2. PEMKO #158A OFFSET SILL OR EQUAL (S1)
3. PEMKO #271A 5-INCH SADDLE OR EQUAL (S2)
4. CARD ACCESS - SEE ELECTRICAL DRAWINGS
5. DOOR KEYPAD ACCESS - SEE ELECTRICAL DRAWINGS
6. DOOR CONTACT - SEE ELECTRICAL DRAWINGS. FRAME TO BE PREPPED FOR DPS (DOOR CONTACT)
7. PROVIDE DOOR BELL - SEE ELECTRICAL DRAWINGS
8. PROVIDE MAGNETIC HOLD-OPEN. SEE ELECTRICAL DRAWINGS



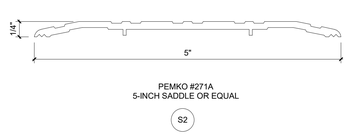
DOOR FRAME ELEVATIONS | 1/4" = 1'-0" | 2



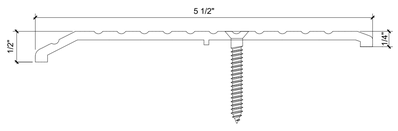
NOTE: FIRE RATED GLAZING AS REQUIRED. SEE DOOR SCHEDULE FOR LOCATIONS OF RATED DOORS



DOOR ELEVATIONS | 1/4" = 1'-0" | 1



PEMKO #217A 5-INCH SADDLE | 12" = 1'-0" | 4



PEMKO #158 OFFSET SILL | 12" = 1'-0" | 3

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SANDY PLAINS PUBLIC SAFETY STATION

15224 CREEDMOOR ROAD
Wake Forest, NC
27587

DOOR SCHEDULE

DATE: 07.17.25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7/31/25	Addendum #1

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SHEET NUMBER:

A600

INTERIOR FINISH LEGEND

ALL MATERIALS ARE BASIS OF DESIGN, SEE SPECIFICATIONS FOR APPROVED EQUALS.

FINISH CODE	MANUFACTURER	PRODUCT NAME	PRODUCT NUMBER	COLOR	SIZE / WIDTH	DESCRIPTION	REMARKS
BASE							
B-1	ROPPE	PINNACLE RUBBER BASE	STANDARD TOE	114 LUNAR DUST	6" H	STANDARD (COVED) TOE BASE	SEE SPECIFICATION 09 65 19
B-2	ROPPE	CONTOURS RUBBER BASE	#85, PV6085	114 LUNAR DUST	6" H	CONTOURS PROFILE	SEE SPECIFICATION 09 65 19
B-3	BEST TILES	PORCELAIN TILE BASE	N/A	FLIGHT	3" x 24"	BULLNOSE	GR-1, LEVEL WITH FLOOR TILE
FLOORING							
CPT-1	SHAW CONTRAT	CARPET - TILE	5T478 DEFFUSE COLOR	78706 WARM	24" x 24" x 5.84MM	CARPET TILE	INSTALLATION DIRECTION - ASHLAR
CPT-2	SHAW CONTRAT	CARPET - WALK OFF TILE	5T035 PORTAL TILE	34557 STERLING	24" x 24" x 6.99MM	WALK OFF CARPET TILE	INSTALLATION DIRECTION - BRICK
EPF-1	SHERWIN WILLIAMS	EPOXY PAINT	-	CANADA GRAY 51	-	EPOXY SYSTEM FINISH	-
LV-1	MOHAWK GROUP	LUXURY VINYL - TILE	RENDERED FLAX C0192	128 BEACH GRASS	6" x 48" x 4.5MM	LUXURY VINYL - TILE	-
PT-1	BEST TILES	PORCELAIN TILE	309999 LINK	BOLT	12" x 24"	PORCELAIN TILE	INSTALLATION PATTERN - GRID, GR-1
PT-2	BEST TILES	WHISPER (PLANK)	303647 WHISPER	FOREST	8" x 40"	PORCELAIN TILE PLANK	INSTALLATION PATTERN - STAGGERED 1/3, GR-2
PT-3	BEST TILES	STONEWAYS	ECWSWYFLI01	FLIGHT	12" x 24"	PORCELAIN TILE	INSTALLATION PATTERN - GRID, GR-1
PT-4	BEST TILES	STONEWAYS	ECWSWYFLI02	FLIGHT	2" x 2"	PORCELAIN TILE	INSTALLATION PATTERN - MONOLITHIC, GR-1
RF-1	CAPRI COLLECTION	FITNESS AND REC	RTL 4035	ROCK BOTTOM	4' WIDTH, 12 MM	RECYCLED RUBBER FLOOR	SEE SPECIFICATION
SC-1	SEE SPEC	SEALED CONCRETE	-	CLEAR	-	STORAGE	SEE SPECIFICATION 03 30 00
SC-2	SEE SPEC	CONCRETE W HARDENER / DENSIFIER	SEAL HARD	CLEAR	-	APPARATUS ROOM	SEE SPECIFICATION 03 30 00
SDT-1	ROPPE	STATIC DISSAPPATIVE TILE	-	751 HAZE GRAY	24" x 24" x 3.2MM	ESD VINYL STATIC CONTROL - IT ROOM	
WALLS							
AWC-1	MOMENTUM TEXTILE	MAYFAIR WC	AMR-02	HANOVER SQUARE	52" W	ACOUSTICAL WALL CARPET	SEE SPECIFICATION 09 72 00
P-1	PPG PAINT	TRIM PAINT	0999-6	STOLEN ROCK	SEMI-GLOSS	TRIM AND HANDRAIL PAINT	SEE SPECIFICATION
P-2	PPG PAINT	STANDARD PAINT	1007-1	WILLOW SPRING	EG SHEL	STANDARD WALL PAINT	SEE FINISH SCHEDULE
P-3	PPG PAINT	ACCENT PAINT	1029-5	MEANDER	EG SHEL	ACCENT WALL & CEILING PAINT	SEE FINISH SCHEDULE
P-4	PPG PAINT	ACCENT PAINT	1023-5	STONE GRAY	EG SHEL	ACCENT WALL, CEILING PAINT, & EXTERIOR PAINT (SEE PAINT SPECIFICATION)	SEE FINISH SCHEDULE FOR EPOXY LOCATIONS CEILING PAINT & SOFFIT TO BE FLAT PAINT FINISH
P-5	PPG PAINT	STANDARD PAINT	1029-4	PHOTO GRAY	EG SHEL OR EPOXY	ACCENT WALL & CEILING PAINT	SEE FINISH SCHEDULE FOR EPOXY LOCATIONS
P-6	PPG PAINT	ACCENT PAINT	0998-6	ON THE EDGE	EG SHEL	ACCENT WALL - APPARATUS BAY	SEE SPECIFICATION
P-7	PPG PAINT	STANDARD PAINT	1007-1	WILLOW SPRING	EPOXY PAINT	EPOXY WALL PAINT	SEE FINISH SCHEDULE FOR EPOXY LOCATIONS
P-8	RAL	ACCENT PAINT	1023	TRAFFIC YELLOW	EPOXY PAINT	FLOOR STRIPING IN APPARATUS ROOM	
P-10	SHERWIN-WILLIAMS	STANDARD CEILING PAINT	SW 7070	SITE WHITE	FLAT	CEILING PAINT	
P-11	PPG PAINT	EXTERIOR PAINT	PPG1030-7	DOUBLE DUTY	*	FIBER CEMENT BOARD AND BATTENS	SEE EXTERIOR PAINT SPECIFICATION
WT-1	TRINITY SURFACES	VIVACE	-	BLANC LINES	3" x 10" x 7.4mm	WALL TILE - KITCHEN BACKSPLASH	SEE INTERIOR ELEVATION A900, GR- #1, STACKED
WT-2	BEST TILES	STONEWAYS	ECWSWYFLI01	FLIGHT	12" x 24"	WALL TILE - TOILET WALLS	SEE INTERIOR ELEVATION A512, GR- #1 , STACKED
WT-3	BEST TILES	STONEWAYS	ECXSWYVEL06	VELVET 12 x 14.5	1.3" x 3.8" SHEET HERRINGBONE MOSAIC	WALL TILE - SHOWER ACCENT	SEE INTERIOR ELEVATION A512, GR-# 1
SURFACES							
PL-1	NEVAMAR	PLASTIC LAMINATE	S-7024	CHALK WHITE	-	CABINET INTERIORS - CABINET LINER	SEE SPECIFICATION 06 22 00
QTZ-1	CAMBRIA	QUARTZ COUNTERTOP	-	NOTHING HILL	FEILD VERIFY	QUARTZ COUNTER TOP	SEE SPECIFICATION
SSF-1	WILSONART	SOLID SURFACE	J573MG	FROSTY WHITE MIRAGE		COUNTER TOPS	-
SSF-2	WILSONART	SOLID SURFACE	9228SS	CHILLED EARTH, MATTE		WINDOW SILLS	
ST-1	SHERWIN WILLIAMS	RIFT CUT WHITE OAK	N/A	CLEAR - SATIN	FEILD MEASURE	CABINET FRONTS	-
SS-1	STAINLESS SUPPLY	STAINLESS STEEL	20 GAUGE	304 # 4 BRUSHED - NO PATTERN	W / 3/8" BACKER BD	FLOOR TO SOFFIT BEHIND RANGES	SEE SEPCIFICATION
MISCELLANEOUS							
CG-1	INPRO	CORNER GUARD - HIGH IMPACT	160BN SURFACE MOUNT	0154 CLAM SHELL	2" WING	BOTTOM IS SET AT 7" AAF. TOP IS TO ALIGN WITH TOP OF INTERIOR DOOR FRAMES AND NOT EXCEED	SEE A701 FOR LOCATION
CG-2	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	SEE A701 FOR LOCATION
CR-1	AWI	CHAIR RAIL - WHITE OAK	CHR-6021	STAINED ST-1 - CLEAR (MATCH TO DOORS)	-	FITNESS ROOM	SEE A701 FOR LOCATION
CRT-1	THE COMPANY STORE	LEGENDS HOTEL BORDER	#59074-7272	GRAY BAND / WHITE	72" X 72"	DECORATIVE SHOWER CURTAIN AND SHOWER LINER	SEE SPECIFICATION 10 18 05
SCWD-1	MASONITE	PREFINISHED DOOR W/STAIN	PLAIN SLICED WHITE OAK	CLEAR	PER DOOR SCHEDULE	-	-
FRP-1	CRANE COMPOSITE	SANITARY WALL FINISH	-	-	-	SEE SPEC.	-
GR-1	LATICRETE	SPRECTRALOCK PRE MIXED EPOXY GROUT	78	STERLING SILVER	-	PAIRED WITH PT-1, PT-3, WT-1, WT-2, WT-3	SEE SPECIFICATION 09 30 00
GR-2	LATICRETE	SPRECTRALOCK PRE MIXED EPOXY GROUT	60	DUSTY GREY	-	PAIRED WITH PT-2	SEE SPECIFICATION 09 30 00
LCK-1	GEARGRID	TURN OUT GEAR		RED BARON	24" X 24"X 74.5"	FD TURNOUT GEAR STORAGE, NO DOORS	-
MR-1	KOHLER	FRAMED MIRROR	K-26052	MATT BLACK	22" X 34" RECTANGULAR		-
MR-2	LENOIR MIRROR	SHEET MIRROR	CAT II SAFETY BACKED	FRAMELESS - EASED EDGES	1/4" x 63" x 5 EQ VERIFY DIMS IN FIELD	EXERCISE 105	-
TR-1	SCHLUTER	TRANSITION	SLOPED EDGING PROFILE - RENO-U	BRUSHED STAINLESS STEEL - EBU 80	SIZE ACCORDING FOR FLOORING	PORCELIAN TILE TO LUXURY VINYL	SEE 706
TR-2	SCHLUTER	TRANSITION	JOLLY	BRUSHED STAINLESS STEEL	-	METAL TRIM FOR VERTICAL TILED EDGES AND OUTSIDE CORNERS OF TILED SURFACES	SEE 706
TR-3	ROPPE	ADA THRESHOLD	#33 FULL	#150 DK.	1/4" TO 1/2" H x 5.5 W x DOOR WIDTH	EPOXY PAINT TO SC	SEE 706
TR-4	ROPPE	REDUCER	#25 STRIP	#100 GRAY BLACK	5/16" x 1 5/16" x DOOR WIDTH	RF-1 TO LV-1	SEE 706
TR-5	SCHLUTER	DILEX-EHK		BRUSHED STAINLESS STEEL	-	WALL TILE COVED TO FL - TILE @ SHOWER	SEE 706
WC-1	MECHO SHADES	SOHO - 1900 SERIES	1902	CORNSILK (3% OPEN)	FEILD VERIFY	MANUAL ROLLER SHADE SYSTEMS	-

INTERIOR FINISH GENERAL NOTES

1. REFER TO OR REFERENCE INTERIOR SECTIONS, ELEVATIONS, DETAILS AND REFLECTED CEILING PLANS FOR ADDITIONAL INFORMATION (SEE COVER SHEET INDEX AND/OR SHEET SERIES). *DESIGNER TO LIST SPECIFIC SHEETS/SHEET SERIES*
2. VERIFY LOCATION OF CONTROL JOINTS IN ROOMS RECEIVING TILE FLOORS. SEE WRITTEN SPECIFICATIONS **SECTION # 09 30 00.**
3. ALL INTERIOR WALL & CEILING FINISHES SHALL COMPLY WITH ***NCSBC CHAPTER 8, SECTION 803, TABLE 803.11***

   SPRINKLERED:
   A. INTERIOR EXIT STAIRWAYS, RAMPS AND EXIT PASSAGEWAYS: ***CLASS B***
   B. CORRIDORS & ENCLOSURES FOR EXIT ACCESS STAIRWAYS AND RAMPS: ***CLASS B***
   C. ROOM AND ENCLOSED SPACES ***CLASS C***

   NONSPRINKLERED:
   A. INTERIOR EXIT STAIRWAYS, RAMPS AND EXIT PASSAGEWAYS: ***CLASS A***
   B. CORRIDORS & ENCLOSURES FOR EXIT ACCESS STAIRWAYS AND RAMPS: ***CLASS A***
   C. ROOM AND ENCLOSED SPACES ***CLASS C***

   DESIGNER TO COORDINATE W/PROJECT'S STATE BUILDING CODE (ITALICS)
4. INTERIOR FLOOR FINISHES COMPLY WITH ***NCSBC CHAPTER 8 SECTION 804***
5. ALL INTERIOR FINISHES IN TOILET AND BATHROOMS SHALL COMPLY WITH ***NCSBC CHAPTER 12, SECTION 1210.2, 1210.2.1 THROUGH 1210.2.4.***
6. REFER TO DOOR SCHEDULE (A600 SERIES) FOR DOOR & FRAME FINISHES.
7. FOR MISCELLANEOUS INTERIOR TRIM FINISHES (WALL CAPS, RAILINGS, SILLS, ETC. SEE REMARKS COLUMN IN ROOM FINISH SCHEDULE. ELEMENTS SUCH AS GRILLE AND LOUVER COLORS TO MATCH ADJACENT WALL OR CEILING PAINT COLOR UNLESS OTHERWISE NOTED.

INTERIOR FINISH CODES

ACT	ACOUSTICAL CEILING TILE	QT	QUARRY TILE
AWC	ACOUSTICAL WALL CARPET	QTZ	QUARTZ
AWP	ACOUSTICAL WALL PANEL FINISH	RC	RESINOUS COUNTER
B	BASE	RF	RUBBER FLOOR
BRK	BRICK VENEER	RP	RESIN PANEL
CC	COLUMN COVER	SC	SEALED CONCRETE
CG	CORNER GUARD	SSF	SOLID SURFACE
CR	CHAIR RAIL	SS	STAINLESS STEEL
CPT	CARPET (TILES, BROADLOOM, WALKOFF)	SCWD	STAINED WOOD DOOR
CRT	CURTAIN (SHOWER, STAGE)	ST	STAIN
CSM	CAST STONE MASONRY	STC	STAINED CONCRETE
D	DOOR	SDT	STATIC DISSIPATIVE TILE
ELV	ELEVATOR FINISHES	STR	STAIR TREAD
EPF	EPOXY FLOOR SYSTEM FINISH	TB	TACK BOARD
EPW	EPOXY WALL SYSTEM FINISH	TP	TOILET PARTITION
FRP	FIBERGLASS REINFORCED PANEL	TR	TRANSITIONS (FLOOR/WALL)
FLM	FILM PRODUCT	TZ	TERRAZZO
GL	GLASS	VCT	VINYL COMPOSITION TILE
GR	GROUT	VET	VINYL ENHANCED TILE
LCK	LOCKERS	VS	VINYL SHEET FLOORING
LV	LUXURY VINYL (TILE, PLANK)	VWC	VINYL WALLCOVERING
MB	MARKER BOARD/ GLASS BOARD	WP	WALL PROTECTION
N	NOSING (WOOD, RUBBER, METAL)	WC	WINDOW COVERING (BLINDS, SOLAR ROLLER SHADE, DRAPES)
OWP	OPERABLE WALL PARTITION		
P	PAINT	WT	WALL TILE
PC	POLISHED CONCRETE	WPS	WALL PANEL SYSTEM
PL	PLASTIC LAMINATE	WFS	WOOD FLOOR SYSTEM
PT	PORCELAIN TILE		

ROOM FINISH SCHEDULE

RM NO.	NAME	FLOOR	BASE	WALLS				MILLWORK			COMMENTS	RM NO.
						CHAIR RAIL			CABINETS			
				STANDARD	ACCENT	ABOVE	BELOW	COUNTERTOP	FRONT	TOE KICK		
100	VESTIBULE	PT-1	B-2	P-2	P-3							100
101	LOBBY	LV-1	B-2	P-2								101
102	RADIO/WORK ROOM	LV-1	B-2	P-2	P-4			SSF-1	ST-1			102
103	FIRE DAYROOM	PT-2	B-2	P-2	P-4							103
104	KITCHEN	PT-2	B-2	P-2	P-4 / WT-1			QTZ-1	ST-1			104
105	EXCERCISE	RB-1	B-2	P-2	AWC-1, P-3	P-2	AWC-1					105
106	ADA BATH	PT-3 / PT-4	B-3	WT-2 / WT-3, P-7	P-5			QTZ-1			P-5 EPOXY PAINT,TR-5 @ SHOWERS	106
107	CORR.	LV-1	B-2	P-2								107
107A	BUNKROOM 1	LV-1	B-2	P-2								107A
107B	BUNKROOM 2	LV-1	B-2	P-2								107B
107C	BUNKROOM 4	LV-1	B-2	P-2								107C
107D	BUNKROOM 3	LV-1	B-2	P-2								107D
108	BATH	PT-3 / PT-4	B-3	WT-2 / WT-3, P-7	P-5			QTZ-1			P-5 EPOXY PAINT,TR-5 @ SHOWERS	108
109	BATH	PT-3 / PT-4	B-3	WT-2 / WT-3, P-7	P-5			QTZ-1			P-5 EPOXY PAINT,TR-5 @ SHOWERS	109
110	TELECOM	SDT-1	B-2	P-2								110
111	WELLNESS	LV-1	B-2	P-2	P-4			SSF-1	ST-1			111
112	EMS DAYROOM / ALCOVE	CPT-1	B-2	P-2	P-4			SSF-1	ST-1			112
113	LAUNDRY / JANITOR	LV-1	B-1	P-2				SSF-1	ST-1			113
118	VEST	CPT-2	B-2	P-2	FRP-1							118
119	VEST	CPT-2	B-2	P-2								119
120	APPARATUS BAY	SC-2 / P-8	SEE NOTE	P-7	P-6						COLORED CAUK AT FLOOR JOINTS TO MATCH CEILED CONCRETE, P8 FLOOR STRIPING SEE A701	120
121	REHAB	SC-1	B-2	P-7								121
122	FIRE TUNROUT GEAR	SC-1	B-1	P-7								122
123	DECON	SC-1	B-1	P-7								123
123A	DECON BATH	EPF-1	B-1	P-7	WT-2						TR5 @ SHOWER	123A
124	MEDICAL STORAGE	SC-1	B-1	P-2								124
125	EMS TURNOUT GEAR	SC-1	B-1	P-2								125
140	FIRE PUMP	SC-1	B-1	P-7								140
141	ELEC	SC-1	B-1	P-7								141
142	MECH	SC-1	B-1	P-7								142
143	OUTDOOR STORAGE	SC-1	B-1	P-7								143
150	MECHANICAL PLATFORM	SC-1	-	P-7								150
CORR A	CORR	LV-1	B-2	P-2								CORR A
CORR B	CORR	LV-1	B-2	P-2								CORR B
CORR C	CORR	LV-1	B-2	P-2								CORR C

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SANDY PLAINS PUBLIC SAFETY STATION

15224 CREEDMOOR ROAD
Wake Forest, NC
27587

FINISH LEGEND, SCHEDULE, NOTES & CODES

DATE: 07.17.25
PROJECT NO: 23029

REVISIONS

NO:	DATE:	DESCRIPTION:
1	7/31/25	Addendum #1

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MICHAEL S. ESPOSITO ENGINEERING ASSISTANT 8927 7-18-25 CHARLOTTE, NC

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OVERALL FIRST FLOOR FINISH PLAN 3/16" = 1'-0" 1

SANDY PLAINS PUBLIC SAFETY STATION

15224 CREEDMOOR ROAD
Wake Forest, NC
27587

FIRST FLOOR FINISH PLAN

DATE: 07.17.25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7/31/25	Addendum #1

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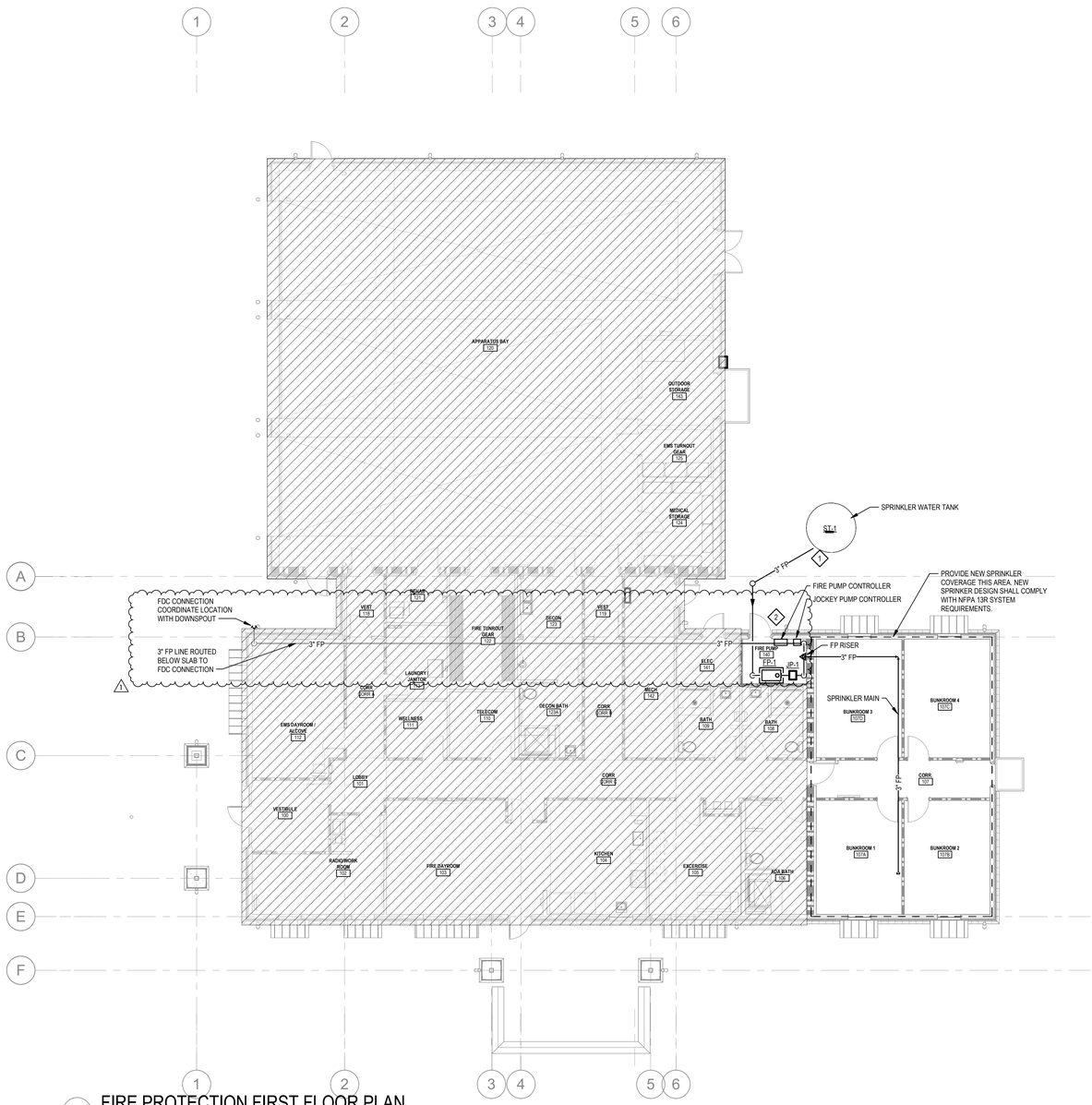

1 FIRE PROTECTION FIRST FLOOR PLAN
SCALE: 1/8" = 1'-0"

GENERAL SHEET NOTES:
A. SPRINKLER AREA TO COMPLY WITH NFPA 13R.

KEYED NOTES:
1. SPRINKLER TANK PROVIDED WITH CONCRETE EQUIPMENT PAD AND INSULATED WITH THERMOLAR TANK TEMPERATURE MAINTENANCE SYSTEM, INSTALLED PER MANUFACTUERES GUIDLINES. (BASIS OF DESIGN CALORIQUE THS-106, OR EQUAL)
2. FIRE PUMP CONTROLLER SHALL BE PROVIDED WITH INTEGRAL ATS.

RATED WALL LEGEND

- 2HR RATED FIRE BARRIER UL DESIGN NO. U905
- 2HR RATED FIRE WALL UL DESIGN NO. U905
- 2HR RATED FIRE BARRIER UL DESIGN NO. U425
- 1HR RATED FIRE PARTITION UL DESIGN NO. U465
- 30 MIN RATED FIRE PARTITION UL DESIGN NO. U407

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

FIRE PROTECTION FIRST FLOOR PLAN

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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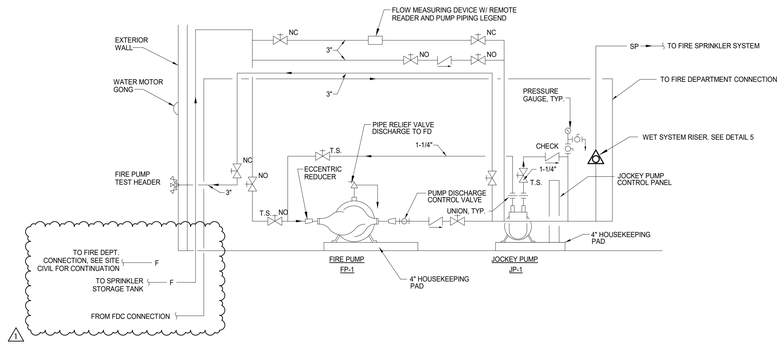
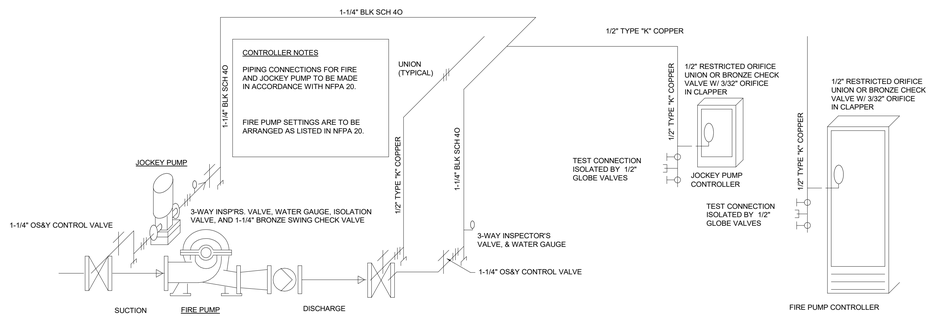
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046612 2025-08-05 DANE J. WALLIN

SHEET NUMBER:
FP101



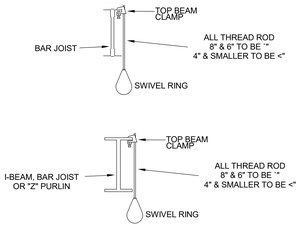
NOT TO SCALE

1 FIRE PUMP PIPING SCHEMATIC

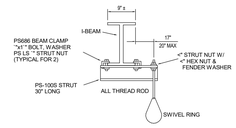


NOT TO SCALE

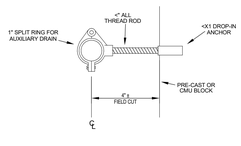
2 CONTROL LINES AND JOCKEY PUMP



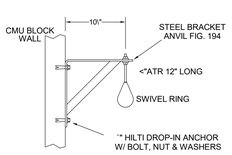
TYPICAL HANGER



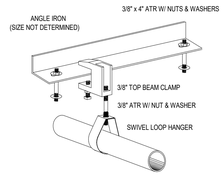
HANGER W/STRUT



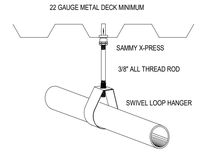
AUXILIARY DRAIN / VERTICAL SUPPORT

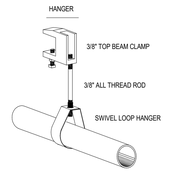


HANGER W/STEEL BRACKET



TRAPEZE HANGER





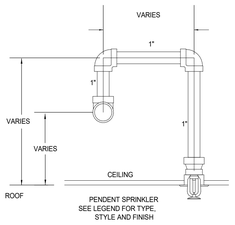
HANGER

HANGER

NOT TO SCALE

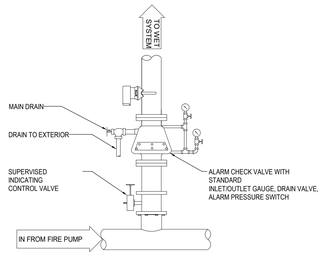
3 TYPICAL HANGERS

NOTE:
1. ALL SPRINKLER TAKE OFFS RIGID SHALL BE FROM TOP OF BRANCH LINE.
2. NO TAKE OFF WILL BE ALLOWED FROM SIDE OF BRANCH LINE.
3. COORDINATE TAKE OFFS WITH OTHER TRADE SERVICES AND EQUIPMENT.



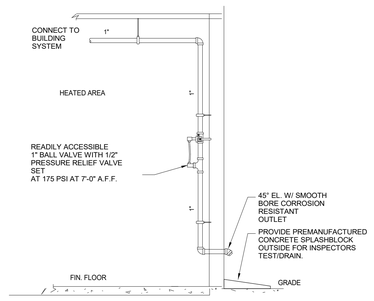
NOT TO SCALE

4 RETURN BEND DETAIL



NOT TO SCALE

5 WET SYSTEM RISER (ALARM CHECK VALVE)



NOT TO SCALE

6 WET SYSTEM INSPECTORS TEST AND DRAIN

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

FIRE PROTECTION DETAILS

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS

NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046612 2025-08-05 REGISTERED DANE J. WALL

SHEET NUMBER:

FP200

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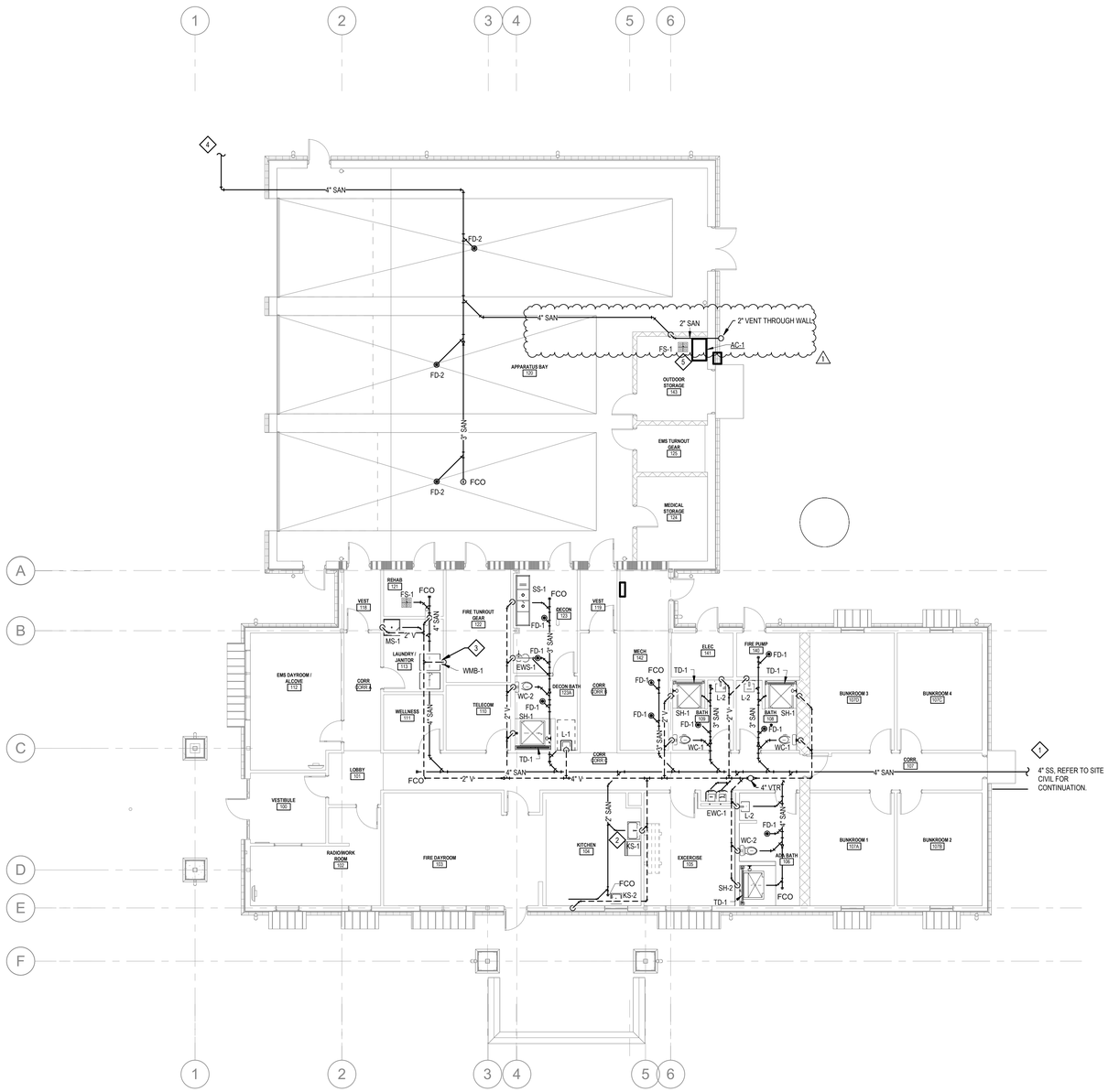

1 SANITARY FIRST FLOOR PLAN
SCALE: 1/8" = 1'-0"

GENERAL SHEET NOTES:

A. ALL SANITARY WASTE PIPING SHOWN IS BELOW SLAB. ALL SANITARY VENT PIPING SHOWN IS ABOVE CEILING. UNLESS NOTED OTHERWISE.
B. ALL VERTICAL PIPING FROM BELOW SLAB SHALL BE ROUTED IN WALLS OR DESIGNATED CHASES UNLESS NOTED OTHERWISE.

KEYED NOTES:

1. EXTEND 4" WASTE 5' OUTSIDE OF BUILDING FOOTPRINT FOR CONNECTION BY CIVIL CONTRACTOR.
2. PROVIDE SINK WITH TAILPIECE SUITABLE FOR DISHWASHER CONNECTION.
3. 2" SANITARY & 1 1/2" VENT CONNECTION TO WASHING MACHINE BOX.
4. 3" SANITARY WASTE FROM APPARATUS BAY TO PUMP AND HAUL TANK. SEE CIVIL DRAWINGS FOR CONTINUATIONS.
5. AIR COMPRESSOR CONDENSATE LINE ROUTED TO FLOOR SINK.

RATED WALL LEGEND

- 2HR RATED FIRE BARRIER UL DESIGN NO. U905
- 2HR RATED FIRE WALL UL DESIGN NO. U905
- 2HR RATED FIRE BARRIER UL DESIGN NO. U425
- 1HR RATED FIRE PARTITION UL DESIGN NO. U465
- 30 MIN RATED FIRE PARTITION UL DESIGN NO. U407

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

SANITARY FIRST FLOOR PLAN

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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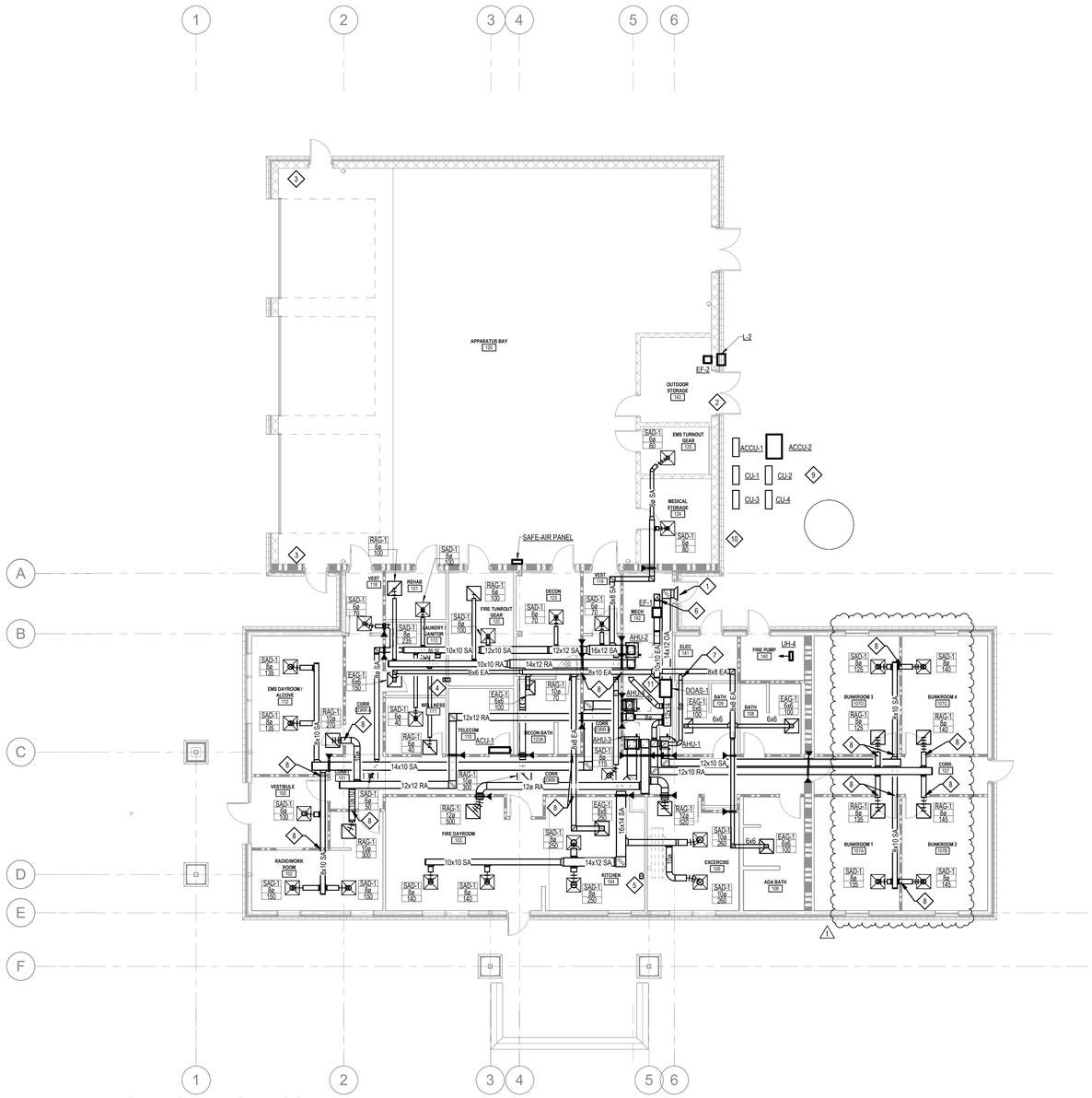
NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER SEAL 046612 2025-08-05 DANIEL J. WALLIN

SHEET NUMBER:

P201



1 MECHANICAL FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

GENERAL SHEET NOTES:

A. REFER TO ARCHITECTURAL RCP FOR CEILING HEIGHT, CEILING MATERIAL AND EXACT LOCATION OF GRILLES/DIFFUSERS.
B. ALL DUCTWORK PENETRATIONS THROUGH FIRE WALLS MUST BE PROVIDED WITH FIRE DAMPERS UNLESS NOTED OTHERWISE.
C. ALL BRANCH SUPPLY DUCTWORK TO AIR DISTRIBUTION DEVICE TO BE PROVIDED WITH MANUAL BALANCING DAMPER.

KEYED NOTES:

1. PROVIDE 30"x14" OUTSIDE AIR INTAKE LOUVER. BASIS OF DESIGN: GREENHECK EVH-501- 30x14 OR APPROVED EQUAL.
2. PROVIDE TRANSFER/RELIEF LOUVER IN STORAGE ROOM DOOR.
3. PROVIDE PHOTO EYE MOUNTED AT 7' AFF FOR SENSORING WHEN TRUCKS ENTER AND LEAVE THE APPARATUS BAY. DETECTION IS FOR ACTIVATING THE AIR SCRUBBERS. REFER TO WIRING DIAGRAM ON SHEET M302.
4. 6" DRYER VENT CONNECTION. COORDINATE WITH APPLIANCE PROVIDER. SEE MECHANICAL PLATFORM PLAN FOR CONTINUATION AND TERMINATION.
5. 6" RANGE HOOD EXHAUST. COORDINATE WITH APPLIANCE SUPPLIER. SEE MECHANICAL PLATFORM PLAN FOR CONTINUATION AND TERMINATION.
6. GENERAL EXHAUST UP AND DISCHARGED THROUGH ROOF.
7. PROVIDE 6" Ø DUCT WITH EBLOW TURNED DOWN THROUGH CEILING INTO ELECTRICAL ROOM. TERMINATE WITH MESH BIRD SCREEN AND BALANCE TO 50 CFM.
8. DUCTWORK PENTRATION THROUGH FIRE PARTITION OR FIRE BARRIER DOES NOT REQUIRE FIRE DAMPERS DUE TO THE EXCEPTIONS NOTED IN SECTION 607.5.3 OF THE 2018 NC MECHANICAL CODE. PROVIDE WITH STEEL SLEEVE AND RETAINING ANGLES IN ACCORDANCE WITH SECTION 607.5.3 EXCEPTION 3.6 TO COMPLY WITH ALL COMPONENTS OF EXCEPTION 3.
9. CONDENSING UNITS TO BE PROVIDED WITH 6" CONCRETE EQUIPMENT PADS.
10. PROVIDE ALL STAINLESS STEEL DISCONNECTS FOR CONDENSING UNITS.
11. IF ALTERNATE #4 IS SELECTED, DUCTWORK CONNECTIONS AND ROUTING TO DOAS-1 WILL NEED TO BE RECONFIGURED IN ACCORDANCE WITH UNIT SIZE AND DUCT CONNECTIONS.

RATED WALL LEGEND

- 2HR RATED FIRE BARRIER UL DESIGN NO. U905
- 2HR RATED FIRE WALL UL DESIGN NO. U905
- 2HR RATED FIRE BARRIER UL DESIGN NO. U425
- 1HR RATED FIRE PARTITION UL DESIGN NO. U465
- 30 MIN RATED FIRE PARTITION UL DESIGN NO. U407

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

MECHANICAL FIRST FLOOR PLAN

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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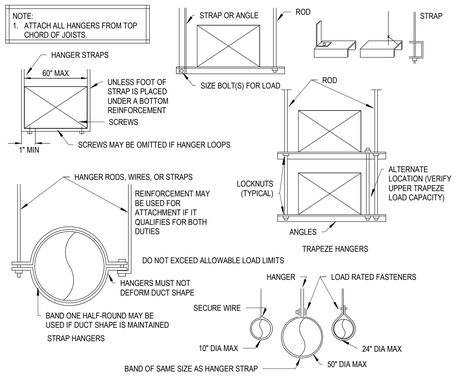
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046612 2025-08-05 DANE J. WALL

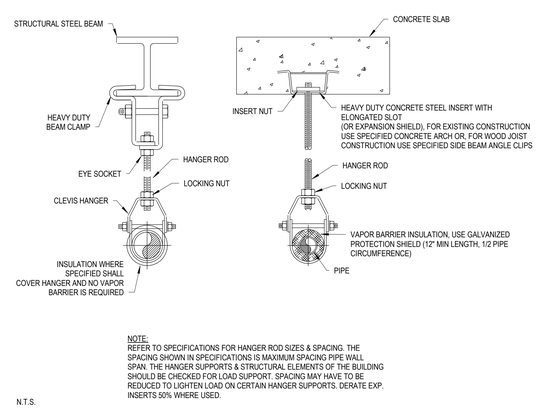
SHEET NUMBER:

M101



N.T.S.

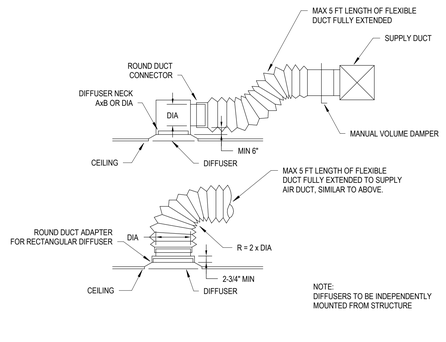
1. DUCT HANGERS



NOTE:
REFER TO SPECIFICATIONS FOR HANGER ROD SIZES & SPACING. THE SPACING SHOWN IN SPECIFICATIONS IS MAXIMUM SPACING PIPE WALL SPAN. THE HANGER SUPPORTS & STRUCTURAL ELEMENTS OF THE BUILDING SHOULD BE CHECKED FOR LOAD SUPPORT. SPACING MAY HAVE TO BE REDUCED TO LIGHTEN LOAD ON CERTAIN HANGER SUPPORTS. DERATE EXP. INSERTS 50% WHERE USED.

N.T.S.

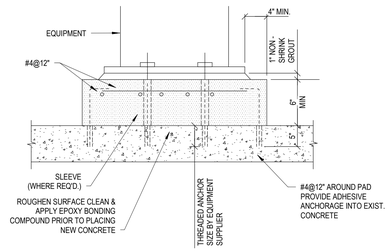
2. PIPE HANGERS



NOTE:
DIFFUSERS TO BE INDEPENDENTLY MOUNTED FROM STRUCTURE

N.T.S.

3. DIFFUSER CONNETIONS



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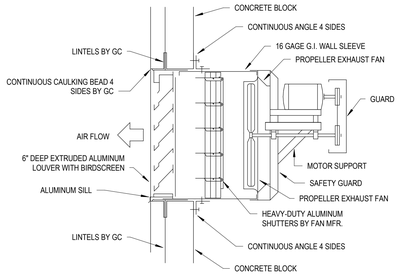
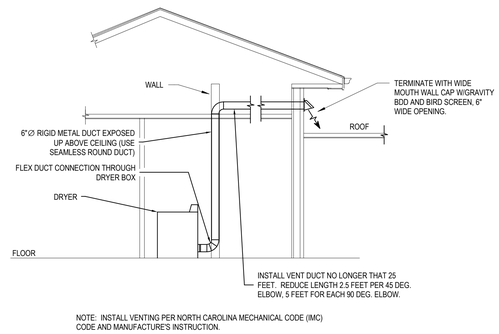
4. EQUIPMENT PAD DETAIL



N.T.S.

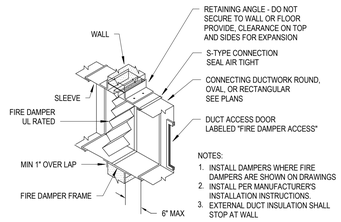
5. SIDEWALL EXHAUST FAN



NOTE: INSTALL VENTING PER NORTH CAROLINA MECHANICAL CODE (IMC) CODE AND MANUFACTURE'S INSTRUCTION.

N.T.S.

6. DRYER VENTING DETAIL



NOTES:
1. INSTALL DAMPERS WHERE FIRE DAMPERS ARE SHOWN ON DRAWINGS
2. INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. EXTERNAL DUCT INSULATION SHALL STOP AT WALL

N.T.S.

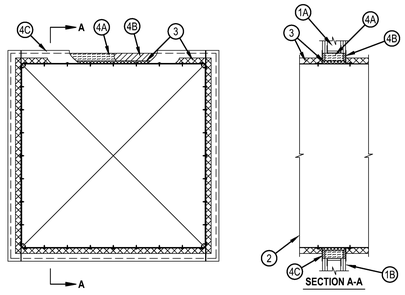
8. WALL MOUNTED FIRE DAMPER

7. DUCT PENETRATION THROUGH FIRE RATED WALL UL DETAIL

System No. W-L-7156 — WL 7156

Classified by Underwriters Laboratories, Inc. to UL 1479 and CAN/ULC-S115

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0, 1 and 2 Hr (See Item 4C)	FT Rating — 0, 1, and 2 Hr (See Item 4C)
	FH Ratings — 1 and 2 Hr (See Item 1)
	FTH Rating — 0, 1, and 2 Hr (See Item 4C)



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC. Additional framing members shall be used to completely frame around opening.
   B. Gypsum Board* — Min 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers and orientation shall be as specified in the individual Wall and Partition Design. Max size of opening is 210 sq in. (1355 cm2) with a max width of 14-1/2 in. (368 mm) for wood studs. Max size of opening is 76.2 sq ft. (7 m2) with a max width of 105-1/2 in. (2.7 m) for steel studs.
   The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall in which it is installed.
2. Steel Duct — Max 100 by 100 in. (2.5 by 2.5 m) steel duct to be installed within the framed opening. The duct shall be constructed and reinforced in accordance with SMACNA construction standards. Steel duct to be rigidly supported on both sides of wall assembly.

Hilti Firestop Systems

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Page: 1 of 2

System No. W-L-7156 — WL 7156

3. Batts and Blankets* — Nom 1-1/2 or 2 in. (38 or 51 mm) thick glass fiber batt or blanket (min 3/4 pcf or 12 kg/m3) jacketed on the outside with a foil-scrim-kraft facing. Longitudinal and transverse joints sealed with aluminum foil tape. During the installation of the fill material, the batt or blanket shall be compressed minimum 50% such that the annular space within the firestop system shall be min 1/2 in. (13 mm) to max 3-1/2 in. (89 mm); refer to the table below.
   See Batts and Blankets (BKNV) category in the Building Materials Directory for names of manufacturers. Any batt or blanket meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index 50 or less may be used.
4. Firestop System — The firestop system shall consist of the following:
   A. Packing Material — Min 3-5/8 (92 mm) or 4-7/8 in. (124 mm) thickness of min 4 pcf (64 kg/m3) mineral wool batt insulation firmly packed into opening as a permanent form for 1 or 2 hr fire-rated walls, respectively. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.
   B. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE MAX Intumescent Sealant
   C. Steel Retaining Angles — Min No. 16 gauge (0.059 in. or 1.5 mm) galv steel angles sized to lap steel duct a min of 2 in. 51 mm) and lap wall surfaces a min of 1 in. (25 mm). Angles attached to steel duct on both sides of wall with min No. 10 steel sheet metal screws spaced a max of 1 in. (25 mm) from each end of steel duct and spaced a max of 6 in. (152 mm) OC. When max duct dimension does not exceed 48 in. (122 cm) and duct area does not exceed 1300 in2 (8387 cm2), angles may be min No. 18 gauge galv steel. Angles attached to steel duct on both sides of wall with min No. 10 by 1/2 in. (13 mm) long steel sheet metal screws located a max of 1 in. (25 mm) from each end of steel duct and spaced a max of 6 in. (152 mm) OC. In addition, see table below for additional conditions and options regarding retaining angles.

Max Duct Dimension	Duct Thickness	Max Insulation Thickness (Item 3)	Annular Space	Packing Material (Item 4A) Required	Angle (Item 4C) Required	T-Rating Hr
**24 in. (610 mm)	24 ga or heavier	1-1/2 in. (38 mm)	1/4 in. min to 1 in. max (6 to 25 mm)	No	No	0
25 in. (635 mm) wide by 45 in. (1143 mm) high	24 ga or heavier	2 in. (51 mm)	1/4 in. min to 3-1/2 in. max (6 to 89 mm)	Yes	No	1 and 2 (Same as wall rating)

** Indicates that when max 1-1/2 in. (38 mm) thick insulation is used, steel angles are optional for those sides of the duct that do not exceed the dimension specified.

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Hilti Firestop Systems

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

MECHANICAL DETAILS

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS

NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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NORTH CAROLINA REGISTERED LANDSCAPE ARCHITECT SEAL 046612 2025-08-05 REGISTERED DANIEL J. WALL III

SHEET NUMBER:

M400

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ELECTRIC UNIT HEATER SCHEDULE

TAG	SERVICE	DESCRIPTION	SUPPLY CFM	KW	MBH	ELECTRICAL DATA			BASIS OF DESIGN		NOTES
						VOLTAGE	PHASE	HERTZ	MANUF	MODEL	
UH-1	APPARATUS BAY	FAN FORCED UNIT HEATER	700	9.9 kW	33.8	208 V	3	60 Hz	RAYWALL	F2F5110CA1L	1-2, 4
UH-2	APPARATUS BAY	FAN FORCED UNIT HEATER	700	9.9 kW	33.8	208 V	3	60 Hz	RAYWALL	F2F5110CA1L	1-2, 4
UH-3	APPARATUS BAY	FAN FORCED UNIT HEATER	400	5.0 kW	17.1	208 V	3	60 Hz	RAYWALL	F2F5105N	1, 3-4
UH-4	FIRE PUMP 140	FAN FORCED UNIT HEATER	400	5.0 kW	17.1	208 V	3	60 Hz	RAYWALL	F2F5105N	1

NOTES:
1. PROVIDE WITH LOUVER DIFFUSER.
2. MOUNTED HORIZONTALLY WITH VERTICAL DISCHARGE.
3. HORIZONTAL DISCHARGE WITH DOWNWARD DEFLECTION FROM DISCHARGE LOUVER.
4. PROVIDE WITH WALL-MOUNTED STRATIFICATION THERMOSTAT.

SPLIT DX AIR CONDITIONING UNIT SCHEDULE (ACU & ACCU)

TAG	INDOOR UNIT							MATCHED OUTDOOR UNIT								BASIS OF DESIGN	
	SERVES	SUPPLY AIR FLOW (CFM)	MIN OA (CFM)	TOTAL COOLING (TONS)	ELECTRICAL DATA		REFRIGERANT TYPE	TAG	FAN MOTOR OUTPUT (W)	# OF FANS	PHASE	HERTZ	MCA (A)	MOCP (A)	MANUF	MODEL
					VOLTAGE	MCA (A)										
ACU-1	110 IT	320	0	0.8	208	1.00	R454B	ACCU-1	51	1	1	60	16	27	MITSUBISHI	PKA-AL12NL / PUZ-AK12NL
AHU-1	BUNKROOMS	595	0	1.5	208	3.00	R454B	CU-1	51	1	1	60	16	27	MITSUBISHI	PVA-AA18NL / PUY-AK18NL
AHU-2	INTERIOR SPACES	990	0	3.0	208	5.50	R454B	CU-2	74	2	1	60	34	56	MITSUBISHI	PVA-AA36NL / PUY-AK36NL
AHU-3	FIRE DAYROOM, KITCHEN, EXERCISE ROOMS	1300	0	3.0	208	5.50	R454B	CU-3	74	2	1	60	34	56	MITSUBISHI	PVA-AA36NL / PUY-AK36NL
AHU-4	EMS DAYROOM, VESTIBLE 100, RADIO ROOM	670	0	2.5	208	4.13	R454B	CU-4	74	1	1	60	22	37	MITSUBISHI	PVA-AA30NL / PUY-AH30NL

REFRIGERANT LIMIT CALCULATION:

System	Critical Space: Smallest Connected Space	Area (ft*2)	Height (ft)	Volume (ft*3)	Refrigerant Type	#/1,000 cu ft	Allowable Charge (lb)	Total Refrigerant (lb)
ACU-1	TELECOM 110	85	9	765.0	R-454B	22	16.8	4.4
AHU-1	ALL	921	9	8289.0	R-454B	22	182.4	11.8
AHU-2	ALL	1283	8	10264.0	R-454B	22	225.8	11.4
AHU-3	ALL	761	9.5	7229.5	R-454B	22	159.0	12.1
AHU-4	ALL	555	10	5550.0	R-454B	22	122.1	11.9

NOTES:
1. AHU-1-4 ARE ALL DUCTED SYSTEMS. PER ADDEDUM G OF ASHRAE 15 2019, THE EFFECTIVE DISPERSAL VOLUME OF THESE SYSTEM EQUALS THE TOTAL VOLUME OF THE SPACES DUCTED TOGETHER.

AIR DISTRIBUTION SCHEDULE

TAG	SYSTEM	BASIS OF DESIGN		DESCRIPTION	MAX. N.C	NOTES
		MANUF	MODEL			
EAG-1	EXHAUST	PRICE	PDDR	24"x24" PERFORATED RETURN GRILLE. SUITABLE FOR LAY IN CEILING. STANDARD OFF-WHITE FINISH. ALUMINUM CONSTRUCTION.	25	ALL
RAG-1	RETURN	PRICE	PDDR	24"x24" PERFORATED RETURN GRILLE. SUITABLE FOR LAY IN CEILING. STANDARD OFF-WHITE FINISH. ALUMINUM CONSTRUCTION.	25	ALL
SAD-1	SUPPLY	PRICE	SCD	24x24 SQUARE CONE DIFFUSER. SUITABLE FOR LAY IN CEILING. STANDARD OFF-WHITE FINISH. ALUMINUM CONSTRUCTION.	25	ALL

NOTES:
1. REFER TO PLANS FOR DUCT CONNECTION SIZE.

DEDICATED OUTSIDE AIR UNIT SCHEDULE

TAG	UNIT TYPE	SUPPLY AIR FAN PERFORMANCE					COOLING CAP TOT (BTU/H)	COOLING CAP SENS (MBh)	COOLING LAT DB/WB	UNIT LAT	REHEAT CAPACITY (MBh)	ELECTRIC HEAT kW	DX HEATING (MBH)	FILTER TYPE	ELECTRICAL DATA				BASIS OF DESIGN		OUTDOOR UNIT				NOTES
		AIRFLOW (CFM)	EXT S.P (IN WG)	MAX FAN RPM	BHP	MOTOR HP									VOLTAGE	PHASE	MCA	MOCP	MANUF.	MODEL	UNIT TAG	V/P/H	MCA / MOCP	MANUF. / MODEL	
DOAS-1	VERTICAL BLOWER COIL	1000	1.00	1657	0.56	1	83581	43.6	52.18 / 50.91	36.58	19.13	5.0 W	0	MERV 8	208 V	1	40 A	40 A	TRANE	BCVE036	ACCU-2	208V / 3P / 60HZ	38 / 60	TRANE TTA090K3AAA	1, 3, 4
DOAS-1	BLOWER COIL	1000	1.00	2434	0.59	1	93800	48.5	51.1 / 50.8	25	16.20	4.8 W	56	MERV-13	208 V	1	53 A	60 A	OXEGEN 8	T12IN	ACCU-2	208V / 3P / 60HZ	34.1/ 35	DAIKIN RXYQ96AATJB	2, 3, 5

NOTES:
1. THIS DOAS-1 IS A PART OF THE BASE BID. IF ALTERNATE #4 IS TAKEN, THIS WILL NOT BE PROVIDED.
2. THIS DOAS-1 IS TO BE PROVIDED IF ALTERNATE #4 IS SELECTED.
3. UNIT IS PROVIDED WITH ELECTRIC PREHEAT COIL SIZED IN ACCORDANCE WITH THE "ELECTRIC HEAT kW".
4. DX COIL IS COOLING ONLY.
5. DX COIL IS FOR HEAT PUMP USE WITH CONDENSING UNIT.

FAN SCHEDULE

TAG	SERVICE	SERVING	FAN TYPE	CFM	S.P. (IN. W.G.)	MOTOR DATA					BASIS OF DESIGN		NOTES
						HP	RPM	VOLTS	PHASE	HERTZ	MANUF	MODEL	
EF-1	EXHAUST	TOILET ROOMS	INLINE	700	1.00	.5	1493	208 V	1	60 Hz	GREENHECK	SQ-130HP-VG	1
EF-2	EXHAUST	MAIN OUTDOOR STORAGE	INLINE	350	0.50	.08	1027	208 V	1	60 Hz	GREENHECK	SQ-95-VG	1, 2, 4
EF-3	EXHAUST	APPARATUS BAY	PROP	9500	0.54	1.82	1414	208 V	1	60 Hz	GREENHECK	AER-30-VG	3-7
SF-1	INTAKE	APPARATUS BAY	PROP	9500	0.54	1.82	1414	208 V	1	60 Hz	GREENHECK	AER-30-VG	3-7

NOTES:
1. PROVIDE UNIT MOUNTED DISCONNECT AND BACKDRAFT DAMPER.
2. PROVIDE FAN WITH SPRING ISOLATORS AND FLEXIBLE DUCT CONNECTIONS.
3. A CARBON MONOXIDE AND MITROGEN OXIDE DETECTOR SHALL BE PROVIDED, DETECTORS SHALL ACTIVATE FAN UPON DETECTION OF CARBON MONOXIDE OR NITROGEN OXIDE EXCEEDING 25 PPM.
4. PROVIDE STARTER AND DISCONNECTS AS REQUIRED.
5. EXHAUST FANS AND ASSOCIATED LOUVER DAMPERS SHALL BE CONTROLLED BY AIR CLEANER SYSTEM.
6. PROVIDE FAN SAFETY GUARD.
7. SIDEWALL PROPELLER FAN SHALL HAVE MOTOR FACTORY MOUNDED AND ACCESSIBLE BETWEEN OCCIPIED SPACE AND FAN BLADES.

LOUVER SCHEDULE

TAG	SERVING	SERVICE	SIZE		MIN FREE AREA %	DESIGN CFM	MAX PRESSURE DROP (IN WG)	BASIS OF DESIGN		NOTES
			WIDTH	HEIGHT				MANUF	MODEL	
L-1	APPARATUS BAY	INTAKE	48	44	57.8	9500	0.20	GREENHECK	ESD-635	ALL
L-2	MAIN OUTDOOR STORAGE	EXHAUST	14	14	0.45	350	0.15	GREENHECK	EDJ-401	ALL
L-3	APPARATUS BAY	EXHAUST	48	44	57.8	9500	0.20	GREENHECK	ESD-635	ALL

NOTES:
1. 6 IN. FRAME WITH 35° ANGLED BLADES.
2. PROVIDE WITH BIRD SCREEN.

AIR SCRUBBER SCHEDULE

TAG	SERVICE	BASIS OF DESIGN		AIRFLOW CFM	FILTER TYPE	DIMENSIONS	MCA	VOLT/PHASE
		MANUF	MODEL					
AS-1	APPARATUS BAY	SAFE-AIR	SA-FHAC-3000	3000	MERV15	77x27x27	7 A	208V / 1P / 60HZ
AS-2	APPARATUS BAY	SAFE-AIR	SA-FHAC-3000	3000	MERV15	77x27x27	7 A	208V / 1P / 60HZ
AS-3	APPARATUS BAY	SAFE-AIR	SA-FHAC-3000	3000	MERV15	77x27x27	7 A	208V / 1P / 60HZ

NOTES:
1. REFER TO M301 & M302 FOR ADDITIONAL INFORMATION.

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

MECHANICAL SCHEDULES

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS

NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046612 2025-08-05 ENGINEER DANIEL J. WALLACE

SHEET NUMBER:

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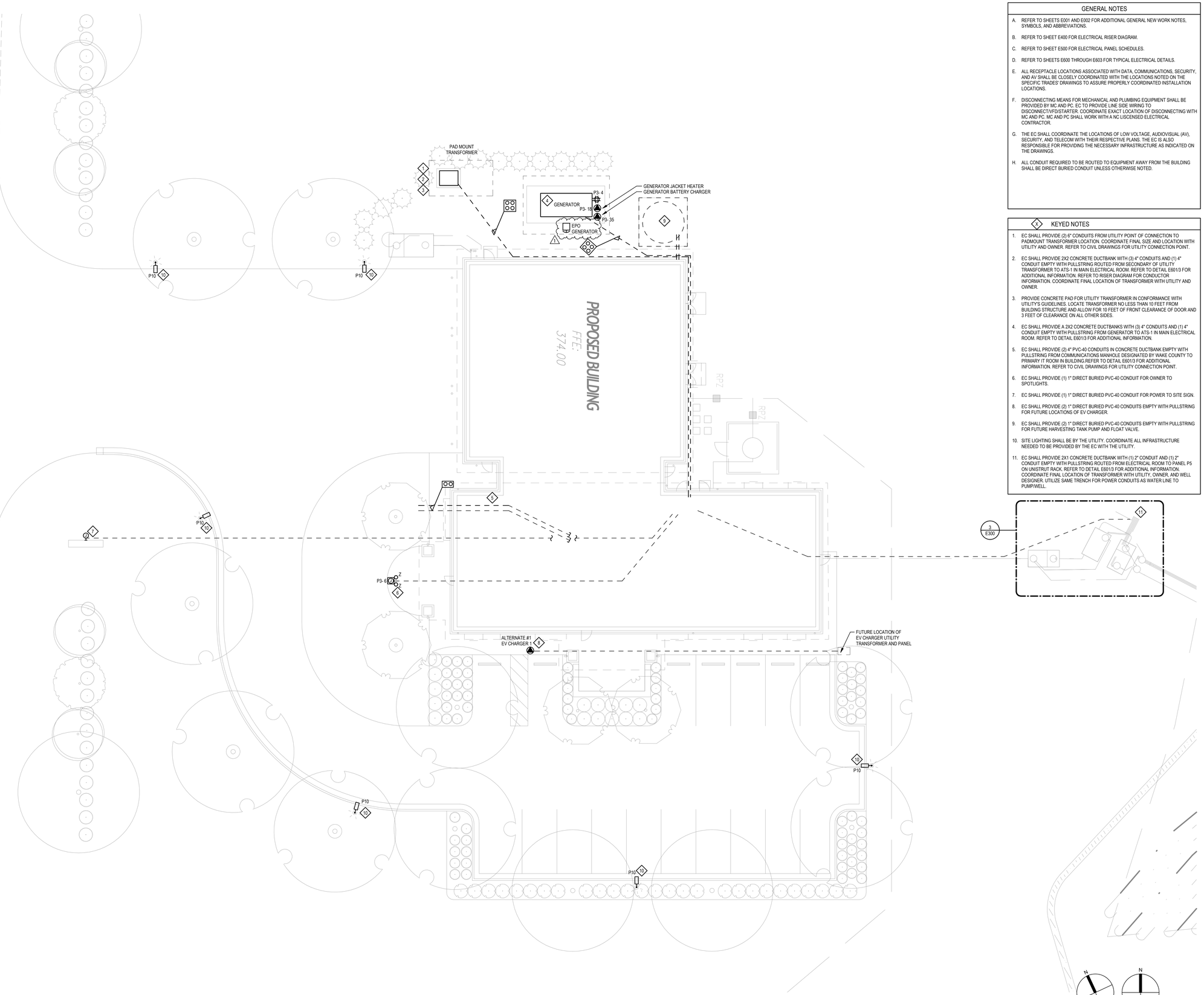

GENERAL NOTES

A. REFER TO SHEETS E001 AND E002 FOR ADDITIONAL GENERAL NEW WORK NOTES, SYMBOLS, AND ABBREVIATIONS.

B. REFER TO SHEET E400 FOR ELECTRICAL RISER DIAGRAM.

C. REFER TO SHEET E500 FOR ELECTRICAL PANEL SCHEDULES.

D. REFER TO SHEETS E600 THROUGH E603 FOR TYPICAL ELECTRICAL DETAILS.

E. ALL RECEPTACLE LOCATIONS ASSOCIATED WITH DATA, COMMUNICATIONS, SECURITY, AND AV SHALL BE CLOSELY COORDINATED WITH THE LOCATIONS NOTED ON THE SPECIFIC TRADES' DRAWINGS TO ASSURE PROPERLY COORDINATED INSTALLATION LOCATIONS.

F. DISCONNECTING MEANS FOR MECHANICAL AND PLUMBING EQUIPMENT SHALL BE PROVIDED BY MC AND PC. EC TO PROVIDE LINE SIDE WIRING TO DISCONNECT/VFD/STARTER. COORDINATE EXACT LOCATION OF DISCONNECTING WITH MC AND PC. MC AND PC SHALL WORK WITH A NC LISCENSED ELECTRICAL CONTRACTOR.

G. THE EC SHALL COORDINATE THE LOCATIONS OF LOW VOLTAGE, AUDIOVISUAL (AV), SECURITY, AND TELECOM WITH THEIR RESPECTIVE PLANS. THE EC IS ALSO RESPONSIBLE FOR PROVIDING THE NECESSARY INFRASTRUCTURE AS INDICATED ON THE DRAWINGS.

H. ALL CONDUIT REQUIRED TO BE ROUTED TO EQUIPMENT AWAY FROM THE BUILDING SHALL BE DIRECT BURIED CONDUIT UNLESS OTHERWISE NOTED.

KEYED NOTES

1. EC SHALL PROVIDE (2) 6" CONDUITS FROM UTILITY POINT OF CONNECTION TO PADMOUNT TRANSFORMER LOCATION. COORDINATE FINAL SIZE AND LOCATION WITH UTILITY AND OWNER. REFER TO CIVIL DRAWINGS FOR UTILITY CONNECTION POINT.
2. EC SHALL PROVIDE 2X2 CONCRETE DUCTBANK WITH (3) 4" CONDUITS AND (1) 4" CONDUIT EMPTY WITH PULLSTRING ROUTED FROM SECONDARY OF UTILITY TRANSFORMER TO ATS-1 IN MAIN ELECTRICAL ROOM. REFER TO DETAIL E601/3 FOR ADDITIONAL INFORMATION. REFER TO RISER DIAGRAM FOR CONDUCTOR INFORMATION. COORDINATE FINAL LOCATION OF TRANSFORMER WITH UTILITY AND OWNER.
3. PROVIDE CONCRETE PAD FOR UTILITY TRANSFORMER IN CONFORMANCE WITH UTILITY'S GUIDELINES. LOCATE TRANSFORMER NO LESS THAN 10 FEET FROM BUILDING STRUCTURE AND ALLOW FOR 10 FEET OF FRONT CLEARANCE OF DOOR AND 3 FEET OF CLEARANCE ON ALL OTHER SIDES.
4. EC SHALL PROVIDE A 2X2 CONCRETE DUCTBANKS WITH (3) 4" CONDUITS AND (1) 4" CONDUIT EMPTY WITH PULLSTRING FROM GENERATOR TO ATS-1 IN MAIN ELECTRICAL ROOM. REFER TO DETAIL E601/3 FOR ADDITIONAL INFORMATION.
5. EC SHALL PROVIDE (2) 4" PVC-40 CONDUITS IN CONCRETE DUCTBANK EMPTY WITH PULLSTRING FROM COMMUNICATIONS MANHOLE DESIGNATED BY WAKE COUNTY TO PRIMARY IT ROOM IN BUILDING.REFER TO DETAIL E601/3 FOR ADDITIONAL INFORMATION. REFER TO CIVIL DRAWINGS FOR UTILITY CONNECTION POINT.
6. EC SHALL PROVIDE (1) 1" DIRECT BURIED PVC-40 CONDUIT FOR OWNER TO SPOTLIGHTS.
7. EC SHALL PROVIDE (1) 1" DIRECT BURIED PVC-40 CONDUIT FOR POWER TO SITE SIGN.
8. EC SHALL PROVIDE (2) 1" DIRECT BURIED PVC-40 CONDUITS EMPTY WITH PULLSTRING FOR FUTURE LOCATIONS OF EV CHARGER.
9. EC SHALL PROVIDE (2) 1" DIRECT BURIED PVC-40 CONDUITS EMPTY WITH PULLSTRING FOR FUTURE HARVESTING TANK PUMP AND FLOAT VALVE.
10. SITE LIGHTING SHALL BE BY THE UTILITY. COORDINATE ALL INFRASTRUCTURE NEEDED TO BE PROVIDED BY THE EC WITH THE UTILITY.
11. EC SHALL PROVIDE 2X1 CONCRETE DUCTBANK WITH (1) 2" CONDUIT AND (1) 2" CONDUIT EMPTY WITH PULLSTRING ROUTED FROM ELECTRICAL ROOM TO PANEL P5 ON UNISTRUT RACK. REFER TO DETAIL E601/3 FOR ADDITIONAL INFORMATION. COORDINATE FINAL LOCATION OF TRANSFORMER WITH UTILITY, OWNER, AND WELL DESIGNER. UTILIZE SAME TRENCH FOR POWER CONDUITS AS WATER LINE TO PUMP/WELL.

1 SITE PLAN - POWER AND SYSTEMS
SCALE: 3/32" = 1'-0"

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

SITE PLAN - POWER AND SYSTEMS

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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NORTH CAROLINA PROFESSIONAL SEAL 053121 ELECTRICAL ENGINEER CHRISTOPHER C. ALDRICH

SHEET NUMBER:
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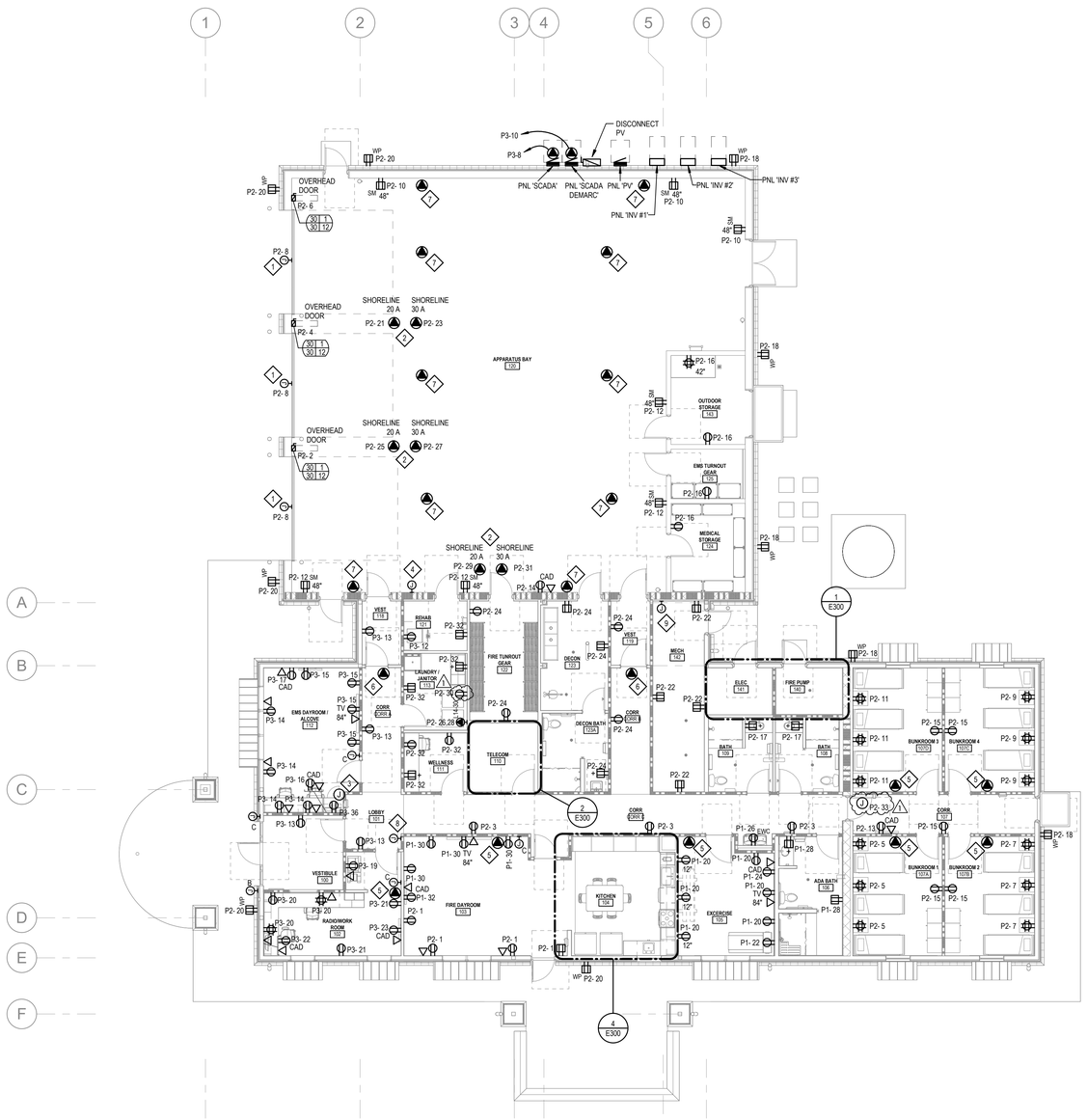
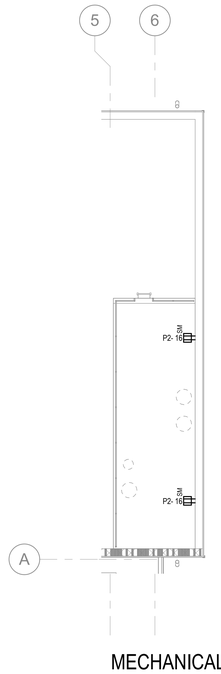


1 FIRST FLOOR PLAN - POWER AND SYSTEMS
SCALE: 1/8" = 1'-0"



2 MECHANICAL PLATFORM PLAN - POWER AND SYSTEMS
SCALE: 1/8" = 1'-0"

GENERAL NOTES

A. REFER TO SHEETS E001 AND E002 FOR ADDITIONAL GENERAL NEW WORK NOTES, SYMBOLS, AND ABBREVIATIONS.

B. REFER TO SHEET E400 FOR ELECTRICAL RISER DIAGRAM.

C. REFER TO SHEET E500 FOR ELECTRICAL PANEL SCHEDULES.

D. REFER TO SHEETS E600 THROUGH E603 FOR TYPICAL ELECTRICAL DETAILS.

E. ALL RECEPTACLE LOCATIONS ASSOCIATED WITH DATA, COMMUNICATIONS, SECURITY, AND AV SHALL BE CLOSELY COORDINATED WITH THE LOCATIONS NOTED ON THE SPECIFIC TRADES' DRAWINGS TO ASSURE PROPERLY COORDINATED INSTALLATION LOCATIONS.

F. DISCONNECTING MEANS FOR MECHANICAL AND PLUMBING EQUIPMENT SHALL BE PROVIDED BY MC AND PC. EC TO PROVIDE LINE SIDE WIRING TO DISCONNECT/VFD/STARTER. COORDINATE EXACT LOCATION OF DISCONNECTING WITH MC AND PC. MC AND PC SHALL WORK WITH A NC LICENSED ELECTRICAL CONTRACTOR.

G. THE EC SHALL COORDINATE THE LOCATIONS OF LOW VOLTAGE, AUDIOVISUAL (AV), SECURITY, AND TELECOM WITH THEIR RESPECTIVE PLANS. THE EC IS ALSO RESPONSIBLE FOR PROVIDING THE NECESSARY INFRASTRUCTURE AS INDICATED ON THE DRAWINGS.

H. GC/DIV. 26 SHALL PROVIDE THE FOLLOWING:
- ALL POWER WIRING (CONDUIT AND WIRE)
- ELECTRICAL BOXES AND CONDUIT AS SHOWN ON THESE DRAWINGS.
- A 1"C SLEEVE FROM EACH SPACE WITH ALERT SYSTEM EQUIPMENT TO THE NEAREST CORRIDOR FOR USE BY THE ALERT SYSTEM DRAWINGS FOR THOSE SPACES.

I. THE ALERT SYSTEM INSTALLER SHALL PROVIDE THE FOLLOWING:
- ALL WIRING, EQUIPMENT AND TESTING.
- J-HOOKS
- CABINETS FOR AMPS AND OTHER EQUIPMENT.

KEYED NOTES

1. EC SHALL PROVIDE JUNCTION BOX FOR IS40P PRESENCE SENSOR WITH VIRTUAL LOOP FUNCTIONALITY.
2. EC SHALL PROVIDE (2) SETS OF SHORELINE POWER FOR FIRE AND EMS VEHICLES. EMS SHORELINE 30A SHALL BE 27' FROM INSIDE WALL ON DRIVER'S SIDE OF VEHICLE. FIRE SHORELINE 20A SHALL BE 15' FROM INSIDE WALL OF DRIVER'S SIDE OF VEHICLE. FOR EACH 20 AMPERE SHORE LINE DROP PROVIDE A 36" 20 AMPERE SO CORD (CORD LENGTH, NOT TOTAL LENGTH) WITH HUBBELL HBLS369C AND HBLS366C CONNECTORS. FOR EACH 30 AMPERE SHORE LINE DROP PROVIDE A 36" 30 AMPERE SO CORD (CORD LENGTH, NOT TOTAL LENGTH) WITH HUBBELL HBL7513C AND 7515C NEMA 10-50R CONNECTORS. SHORE POWER SHALL BE LONG ENOUGH TO BE 6" OFF THE GROUND. COORDINATE LOCATION OF ALL PIG TAILS.
3. EC SHALL PROVIDE JUNCTION BOX FOR DAYFORCE TIME CLOCK.
4. EC SHALL PROVIDE A TOTAL OF (3) SWITCHES FOR THE APPARATUS BAY DOORS. EACH SWITCH SHALL PROVIDE AN OPEN, CLOSE, AND STOP FUNCTION.
5. PROVIDE BOX AS SHOWN. PROVIDE 1-1"C FROM BOX TO 6" AFC FOR USE BY ALERTING SYSTEM CONTRACTOR. TYPICAL UNLESS OTHERWISE NOTED.
6. PROVIDE BOX CENTERED ABOVE TOP OF DOOR. PROVIDE 1-1"C FROM BOX TO 6" AFC FOR USE BY ALERTING SYSTEM CONTRACTOR.
7. CONTRACTOR SHALL PROVIDE 1-1"C FROM EACH BOX SHOWN IN APPARATUS BAY TO ABOVE CEILING OF CORRIDORS IN LIVING AREA.
8. EC SHALL PROVIDE GENERATOR ANNUNCIATOR IN CONFORMANCE WITH MANUFACTURER BEST PRACTICES. PROVIDE ALL NECESSARY COMPONENTS FOR COMPLETE AND FUNCTIONING SYSTEM.
9. EC SHALL PROVIDE OVEN 60A CONTACTOR FOR RANGE OVEN PUSH STOP BUTTON.

RATED WALL LEGEND

- 2HR RATED FIRE BARRIER UL DESIGN NO. U905
- 2HR RATED FIRE WALL UL DESIGN NO. U905
- 2HR RATED FIRE BARRIER UL DESIGN NO. U425
- 1HR RATED FIRE PARTITION UL DESIGN NO. U465
- 30 MIN RATED FIRE PARTITION UL DESIGN NO. U407

TRUE NORTH PLAN NORTH

1/8"=1'-0" 8' 4' 0 8' 16'

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

FIRST FLOOR PLAN - POWER AND SYSTEMS

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS

NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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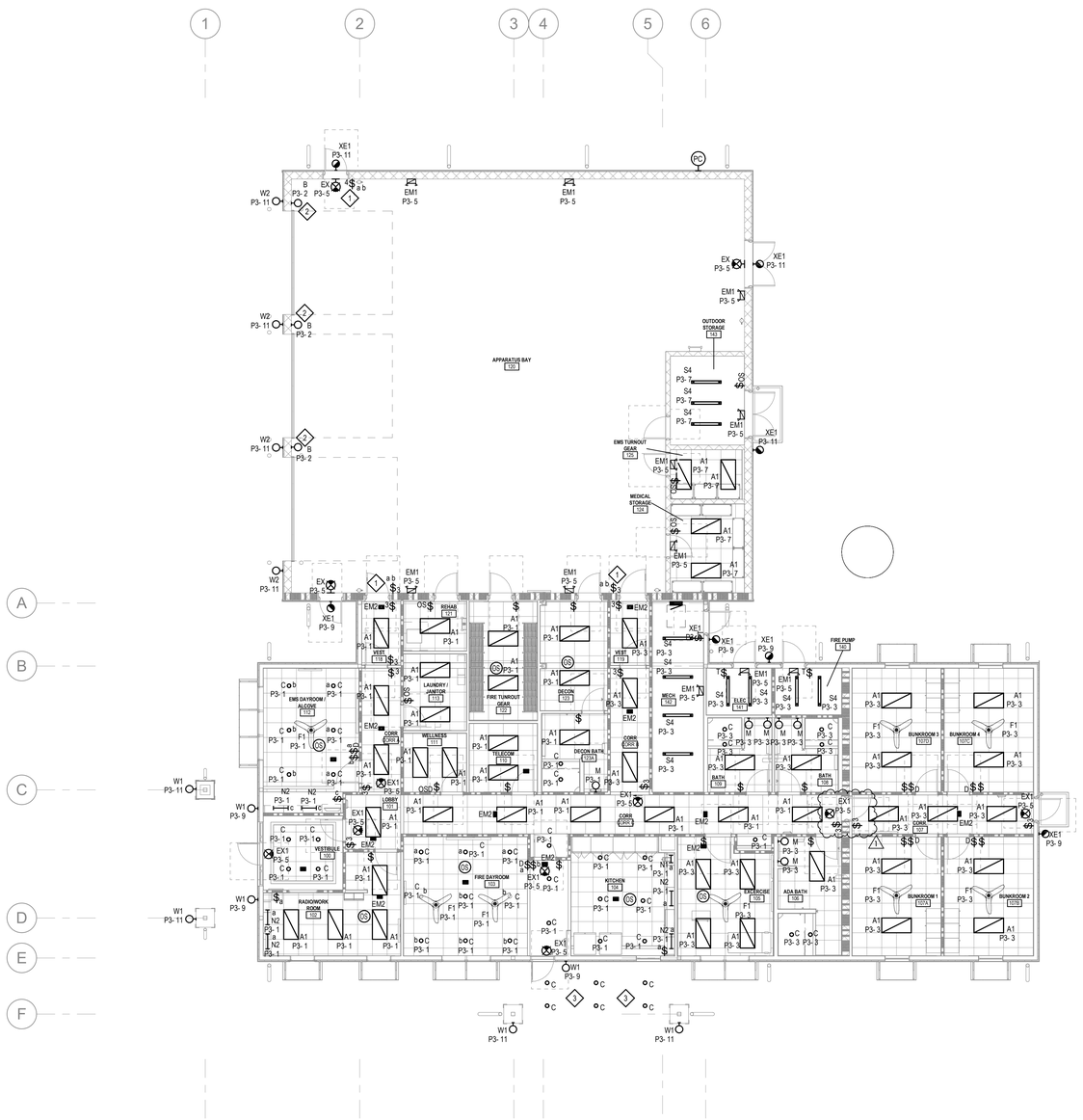
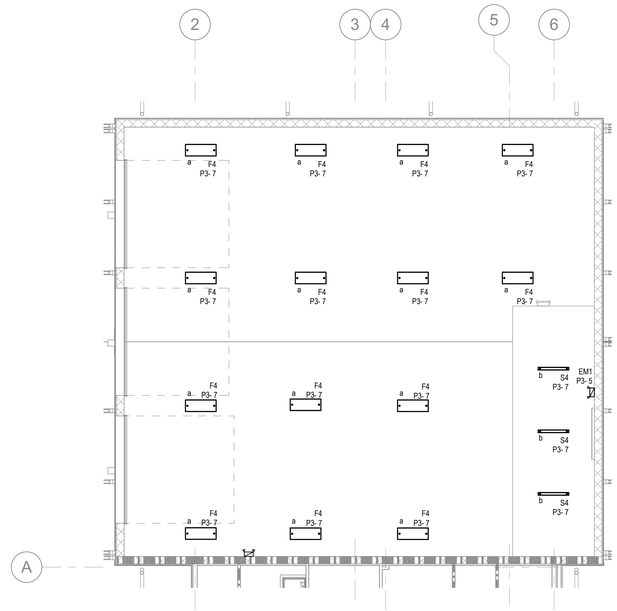
NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER SEAL 053121 ELECTRICAL JESSE C. ALLRED JR.

SHEET NUMBER:
E100



1 FIRST FLOOR PLAN - LIGHTING
SCALE: 1/8" = 1'-0"



2 MECHANICAL PLATFORM PLAN - LIGHTING
SCALE: 1/8" = 1'-0"

GENERAL NOTES

A. REFER TO SHEETS E001 AND E002 FOR ADDITIONAL GENERAL NEW WORK NOTES, SYMBOLS, AND ABBREVIATIONS.

B. REFER TO SHEET E400 FOR ELECTRICAL RISER DIAGRAM.

C. REFER TO SHEET E500 FOR ELECTRICAL PANEL SCHEDULES.

D. REFER TO SHEETS E600 THROUGH E603 FOR TYPICAL ELECTRICAL DETAILS.

E. EXTERIOR LIGHTING CIRCUITS SHALL BE ROUTED VIA LIGHTING RELAY PANEL 'LCP' UNLESS NOTED OTHERWISE. BASIS OF DESIGN IS 8-RELAY NXP2-PNL-8-0-U-S SERIES LIGHTING PANEL BY NX LIGHTING CONTROL.

KEYED NOTES

1. REFER TO DETAIL E2002 FOR LIGHTING ZONING INFORMATION.
2. COORDINATE CONTROLS AND WIRING WITH OWNER AND ARCHITECT PRIOR TO INSTALLATION.
3. DOWNLIGHTS WILL BE CONNECTED TO CANOPY.

RATED WALL LEGEND

- 2HR RATED FIRE BARRIER UL DESIGN NO. U905
- 2HR RATED FIRE WALL UL DESIGN NO. U905
- 2HR RATED FIRE BARRIER UL DESIGN NO. U425
- 1HR RATED FIRE PARTITION UL DESIGN NO. U465
- 30 MIN RATED FIRE PARTITION UL DESIGN NO. U407

TRUE NORTH PLAN NORTH

1/8"=1'-0" 8' 4' 0 8' 16'

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

FIRST FLOOR PLAN - LIGHTING

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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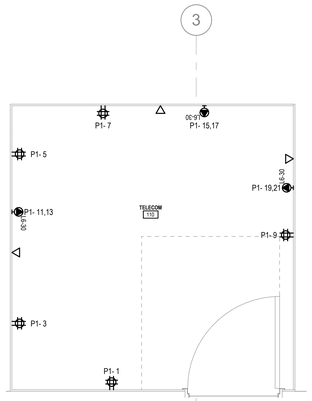
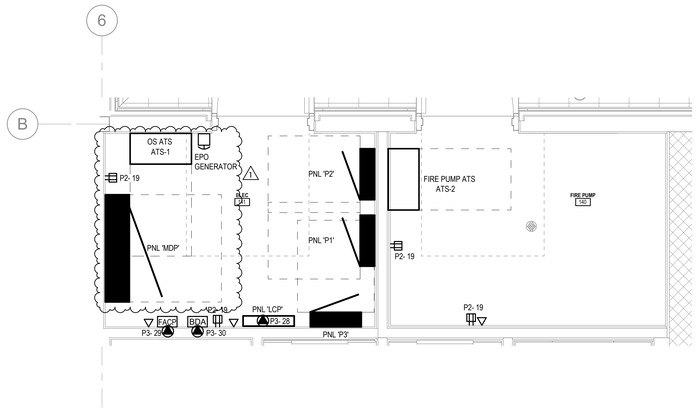
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 05312 JESSE C. ALLRED JR. 05/31/25

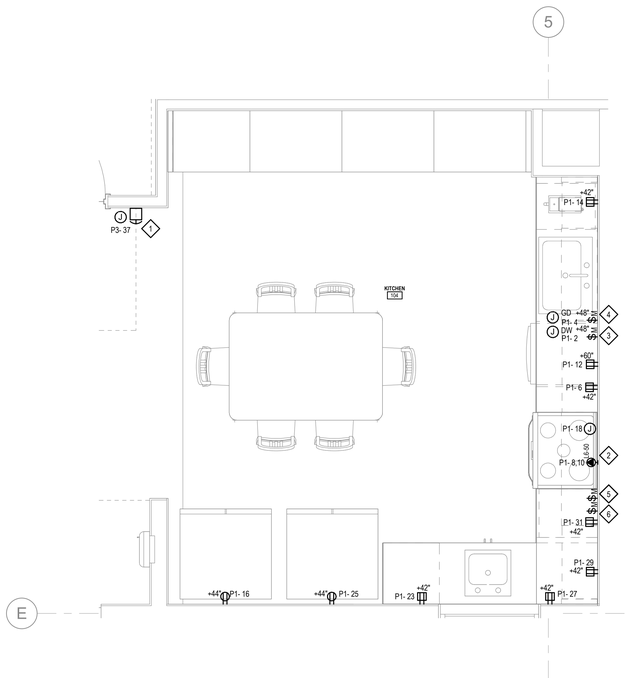
SHEET NUMBER:
E200



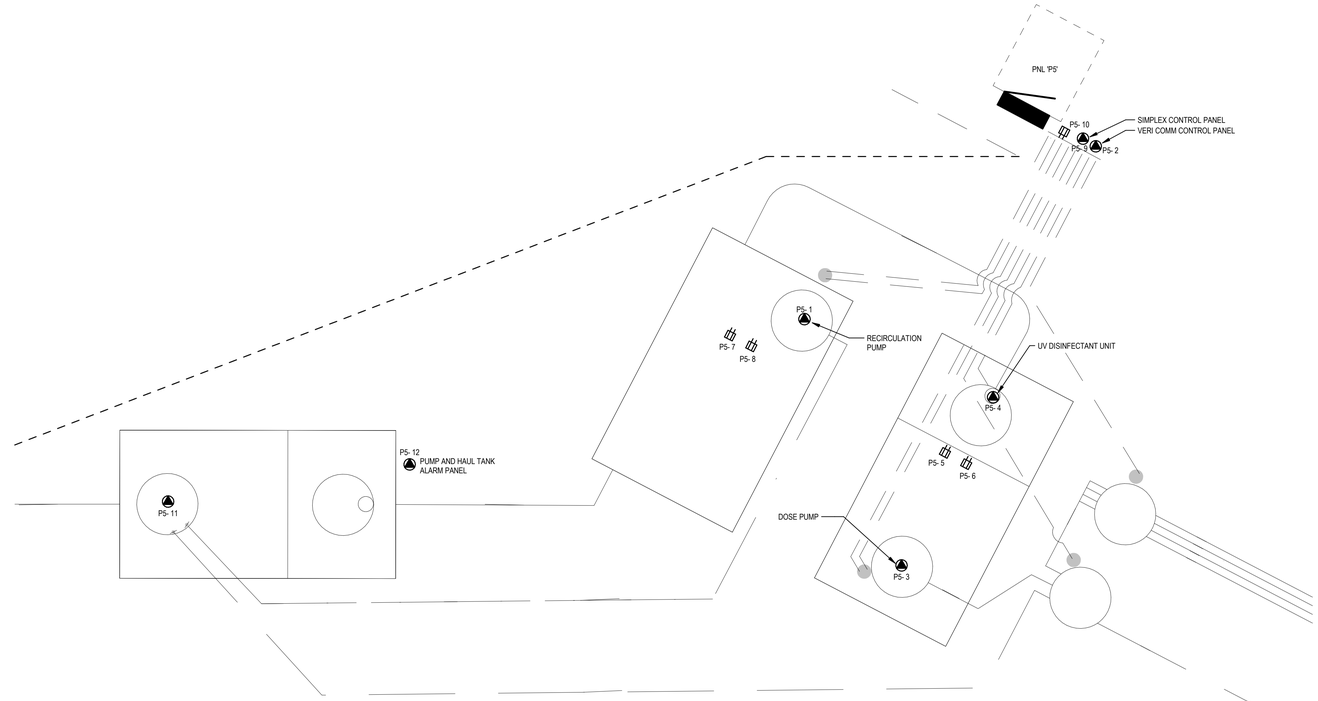
2 ENLARGED IT ROOM 110 - POWER AND SYSTEMS
SCALE: 1/2" = 1'-0"



1 ELEC 141 AND FIRE PUMP 140 ENLARGED - POWER AND SYSTEMS
SCALE: 1/2" = 1'-0"



4 ENLARGED KITCHEN ROOM 104 - POWER AND SYSTEMS
SCALE: 1/2" = 1'-0"



3 ENLARGED SITE PLAN - POWER
SCALE: 1/2" = 1'-0"

1/2"=1'-0" 1/2" 6" 0 1' 2' 3' 4' 5'

8/5/2025 3:30:25 PM

GENERAL NOTES

A. REFER TO SHEETS E001 AND E002 FOR ADDITIONAL GENERAL NEW WORK NOTES, SYMBOLS, AND ABBREVIATIONS.

B. REFER TO SHEET E400 FOR ELECTRICAL RISER DIAGRAM.

C. REFER TO SHEET E500 FOR ELECTRICAL PANEL SCHEDULES.

D. REFER TO SHEETS E600 THROUGH E603 FOR TYPICAL ELECTRICAL DETAILS.

KEYED NOTES

1. EC SHALL PROVIDE EMERGENCY STOP FOR ELECTRIC RANGE.
2. EC SHALL COORDINATE NEMA CONFIGURATION AND CONNECTION TYPE WITH OWNER FURNISHED OVEN PRIOR TO INSTALLATION.
3. SWITCH FOR DISHWASHER.
4. SWITCH FOR GARBAGE DISPOSAL.
5. SWITCH FOR ADA RANGE HOOD LIGHT CONTROL.
6. SWITCH FOR RANGE HOOD VENT CONTROL.

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

ELECTRICAL ENLARGED PLANS

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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NORTH CAROLINA PROFESSIONAL SEAL 05312 ENGINEER MICHAEL C. ALDRIDGE JR.

SHEET NUMBER:

E300

GENERAL NOTES

A. REFER TO SHEETS E001 AND E002 FOR ADDITIONAL GENERAL NEW WORK NOTES, SYMBOLS, AND ABBREVIATIONS.

B. REFER TO SHEET E400 FOR ELECTRICAL RISER DIAGRAM.

C. REFER TO SHEET E500 FOR ELECTRICAL PANEL SCHEDULES.

D. REFER TO SHEETS E600 THROUGH E603 FOR TYPICAL ELECTRICAL DETAILS.

E. ALL RECEPTACLE LOCATIONS ASSOCIATED WITH DATA, COMMUNICATIONS, SECURITY, AND AV SHALL BE CLOSELY COORDINATED WITH THE LOCATIONS NOTED ON THE SPECIFIC TRADES' DRAWINGS TO ASSURE PROPERLY COORDINATED INSTALLATION LOCATIONS.

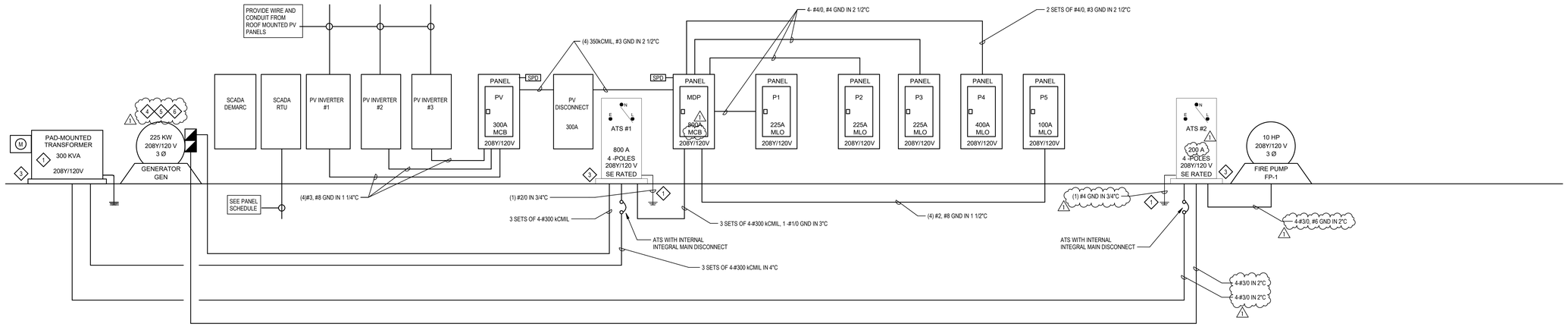
1 F. EC SHALL PROVIDE AVAILABLE FAULT CURRENT FOR ALL SERVICE EQUIPMENT IN COORDINATION WITH THE EC PROVIDED SHORT CIRCUIT, COORDINATION, ARC FLASH STUDY AND NEC 110.24

KEYED NOTES

1. TRANSFORMER TO BE PROVIDED BY UTILITY.
2. PROVIDE GROUNDING MEANS IN 3/4" CONDUIT TO (GROUND ROD, BUILDING FOOTER STEEL, WATER SERVICE PIPE).
3. ALL 4" CONCRETE PADS SHALL BE PROVIDED BY EC.

1 4. EC SHALL PROVIDE EMERGENCY STOP FOR GENERATOR SET PER SPECIFICATIONS, MANUFACTURERS INSTALLATION REQUIREMENTS AND LOCATIONS AS SHOWN ON SHEETS E010 AND E300.

5. EC SHALL PROVIDE 4#12 IN 1"C FOR START SIGNAL TO ATS-1 AND ATS-FP.
6. EC SHALL PROVIDE 1"C WITH GEL-FILLED CAT-6 FOR DATA TO GENERATOR ANNUNCIATOR PANEL



1 ELECTRICAL RISER DIAGRAM
SCALE: NTS

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ELECTRICAL RISER DIAGRAM

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 053171 CHRISTOPHER C. ALDRED

SHEET NUMBER:

E400

8/5/2025 3:30:25 PM

Panelboard: MDP

VOLTAGE: 208/120 Wye | PHASE: 3 | WIRE: 4 | MAINS TYPE: MCB | MAINS RATING: 1000 A | MCB RATING: 800 A | SERVED FROM: UTILITY | ENCLOSURE NEMA... Type 1 | MOUNTING: Surface | 42 :KAIC RATING | LOCATION: ELEC 141

LOAD CLASS	WIRE SIZE PH / N / GND	COND IN.	LOAD DESCRIPTION	BRKR RTG	CIR NO	A		B		C		CIR NO	BRKR RTG	LOAD DESCRIPTION	COND IN.	WIRE SIZE PH / N / GND	LOAD CLASS
Spare; REC; MISC	SEE RISER	SEE RISER	PANEL 'P1'	225	1	14.66	14.27					2					
					3			13.26	14.16			4	100	PANEL 'P2'	SEE RISER	SEE RISER	Spare; REC; MISC
					5					10.07	12.3	6					
Spare; Lighting; REC..	SEE RISER	SEE RISER	PANEL 'P3'	400	7	9.44	0					8					
					9			7.34	0			10	100	SPARE	-	-	--
					11					6.54	0	12					
Spare; MISC	SEE RISER	SEE RISER	PANEL 'P4'	225	13	21.2	2.29					14					
					15			25.74	2.79			16	100	PANEL 'P5'	SEE RISER	SEE RISER	Spare; REC; MISC
					17					25.14	2.79	18					
					19	0	--					20					
--	-	-	SPARE	225	21			0	--			22	--	3 POLE PREPARED SPACE	-	-	--
					23					0	--	24					
					25	--	--					26					
--	-	-	3 POLE PREPARED SPACE	--	27			--	--			28	--	3 POLE PREPARED SPACE	-	-	--
					29					--	--	30					
					31	--	0					32					
--	-	-	3 POLE PREPARED SPACE	--	33			--	0			34	30	SPD	-	-	--
					35					--	0	36					
					37	--	0					38					
--	-	-	3 POLE PREPARED SPACE	--	39			--	0			40	300	PV BREAKER	-	-	--
					41					--	0	42					
TOTAL CONN. LOAD (kVA):						61.74		63.29		56.84							

LOAD CLASSIFICATION	CONNECTED	DEMAND FACTOR	DEMAND
Lighting	3581 VA	125%	4476 VA
REC	70346 VA	57%	40173 VA
MISC	108437 VA	100%	108437 VA

TOTAL CONNECTED AMPS: 505 A
TOTAL CONNECTED LOAD: 181.87 kVA
TOTAL ESTIMATED DEMAND AMPS: 423 A
TOTAL ESTIMATED DEMAND LOAD: 152.47 kVA

NOTES:
1. SQUARE D I LINE - BASIS OF DESIGN.
2. PANELBOARD SHALL BE UL LISTED FOR USE AS S.E. EQUIPMENT.
3. MAIN BREAKER WITH LSI, GFP TRIP FUNCTIONS.
4. PROVIDE WITH 320kA INTERNAL SURGE PROTECTION DEVICE.
5. SOLAR INTERCONNECTION CB SHALL BE INSTALLED ON OPPOSITE END OF THE BUSBAR FROM THE MCB IN THE PANELBOARD PER NEC 705.12(B)(3)(2).
6. ALL SPACES NOT IN USE SHALL BE PROVIDED AS PREPARED BREAKER SPACES.

Panelboard: P1

VOLTAGE: 208/120 Wye | PHASE: 3 | WIRE: 4 | MAINS TYPE: MLO | MAINS RATING: 225 A | MCB RATING: N/A | SERVED FROM: MDP | ENCLOSURE NEMA... Type 1 | MOUNTING: Surface | 22 :KAIC RATING | LOCATION: ELEC 141

LOAD CLASS	WIRE SIZE PH / N / GND	COND IN.	LOAD DESCRIPTION	BRKR RTG	CIR NO	A		B		C		CIR NO	BRKR RTG	LOAD DESCRIPTION	COND IN.	WIRE SIZE PH / N / GND	LOAD CLASS
REC	1-#12, 1-#12, 1-#12	3/4"	110 QUAD SOUTH WALL	20	1	0.5	0.18					2	20	104 KITCHEN DISHWASHER (NOTE 2)	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	110 QUAD WEST WALL	20	3			0.5	0.18			4	20	104 KITCHEN GARBAGE DISP. (NOTE 2)	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	110 QUAD WEST WALL	20	5					0.5	1	6	20	104 KITCHEN CTR TOP REC	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	110 QUAD NORTH WALL	20	7	0.5	4.55					8	50	104 KITCHEN RANGE (NOTE 2)	1"	3-#6, 1-#10	MISC
REC	1-#12, 1-#12, 1-#12	3/4"	110 QUAD EAST WALL	20	9			0.5	4.55			10					
REC	2-#10, 1-#10	3/4"	110 L6-30 REC WEST	30	11					2.5	0.18	12	20	104 KITCHEN MICROWAVE	3/4"	1-#12, 1-#12, 1-#12	REC
					13	2.5	1					14	20	104 KITCHEN CTR TOP REC	3/4"	1-#12, 1-#12, 1-#12	REC
REC	2-#10, 1-#10	3/4"	110 L6-30 REC NORTH	30	15			2.5	0.18			16	20	104 KITCHEN REFRIGERATOR (NOTE 2)	3/4"	1-#12, 1-#12, 1-#12	REC
					17					2.5	0.5	18	20	104 FUME HOOD	3/4"	1-#12, 1-#12, 1-#12	REC
REC	2-#10, 1-#10	3/4"	110 L6-30 REC EAST	30	19	2.5	1.08					20	20	105 EXERCISE RECS	3/4"	1-#12, 1-#12, 1-#12	REC
					21			2.5	1			22	20	105 EXERCISE TREADMILL	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	104 KITCHEN CTR TOP REC	20	23					1	0.18	24	20	105 EXERCISE CAD RECEPT	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	104 KITCHEN REFRIGERATOR (NOTE 2)	20	25	0.18	0.5					26	20	105 CORR. C EWC (NOTE 2)	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	104 KITCHEN CTR TOP REC	20	27			1	0.36			28	20	106 ADA BATH RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	104 KITCHEN CTR TOP REC	20	29					1	0.72	30	20	103 DAYROOM RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	104 KITCHEN CTR TOP REC	20	31	1	0.18					32	20	103 DAYROOM CAD RECEPT	3/4"	1-#12, 1-#12, 1-#12	REC
--	-	-	SPARE	20	33			0	0			34	20	SPARE	-	-	--
--	-	-	SPARE	20	35					0	0	36	20	SPARE	-	-	--
--	-	-	SPARE	20	37	0	0					38	20	SPARE	-	-	--
--	-	-	SPARE	20	39			0	0			40	20	SPARE	-	-	--
--	-	-	SPARE	20	41					0	0	42	20	SPARE	-	-	--
TOTAL CONN. LOAD (kVA):						14.66		13.26		10.07							

LOAD CLASSIFICATION	CONNECTED	DEMAND FACTOR	DEMAND
REC	28896 VA	67%	19448 VA
MISC	9100 VA	100%	9100 VA

TOTAL CONNECTED AMPS: 105 A
TOTAL CONNECTED LOAD: 38.00 kVA
TOTAL ESTIMATED DEMAND AMPS: 79 A
TOTAL ESTIMATED DEMAND LOAD: 28.55 kVA

NOTES:
1. SQUARE D TYPE NQ - BASIS OF DESIGN.
2. PROVIDE WITH GFCI BREAKER.

Panelboard: P2

VOLTAGE: 208/120 Wye | PHASE: 3 | WIRE: 4 | MAINS TYPE: MLO | MAINS RATING: 225 A | MCB RATING: N/A | SERVED FROM: MDP | ENCLOSURE NEMA... Type 1 | MOUNTING: Surface | 22 :KAIC RATING | LOCATION: ELEC 141

LOAD CLASS	WIRE SIZE PH / N / GND	COND IN.	LOAD DESCRIPTION	BRKR RTG	CIR NO	A		B		C		CIR NO	BRKR RTG	LOAD DESCRIPTION	COND IN.	WIRE SIZE PH / N / GND	LOAD CLASS
REC	1-#12, 1-#12, 1-#12	3/4"	103 DAYROOM RECS	20	1	0.72	1.92					2	20	OVERHEAD DOOR	3/4"	1-#10, 1-#10, 1-#10	MISC
REC	1-#12, 1-#12, 1-#12	3/4"	105, 107 CORRIDOR RECS	20	3			0.54	1.92			4	20	OVERHEAD DOOR	3/4"	1-#10, 1-#10, 1-#10	MISC
REC	1-#12, 1-#12, 1-#12	3/4"	107A BUNKROOM 1 RECS (NOTE 3)	20	5					1.08	1.92	6	20	OVERHEAD DOOR	3/4"	1-#10, 1-#10, 1-#10	MISC
REC	1-#12, 1-#12, 1-#12	3/4"	107B BUNKROOM 2 RECS (NOTE 3)	20	7	1.08	0.54					8	20	PRESENCE SENSORS	3/4"	1-#12, 1-#12, 1-#12	MISC
REC	1-#12, 1-#12, 1-#12	3/4"	107C BUNKROOM 4 RECS (NOTE 3)	20	9			1.08	0.54			10	20	120 APPARATUS BAY RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	107D BUNKROOM 3 RECS (NOTE 3)	20	11					1.08	0.72	12	20	120 APPARATUS BAY RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	107 CORR CAD RECEPT	20	13	0.18	0.18					14	20	120 BAY CAD RECEPTS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	107, 107A-107D WALL RECS (NOTE 3)	20	15			0.9	1.26			16	20	124, 125,143 RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	108 BATH 109 BATH RECS	20	17					0.36	0.9	18	20	EAST EXTERIOR WP RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	140 FIRE PUMP 141 ELEC RECS	20	19	0.72	0.9					20	20	WEST SOUTH EXTERIOR WP RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#10, 1-#10, 1-#10	3/4"	TRUCK SHORELINE	20	21			1.92	0.72			22	20	142 MECH RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#8, 1-#8, 1-#8	3/4"	TRUCK SHORELINE	30	23					2.88	1.26	24	20	122, 123, 123A RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#10, 1-#10, 1-#10	3/4"	ENGINE SHORELINE	20	25	1.92	2.15					26	30	113 DRYER (NOTE 2)	3/4"	3-#10, 1-#10	MISC
REC	1-#10, 1-#10, 1-#10	3/4"	ENGINE SHORELINE	30	27			2.88	2.15			28					
REC	1-#12, 1-#12, 1-#12	3/4"	EMS SHORELINE	20	29					1.92	0.18	30	20	113 WASHER (NOTE 2)	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#10, 1-#10, 1-#10	3/4"	EMS SHORELINE	30	31	2.88	1.08					32	20	111, 113, 115 REC'S	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	107E DOOR OPENER	20	33			0.25	0			34	20	SPARE	-	-	--
--	-	-	SPARE	20	35					0	0	36	20	SPARE	-	-	--
--	-	-	SPARE	20	37	0	0					38	20	SPARE	-	-	--
--	-	-	SPARE	20	39			0	0			40	20	SPARE	-	-	--
--	-	-	SPARE	20	41					0	0	42	20	SPARE	-	-	--
TOTAL CONN. LOAD (kVA):						14.27		14.16		12.3							

LOAD CLASSIFICATION	CONNECTED	DEMAND FACTOR	DEMAND
REC	30130 VA	67%	20065 VA
MISC	10600 VA	100%	10600 VA

TOTAL CONNECTED AMPS: 113 A
TOTAL CONNECTED LOAD: 40.73 kVA
TOTAL ESTIMATED DEMAND AMPS: 85 A
TOTAL ESTIMATED DEMAND LOAD: 30.67 kVA

NOTES:
1. SQUAE D TYPE NQ - BASIS OF DESIGN.
2. PROVIDE WITH GFI BREAKER.
3. PROVIDE WITH AFCI BREAKER.

Panelboard: P3

VOLTAGE: 208/120 Wye | PHASE: 3 | WIRE: 4 | MAINS TYPE: MLO | MAINS RATING: 400 A | MCB RATING: N/A | SERVED FROM: MDP | ENCLOSURE NEMA... Type 1 | MOUNTING: Surface | 22 :KAIC RATING | LOCATION: ELEC 141

LOAD CLASS	WIRE SIZE PH / N / GND	COND IN.	LOAD DESCRIPTION	BRKR RTG	CIR NO	A		B		C		CIR NO	BRKR RTG	LOAD DESCRIPTION	COND IN.	WIRE SIZE PH / N / GND	LOAD CLASS
Lighting	1-#12, 1-#12, 1-#12	3/4"	WEST LIGHTING BLDG	20	1	0.81	0					2	20	STOP AND GO LIGHTS	3/4"	1-#12, 1-#12, 1-#12	Lighting
Lighting	1-#12, 1-#12, 1-#12	3/4"	EAST LIGHTING BLDG	20	3			0.44	1			4	20	GENERATOR CONVIENCE REC	3/4"	1-#12, 1-#12, 1-#12	REC
Lighting	1-#12, 1-#12, 1-#12	3/4"	EMERGENCY LIGHT/BUG LIGHTS	20	5					0.05	0.03	6	20	FLAG POLE	3/4"	1-#10, 1-#10, 1-#10	Lighting
Lighting	1-#12, 1-#12, 1-#12	3/4"	APPARTUS BAY LIGHTING	20	7	1.58	0.5					8	20	SCADA	3/4"	1-#12, 1-#12, 1-#12	MISC
Lighting	1-#12, 1-#12, 1-#12	3/4"	BLDG EXTERIOR WALL LIGHTS	20	9			0.27	0.5			10	20	SCADA DEMARC	3/4"	1-#12, 1-#12, 1-#12	MISC
Lighting	1-#12, 1-#12, 1-#12	3/4"	BAY/COLUMN EXTERIOR LTS	20	11					0.55	1	12	20	121 REHAD ICE MAKER REC	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	100, 101, CORR. A, 118 RECS	20	13	0.72	0.72					14	20	112 SOUTH WEST WALL RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	112 NORTH EAST WALL RECS	20	15			0.72	0.18			16	20	112 DAYROOM CAD RECEPT	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	112 DAYROOM CAD RECEPT	20	17					0.18	1	18	20	GENERATOR JACKET HEATER	3/4"	1-#12, 1-#12, 1-#12	MISC
REC	1-#12, 1-#12, 1-#12	3/4"	102 RADIO/WORK ROOM COPIER	20	19	1	0.9					20	20	102 RADIO/WORK ROOM RECS	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	102 RADIO/WORK ROOM RECS	20	21			0.36	0.18			22	20	102 RADIO/WORK CAD RECEPT	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	102 RADIO/WORK CAD RECEPT	20	23					0.18	1.37	24	20	SF-1	3/4"	2-#12, 1-#12	MISC
MISC	2-#12, 1-#12	3/4"	JP-1	15	25	0.79	1.37					26					
					27					0.79	1	28	20	CONTACTOR PANEL	3/4"	1-#12, 1-#12, 1-#12	Lighting
MISC	1-#12, 1-#12, 1-#12	3/4"	FACP (NOTE 2)	20	29						0.5	30	20	BDA (NOTE 2)	3/4"	1-#12, 1-#12, 1-#12	MISC
MISC	2-#12, 1-#12	3/4"	BP-1	20	31	1.91	0.08					32	15	RCP-1	3/4"	2-#12, 1-#12	MISC
					33					1.91	0.08	34					
MISC	1-#12, 1-#12, 1-#12	3/4"	GENERATOR BATTERY CHARGER	20	35						1	36	20	UNDERCOUNTER FRIDGE	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	SHUNT TRIP OVEN RANGE	20	37	0.5	0					38	20	SPARE	-	-	--
--	-	-	SPARE	20	39			0	0			40	20	SPARE	-	-	--
--	-	-	SPARE	20	41					0	0	42	20	SPARE	-	-	--
TOTAL CONN. LOAD (kVA):						9.44		7.34		6.54							

LOAD CLASSIFICATION	CONNECTED	DEMAND FACTOR	DEMAND
Lighting	3581 VA	125%	4476 VA
REC	7820 VA	100%	7820 VA
MISC	12292 VA	100%	12292 VA

TOTAL CONNECTED AMPS: 65 A
TOTAL CONNECTED LOAD: 23.26 kVA
TOTAL ESTIMATED DEMAND AMPS: 67 A
TOTAL ESTIMATED DEMAND LOAD: 24.06 kVA

NOTES:
1. SQUARE D TYPE NQ - BASIS OF DESIGN.
2. PROVIDE WITH RED LOCKED BREAKERS.

Panelboard: P4

VOLTAGE: 208/120 Wye | PHASE: 3 | WIRE: 4 | MAINS TYPE: MLO | MAINS RATING: 225 A | MCB RATING: N/A | SERVED FROM: MDP | ENCLOSURE NEMA... Type 1 | MOUNTING: Surface | 22 :KAIC RATING | LOCATION: MECH 142

LOAD CLASS	WIRE SIZE PH / N / GND	COND IN.	LOAD DESCRIPTION	BRKR RTG	CIR NO	A		B		C		CIR NO	BRKR RTG	LOAD DESCRIPTION	COND IN.	WIRE SIZE PH / N / GND	LOAD CLASS
MISC	1-#12, 1-#12, 1-#12	3/4"	HEAT TRACE	20	1	0	1.98					2					
					3			3.64	1.98			4	30	CU-4	3/4"	2-#10, 1-#10	MISC
MISC	2-#8, 1-#10	3/4"	DOAS-1 (NOTE 2)	40	5					3.64	2.5	6					
					7	0.56	2.5					8	20	UH-4	3/4"	2-#12, 1-#12	MISC
MISC	2-#12, 1-#12	3/4"	EF-1	15	9			0.56	5			10					
MISC	2-#12, 1-#12	3/4"	EF-2	15	11					0.05	5	12	90	UH-1	1-1/4"	2-#3, 1-#8	MISC
					13	0.05	5					14					
MISC	2-#10, 1-#10	3/4"	EF-3	25	15			1.37	5			16	90	UH-2	1-1/4"	2-#3, 1-#8	MISC
					17					1.37	2.5	18					
MISC	2-#12, 1-#12	3/4"	AC-1	20	19	1.74	2.5					20	70	UH-3	1-1/4"	2-#4, 1-#8	MISC
					21			1.74	0.73			22					
MISC	2-#10, 1-#10	3/4"	ACCU-1	25	23					1.66	0.73	24	15	AS-1	3/4"	2-#12, 1-#12	MISC
					25	1.66	0.73					26					
MISC	2-#6, 1-#10	1"	ACCU-2 (NOTE 3)	60	27			1.25	0.73			28	15	AS-2	3/4"	2-#12, 1-#12	MISC
					29					1.25	0.73	30					
MISC	2-#10, 1-#10	3/4"	CU-1	25	31	1.14	0.73					32	20	AS-3	3/4"	2-#12, 1-#12	MISC
					33			1.14	0			34					
MISC	2-#10, 1-#10	3/4"	CU-2	30	35					2.6	0	36	20	WH-1	3/4"	2-#12, 1-#12	MISC
					37	2.6	0					38					
MISC	2-#10, 1-#10	3/4"	CU-3	30	39			2.6	0			40	20	WH-2	3/4"	2-#12, 1-#12	MISC
					41					2.6	0.5	42	20	MOTORIZED DAMPER	3/4"	1-#12, 1-#12, 1-#12	MISC
--	-	-	SPARE	20	43	0	0					44	20	SPARE	-	-	--
--	-	-	SPARE	20	45			0	0			46	20	SPARE	-	-	--
--	-	-	SPARE	20	47					0	0	48	20	SPARE	-	-	--
--	-	-	SPARE	20	49	0	0					50	20	SPARE	-	-	--
--	-	-	SPARE	20	51			0	0			52	20	SPARE	-	-	--
--	-	-	SPARE	20	53					0	0	54	20	SPARE	-	-	--
TOTAL CONN. LOAD (kVA):						21.2		25.74		25.14							

LOAD CLASSIFICATION	CONNECTED	DEMAND FACTOR	DEMAND
MISC	72080 VA	100%	72080 VA

TOTAL CONNECTED AMPS: 200 A
TOTAL CONNECTED LOAD: 72.08 kVA
TOTAL ESTIMATED DEMAND AMPS: 200 A
TOTAL ESTIMATED DEMAND LOAD: 72.08 kVA

NOTES:
1. SQUARE D TYPE NQ - BASIS OF DESIGN.
2. ALTERNATE 4: PROVIDE AN 60A BREAKER WITH 2-#6, #10 GND
3. ALTERNATE 4: PROVIDE A 35A BREAKER WITH 2#8, #10 GND

Panelboard: P5

VOLTAGE: 208/120 Wye | PHASE: 3 | WIRE: 4 | MAINS TYPE: MLO | MAINS RATING: 100 A | MCB RATING: N/A | SERVED FROM: MDP | ENCLOSURE NEMA... NEMA 4X | MOUNTING: Surface | 22 :KAIC RATING NEAR | LOCATION: TREATMENT UNIT

LOAD CLASS	WIRE SIZE PH / N / GND	COND IN.	LOAD DESCRIPTION	BRKR RTG	CIR NO	A		B		C		CIR NO	BRKR RTG	LOAD DESCRIPTION	COND IN.	WIRE SIZE PH / N / GND	LOAD CLASS
MISC	1-#12, 1-#12, 1-#12	3/4"	RECIRCULATION PUMP	20	1	0.29	1					2	20	VERI COMM CONTROL PANEL	3/4"	1-#12, 1-#12, 1-#12	MISC
MISC	1-#12, 1-#12, 1-#12	3/4"	DOSE PUMP	20	3			0.29	1			4	20	UV DISINFECTANT UNIT	3/4"	1-#12, 1-#12, 1-#12	MISC
REC	1-#12, 1-#12, 1-#12	3/4"	DOSING TANK REC	20	5					1	1	6	20	DOSING TANK REC	3/4"	1-#12, 1-#12, 1-#12	REC
REC	1-#12, 1-#12, 1-#12	3/4"	TREATMENT TANK PIT REC	20	7	0.5	0.5					8	20	TREATMENT TANK PIT REC	3/4"	1-#12, 1-#12, 1-#12	REC
MISC	1-#12, 1-#12, 1-#12	3/4"	SIMPLEX CONTROL PANEL	20	9			1	0.5			10	20	PANEL 5 REC	3/4"	1-#12, 1-#12, 1-#12	REC
MISC	1-#12, 1-#12, 1-#12	3/4"	PUMP	20	11					0.29	0.5	12	20	PUMP/HAUL TANK ALARM PNL	3/4"	1-#12, 1-#12, 1-#12	MISC
--	-	-	SPARE	20	13	0	0					14	20	SPARE	-	-	--
--	-	-	SPARE	20	15			0	0			16	20	SPARE	-	-	--
--	-	-	SPARE	20	17					0	0	18	20	SPARE	-	-	--
--	-	-	SPARE	20	19	0	0					20	20	SPARE	-	-	--
--	-	-	SPARE	20	21			0	0			22	20	SPARE	-	-	--
--	-	-	SPARE	20	23					0	0	24	20	SPARE	-	-	--
--	-	-	SPARE	20	25	0	0					26	20	SPARE	-	-	--
--	-	-	SPARE	20	27			0	0			28	20	SPARE	-	-	--
--	-	-	SPARE	20	29					0	0	30	20	SPARE	-	-	--
--	-	-	SPARE	20	31	0	0					32	20	SPARE	-	-	--
--	-	-	SPARE	20	33			0	0			34	20	SPARE	-	-	--
--	-	-	SPARE	20	35					0	0	36	20	SPARE	-	-	--
--	-	-	SPARE	20	37	0	0					38	20	SPARE	-	-	--
--	-	-	SPARE	20	39			0	0			40	20	SPARE	-	-	--
--	-	-	SPARE	20	41					0	0	42	20	SPARE	-	-	--
TOTAL CONN. LOAD (kVA):						2.29		2.79		2.79							

LOAD CLASSIFICATION	CONNECTED	DEMAND FACTOR	DEMAND
REC	3500 VA	100%	3500 VA
MISC	4364 VA	100%	4364 VA

TOTAL CONNECTED AMPS: 22 A
TOTAL CONNECTED LOAD: 7.86 kVA
TOTAL ESTIMATED DEMAND AMPS: 22 A
TOTAL ESTIMATED DEMAND LOAD: 7.86 kVA

NOTES:
1. SQUARE D TYPE NQ - BASIS OF DESIGN.

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

ELECTRICAL SCHEDULES

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS

NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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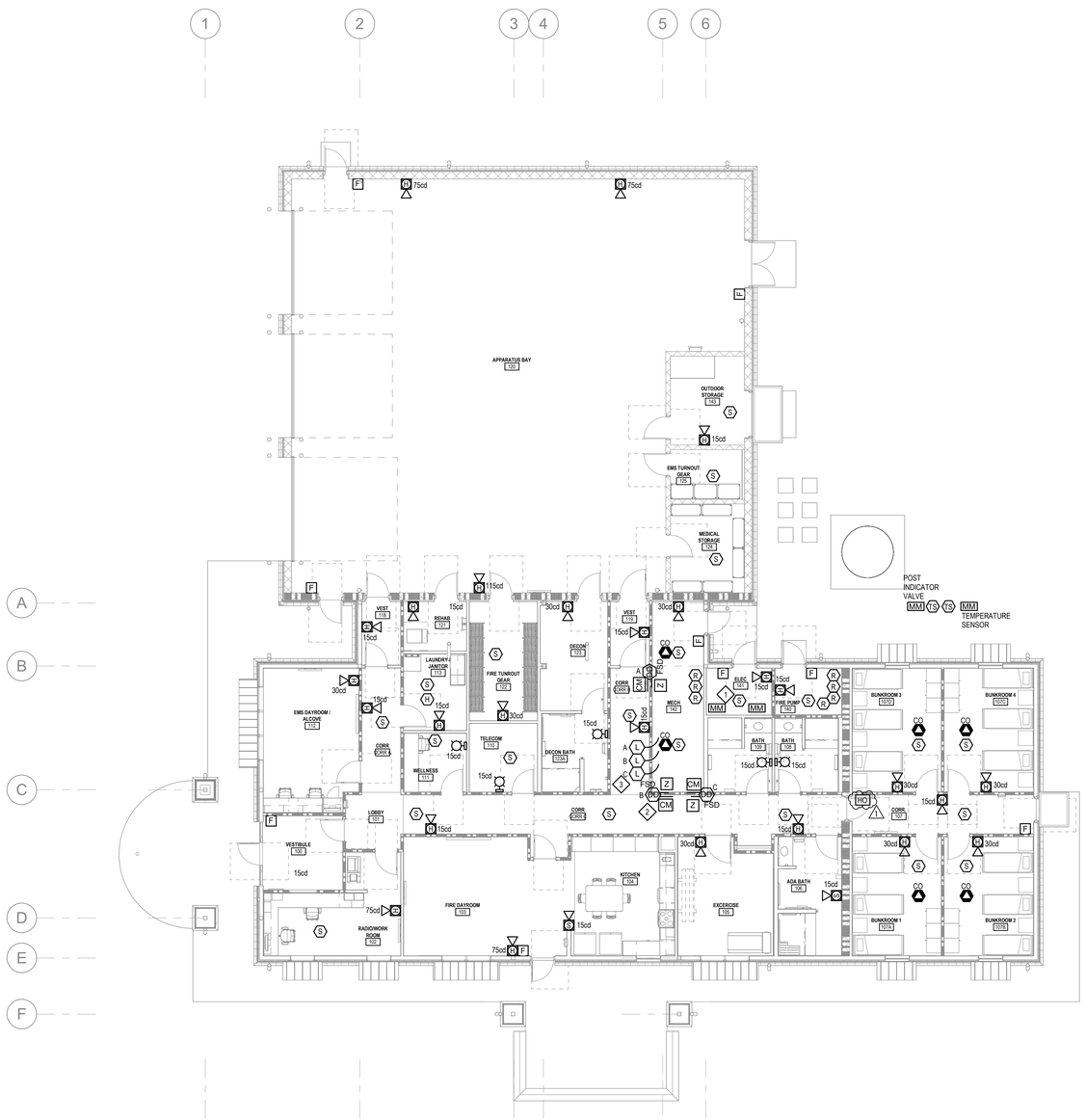
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 053121 JESSE C. ALDRIDGE

SHEET NUMBER:

E500

8/5/2025 3:30:27 PM



1 FIRST FLOOR PLAN - FIRE ALARM
SCALE: 1/8" = 1'-0"

GENERAL NOTES

A. REFER TO SHEET FA001 FOR ADDITIONAL GENERAL NEW WORK NOTES, SYMBOLS, AND ABBREVIATIONS.

B. REFER TO SHEET FA200 FOR FIRE ALARM RISER AND MATRIX.

KEYED NOTES

1. PROVIDE A BDA SYSTEM PER SPECIFICATION 285000.
2. FURNISH DUCT SMOKE DETECTOR FOR INSTALLATION OF MECHANICAL CONTRACTOR. COORDINATE THE LOCATION WITH THE MECHANICAL CONTRACTOR. CONNECT TO THE FIRE ALARM SYSTEM. PROVIDE RACEWAY, WIRING/CABLING, ETC AS REQUIRED FOR COMPLETE INSTALLATION, TYP.
3. PROVIDE REMOTE ALARM INDICATOR LIGHT (RAIL) AND TEST SWITCH IN NEAREST PUBLIC SPACE. PROVIDE RACEWAY, WIRING/CABLING, ETC. AS REQUIRED FOR COMPLETE INSTALLATION. UNLESS DIRECTED OTHERWISE SPECIFICALLY BY THE OWNER'S PM, DEVICE SHALL BE MOUNTED ON CEILING IN CORRIDOR. PROVIDE LABEL INDICATING DEVICE SERVED AND LOCATION OF DEVICE SERVED. TYPICAL.

TRUE NORTH PLAN NORTH

1/8"=1'-0" 8' 4' 0 8' 16'

8/5/2025 3:30:28 PM

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SANDY PLAINS FIRE AND EMS STATION

15224 CREEDMOOR RD, WAKE FOREST, NORTH CAROLINA

FIRST FLOOR PLAN - FIRE ALARM

DATE: 07-10-25
PROJECT NO: 23029

REVISIONS		
NO:	DATE:	DESCRIPTION:
1	7-31-25	1-PERMIT COMMENTS, 7-31-25

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 053121 JESSE C. ALDRIDGE

SHEET NUMBER:
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