DIVISION 00 **ADDENDUM #1**
August 22, 2019

SECTION 00 91 14: SUPPLEMENTAL SHEETS

Stump Sound Elementary School – New School
Holly Ridge, North Carolina

00 91 14.01: GENERAL

A. These supplemental sheets are a part of the Specifications and are intended to give additional information on items which may or may not be noted in the specifications or on the drawings. It is suggested that the Contractor carefully read these sheets and note changes, additions, etc., in the corresponding section of these specifications.

B. The specifications are typical and only those parts applicable to this project will be considered.

00 91 14.02: MODIFICATION

Revise the following:

A. SECTION 00 41 13: GENERAL CONSTRUCTION PROPOSAL (Single Prime)

1. Delete this section in its entirety and replace with SECTION 00 41 13: GENERAL CONSTRUCTION PROPOSAL (Single Prime) – Addendum #1 dated August 22, 2019.

B. SECTION 00 41 13.1: GENERAL CONSTRUCTION PROPOSAL - COMBINED SCHOOLS (Single Prime)

1. Delete this section in its entirety and replace with SECTION 00 41 13.1: GENERAL CONSTRUCTION PROPOSAL (Single Prime) – Addendum #1 dated August 22, 2019.

C. SECTION 01 21 00: ALLOWANCES

1. 01 21 00.01: GENERAL

C. SCHEDULE OF ALLOWANCES

1. Lump Sum Allowance

a. General Allowance (to include labor within the allowance. Cost of labor will be as stipulated per Trade in the most recent Davis-Bacon Act.) **$150,000.00**

c. NCDOT UPGRADES **$350,000.00**

2. Quantity Allowance

b. Engineered Soil-Offsite Borrow Fill, **Compacted in Place** 20,000 Cubic Yards

00 91 14.03: ADDITIONAL SPECIFICATION

Add the following:

A. SECTION 00 91 14: Supplemental Sheets – Addendum #1 dated August 22, 2019.

B. Section 33 11 00: Water Extensions – Addendum #1 dated August 22, 2019.

C. Section 33 31 10: Sewer Extensions & Sewage Pumping Station – Addendum #1 dated August 22, 2019.

00 91 14.04: DRAWINGS

Revise the following:

A. SHEET C101 - Site Plan - Delete this sheet in its entirety and replace with SHEET C101-Site Plan - Addendum #1 dated August 21, 2019. Revised paving and concrete paving notes.

B. SHEET A603 - Enlarge Kitchen Plan & Food Service Equipment Schedule - 1) **Remove** Item **#34** from below the two-compartment sink that is shown in detail 1/A603. 2) Food Service Equipment Schedule - Item #22: **Add** to Remarks - **See Note #2 below**.

C. SHEET P200 - Enlarged Plans - Delete this sheet in its entirety and replace with SHEET P200 - Enlarged Plans - Addendum #1 dated August 22, 2019. Added generator to plan with its associated gas piping and notes. Updated propane gas piping size to reflect the addition of the generator load.

D. SHEET P201 - Enlarged Plans - Delete this sheet in its entirety and replace with SHEET P201 - Enlarged Plans - Addendum #1 dated August 22, 2019. Updated fixture tag on sinks in Girls' Toilets C102 & Boys' Toilets C101 to P-6.

E. SHEET P302 - Schedules & Details - Delete this sheet in its entirety and replace with SHEET P302 - Schedules & Details - Addendum #1 dated August 22, 2019. Updated P-6 on Plumbing Fixture Schedule to reflect 3-station lavatory.

F. SHEET M101 - Floor Plan Areas C, D & E - Delete this sheet in its entirety and replace with SHEET M101 - Floor Plan Areas C, D & E - Addendum #1 dated August 22, 2019. Corrected call out to thermostat in Student Dining Area to read "To AH-2".

G. SHEET M200 - Schedules & Legend - Delete this sheet in its entirety and replace with SHEET M200 - Schedules & Legend - Addendum #1 dated August 22, 2019. Edited notes 2 & 3 on "Vertical Interior Heat Pump Schedule" and added notes 11 & 12 on "Vertical Interior Heat Pump Schedule".

H. SHEET M300 - Details - Delete this sheet in its entirety and replace with SHEET M300 - Details - Addendum #1 dated August 22, 2019. Updated Detail 12 "Section at PHP Unit".

I. SHEET E300 - Partial Power Plan Areas A, B, F & G - Delete this sheet in its entirety and replace with SHEET E300-Partial Power Plan Areas A, B, F & G - Addendum #1 dated August 22, 2019. Added MSAC-1, MSAC-2, MSAH-4 and MSAH-5 and all associated conduit, disconnects and wiring.

J. SHEET E301 - Partial Power Plan Areas C, D & E - Delete this sheet in its entirety and replace with SHEET E301-Partial Power Plan Areas C, D & E - Addendum #1 dated August 22, 2019. Revised location for HP20 and its associated conduit, wiring and disconnect.

K. SHEET E304 - Enlarged Power Plan Area C - Delete this sheet in its entirety and replace with SHEET E304- Enlarged Power Plan Area C - Addendum #1 dated August 22, 2019. Deleted HP20 and its associated conduit, wiring and disconnect from service yard.

L. SHEET E605 - Panel Schedules-Base Bid & Alternate #4 - Delete this sheet in its entirety and replace with SHEET E605 - Panel Schedules-Base Bid & Alternate #4 - Addendum #1 dated August 22, 2019. Added circuits for MSAH-4/MSAC-1 and MSAH-5/ MSAC-2.

00 91 14.05: PRIOR APPROVAL

The following products/manufacturers are approved only if items supplied and submitted meet or exceed the Construction Documents:

A. SECTION 07 10 00: Dampproofing & Waterproofing

1. Raven Industries - VAPORBLOCK® - VB15

B. SECTION 07 61 13: Sheet Metal Roofing System

1. Construction Metal Panels, Inc. - CMP S-2500

C. SECTION 23 09 00: Building Automation System

1. Delta Controls - entelliBUS & entelliWEB Enterprise Automation System

End of Addendum #1
August 22, 2019

SECTION 00 41 13: GENERAL CONSTRUCTION PROPOSAL (SINGLE PRIME)

Stump Sound Elementary School –New School
Folkstone Road
Holly Ridge, North Carolina 28445

Gentlemen:

The undersigned, as bidder, hereby declares that the only person or persons, interested in this proposal as principal is/or are named herein and that no other person than herein named has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is, in all respects, fair and in good faith without collusion of fraud.

Having examined the contract plans, specifications and other documents, visited the site and being familiar with all requirements of same, I (or we) propose to furnish all the materials and perform all the work necessary for the General Construction of the above referenced project in strict accordance with the plans, specifications and other contract documents prepared by Pinnacle Architecture, P.A., Matthews, North Carolina for the sum of:

_____Dollars

($_____). The time required for construction will be _____ calendar days.

A certified check in the amount of $_____ (5%), or a Bid Bond in the amount of 5% of the Bid, or a cash deposit in the amount of $_____ (5%) is attached hereto.

We also agree that after the presentation of this proposal, that a reasonable time, and in no case less than 30 days, will be allowed **Onslow County Schools** for the necessary approvals before awarding the contract.

The undersigned further agrees that, in case of failure on his part to execute the said contract and the bond within ten (10) consecutive days after written notice being given of the award of the contract, the check or bid bond accompanying this bid and the monies payable thereon, shall be paid to **Onslow County Schools**, as liquidated damages for such failure; otherwise, the check or bid bond accompanying this proposal shall be returned to the undersigned.

ALTERNATES

Alternate #1 - Six (6) Classroom Addition	Add: $_____
	Deduct: $_____
Alternate #2 - Owner Preferred Finish Hardware (See schedule)	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (1) Fire Alarm - Notifier	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (2) Gear/Panels/Disconnects…-Square D	Add: $_____
	Deduct: $_____
Alternate #4 - Generator	Add: $_____
	Deduct: $_____
Alternate #5 - Building Automation Controls (Schneider - Owner Preferred)	Add: $_____
	Deduct: $_____

UNIT PRICES

Ceramic/Porcelain Tile Installed	$_____per square foot
Quarry Tile Installed	$_____per square foot
Suspended Acoustical Ceiling Installed	$_____per square foot
Resilient Flooring (VCT) Installed	$_____per square foot
Resilient Sports Flooring Installed	$_____per square foot
Epoxy Terrazzo Installed	$_____per square foot
Carpet/Carpet Tile Installed	$_____per square foot
Paint Installed	$_____per square foot
Dirt Excavation	$_____per cubic yard
Compacted Fill	$_____per cubic yard
Unsuitable Soil (disposed of Off-site)	$_____per cubic yard
Off-site Borrow Fill (engineered, compacted in place)	$_____per cubic yard

Rock Excavation, Mass Rock	$_____per cubic yard
Rock Excavation, Trench Rock	$_____per cubic yard
Formed Cast in Place Reinforced Concrete	$_____per cubic yard
Heavy-Duty Asphalt Paving	$_____per square foot
Light-Duty Asphalt Paving	$_____per square foot

SUBCONTRACTORS LIST

GENERAL:_____ Amount $_____

PLUMBING:_____ Amount $_____

HVAC:_____ Amount $_____

ELECTRICAL:_____ Amount $_____

SITE WORK:_____ Amount $_____

Contractor's State License No. _____

Contractor _____

By _____

NOTE: BID PROPOSAL FORM MUST BE COMPLETELY FILLED OUT (i.e. BASE BID PRICE, TIME IN CALENDAR DAYS, LICENSE NO. AND SIGNATURE) TO BE READ. ANY ALTERNATE OR UNIT PRICE LEFT BLANK WILL BE CONSIDERED "NO ADDITIONAL CHARGE" ($0.00). UNIT PRICES WILL NOT BE READ PUBLICLY, BUT WILL BE A PART OF THE CONTRACT.

Acknowledge of Receipt of Addenda

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

SECTION 00 41 13.1: GENERAL CONSTRUCTION PROPOSAL (COMBINED FOR BOTH SCHOOLS)

Catherine Lake Elementary School –New School
4821 Richlands Highway
Jacksonville, North Carolina 28540

&

Stump Sound Elementary School –New School
Folkstone Road
Holly Ridge, North Carolina 28445

Gentlemen:

The undersigned, as bidder, hereby declares that the only person or persons, interested in this proposal as principal is/or are named herein and that no other person than herein named has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is, in all respects, fair and in good faith without collusion of fraud.

Having examined the contract plans, specifications and other documents, visited the site and being familiar with all requirements of same, I (or we) propose to furnish all the materials and perform all the work necessary for the General Construction of the above referenced project in strict accordance with the plans, specifications and other contract documents prepared by Pinnacle Architecture, P.A., Matthews, North Carolina for the sum of:

_____Dollars

($_____). The time required for construction will be _____ calendar days.

A certified check in the amount of $_____ (5%), or a Bid Bond in the amount of 5% of the Bid, or a cash deposit in the amount of $_____ (5%) is attached hereto.

We also agree that after the presentation of this proposal, that a reasonable time, and in no case less than 30 days, will be allowed **Onslow County Schools** for the necessary approvals before awarding the contract.

The undersigned further agrees that, in case of failure on his part to execute the said contract and the bond within ten (10) consecutive days after written notice being given of the award of the contract, the check or bid bond accompanying this bid and the monies payable thereon, shall be paid to **Onslow County Schools**, as liquidated damages for such failure; otherwise, the check or bid bond accompanying this proposal shall be returned to the undersigned.

ALTERNATES FOR CATHERINE LAKE ELEMENTARY SCHOOL

Alternate #1 - Six (6) Classroom Addition	Add: $_____
	Deduct: $_____
Alternate #2 - Owner Preferred Finish Hardware (See schedule)	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (1) Fire Alarm - Notifier	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (2) Gear/Panels/Disconnects…-Square D	Add: $_____
	Deduct: $_____
Alternate #4 - Generator	Add: $_____
	Deduct: $_____
Alternate #5 - Building Automation Controls (Schneider - Owner Preferred)	Add: $_____
	Deduct: $_____

UNIT PRICES

Ceramic/Porcelain Tile Installed	$_____per square foot
Quarry Tile Installed	$_____per square foot
Suspended Acoustical Ceiling Installed	$_____per square foot
Resilient Flooring (VCT) Installed	$_____per square foot
Resilient Sports Flooring Installed	$_____per square foot
Epoxy Terrazzo Installed	$_____per square foot
Carpet/Carpet Tile Installed	$_____per square foot
Paint Installed	$_____per square foot
Dirt Excavation	$_____per cubic yard
Compacted Fill	$_____per cubic yard
Unsuitable Soil (disposed of Off-site)	$_____per cubic yard
Off-site Borrow Fill (engineered, compacted in place)	$_____per cubic yard

Rock Excavation, Mass Rock	$_____per cubic yard
Rock Excavation, Trench Rock	$_____per cubic yard
Formed Cast in Place Reinforced Concrete	$_____per cubic yard
Heavy-Duty Asphalt Paving	$_____per square foot
Light-Duty Asphalt Paving	$_____per square foot

SUBCONTRACTORS LIST

GENERAL:_____ Amount $_____

PLUMBING:_____ Amount $_____

HVAC:_____ Amount $_____

ELECTRICAL:_____ Amount $_____

SITE WORK:_____ Amount $_____

ALTERNATES FOR STUMP SOUND ELEMENTARY SCHOOL

Alternate #1 - Six (6) Classroom Addition	Add: $_____
	Deduct: $_____
Alternate #2 - Owner Preferred Finish Hardware (See schedule)	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (1) Fire Alarm - Notifier	Add: $_____
	Deduct: $_____
Alternate #3 - Owner Preferred Equipment (2) Gear/Panels/Disconnects…-Square D	Add: $_____
	Deduct: $_____
Alternate #4 - Generator	Add: $_____
	Deduct: $_____
Alternate #5 - Building Automation Controls (Schneider - Owner Preferred)	Add: $_____
	Deduct: $_____

UNIT PRICES

Ceramic/Porcelain Tile Installed	$_____per square foot
Quarry Tile Installed	$_____per square foot
Suspended Acoustical Ceiling Installed	$_____per square foot
Resilient Flooring (VCT) Installed	$_____per square foot
Resilient Sports Flooring Installed	$_____per square foot
Epoxy Terrazzo Installed	$_____per square foot
Carpet/Carpet Tile Installed	$_____per square foot
Paint Installed	$_____per square foot
Dirt Excavation	$_____per cubic yard
Compacted Fill	$_____per cubic yard
Unsuitable Soil (disposed of Off-site)	$_____per cubic yard
Off-site Borrow Fill (engineered, compacted in place)	$_____per cubic yard

Rock Excavation, Mass Rock	$_____per cubic yard
Rock Excavation, Trench Rock	$_____per cubic yard
Formed Cast in Place Reinforced Concrete	$_____per cubic yard
Heavy-Duty Asphalt Paving	$_____per square foot
Light-Duty Asphalt Paving	$_____per square foot

SUBCONTRACTORS LIST

GENERAL:_____ Amount $_____

PLUMBING:_____ Amount $_____

HVAC:_____ Amount $_____

ELECTRICAL:_____ Amount $_____

SITE WORK:_____ Amount $_____

Contractor's State License No. _____

Contractor _____

By _____

NOTE: BID PROPOSAL FORM MUST BE COMPLETELY FILLED OUT (i.e. BASE BID PRICE, TIME IN CALENDAR DAYS, LICENSE NO. AND SIGNATURE) TO BE READ. ANY ALTERNATE OR UNIT PRICE LEFT BLANK WILL BE CONSIDERED "NO ADDITIONAL CHARGE" ($0.00). UNIT PRICES WILL NOT BE READ PUBLICLY, BUT WILL BE A PART OF THE CONTRACT.

Acknowledge of Receipt of Addenda

Addendum No._____ Signature_____ Date_____

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Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

Addendum No._____ Signature_____ Date_____

ADDENDUM #1
ISSUED: August 22, 2019

TECHNICAL SPECIFICATIONS

FOR

WATER EXTENSIONS

TO SERVE

STUMP SOUND ELEMENTARY SCHOOL

ONSLOW COUNTY, NORTH CAROLINA

OWNER:

Onslow County Schools

Jacksonville, North Carolina

April 2019

4-26-19

PARKER & ASSOCIATES, INC.
ENGINEERS • SURVEYORS • PLANNERS
JACKSONVILLE, NORTH CAROLINA

(910) 455-2414 | 306 New Bridge Street | P.O. Box 976 | Jacksonville, NC 28541-0976
Firm License Number F-0108 | www.parkerjacksonville.com

PROJECT INFORMATION SHEET

OWNER:

Onslow County Schools
200 Broadhurst Road
Jacksonville, NC 28540

Contact Person: Mr. Steve Myers
Chief of Operations
(910) 455-2211 Ext. 20500

ENGINEER:

Parker & Associates, Inc.
P. O. Box 976
Jacksonville, North Carolina 28541-0976

Contact Person: Mr. Timothy M. Stewart, P.E.
(910) 455-2414

UTILITY:

Onslow Water & Sewer Authority
228 Georgetown Road
Jacksonville, NC 28540

Contact Person: Mr. David M. Mohr, P.E., Engineering Director
(910) 455-0722

TABLE OF CONTENTS

CONSTRUCTION STAKING QUALITY ASSURANCE

CONTRACTOR SHALL INSURE THAT HE AND ALL HIS WORKERS (CONTRACTORS, SUBCONTRACTORS AND OTHER SITE PERSONNEL) DO NOT DAMAGE CONSTRUCTION STAKES OR OTHER MEASURES USED IN LAYING OUT THE PROJECT WHETHER BY PARKER & ASSOCIATES OR ANOTHER ENTITY INCLUDING THOSE UNDER THE EMPLOY OF THE CONTRACTOR.CONTRACTOR SHALL CAUSE HIS WORKERS TO OBSERVE AND VERIFY TO THE FULLEST EXTENT PRACTICABLE THAT STAKES, OTHER MEASURES AND GRADES ARE, OR APPEAR TO BE, ACCURATE AND CORRECT, AND IMMEDIATELY, BUT PRIOR TO ANY ASSOCIATED WORK, NOTIFY THE STAKING ENTITY OF ANY POTENTIAL CONFLICT, ERROR OR QUESTION REGARDING THE WORK. PARKER & ASSOCIATES SHALL NOT BE RESPONSIBLE IF ALL OF THE ABOVE MEASURES ARE NOT STRICTLY ADHERED TO. PARKER & ASSOCIATES SHALL NOT BE RESPONSIBLE WHERE, DUE TO DAMAGE, ITS STAKING CANNOT BE VERIFIED. FOR CRITICAL OR COSTLY COMPOTENTS OF THE WORK, WHERE THE CONTRACTOR BELIEVES THAT STAKING MAY NOT BE PRESERVED, THE CONTRACTOR SHALL REQUEST THE STAKING ENTITY TO PLACE STAKING IN AN AREA WHERE ITS PRESERVATION CAN BE INSURED.

JOBSITE SAFETY

NEITHER THE PROFESSIONAL ACTIVITIES OF THE DESIGN PROFESSIONAL, NOR THE PRESENCE OF THE DESIGN PROFESSIONAL OR THE DESIGN PROFESSIONAL'S EMPLOYEES AND SUBCONSULTANTS AT A CONSTRUCTION SITE, SHALL RELIEVE THE CONTRACTORS AND ANY OTHER ENTITY OF THEIR OBLIGATIONS, DUTIES, AND RESPONSIBILITIES INCLUDING, BUT NOT LIMITED TO, CONSTRUCTION MEANS, METHODS, SEQUENCES, TECHNIQUES, OR PROCEDURES NECESSARYFOR PERFORMING, SUPERINTENDING, OR COORDINATING ALL PORTIONS OF THE WORK OF CONSTRUCTION IN ACORDANCE WITH THE CONTRACT DOCUMENTS AND ANY HEALTH OR SAFETY PRECAUTIONS REQUIRED BY ANY REGULATORY AGENCIES. THE DESIGN PROFESSIONAL AND DESIGN PROFESSIONAL'S PERSONNEL HAVE NO AUTHORITY TO EXERCISE ANY CONTROL OVER ANY CONSTRUCTION CONTRACTOR OR OTHER ENTITY OR THEIR EMPLOYEES IN CONNECTION WITH THEIR WORK OR ANY HEALTH OR SAFETY PRECAUTIONS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR JOBSITE SAFETY. THE DESIGN PROFESSIONAL AND THE DESIGN PROFESSIONAL'S CONSULTANTS SHALL BE INDEMNIFIED AND SHALL BE MADE ADDITIONAL INSUREDS UNDEER THE CONTRACTOR'S GENERAL LIABILITY INSURANCE POLICY.

There is an underground natural gas pipeline near you

Piedmont Natural Gas is an energy services company primarily engaged in the distribution of natural gas to over one million residential, commercial and industrial utility customers in North Carolina, South Carolina and Tennessee. Natural Gas pipeline markers containing contact phone and emergency information indicate the presence of underground utilities but may not be posted in many areas throughout the system. For more pipeline location information, call your state One-Call center or see the National Pipeline Mapping System online at http://www.npms.phmsa.dot.gov

Pipelines are the safest method of transportation for natural gas

According to the National Transportation Safety Board, pipelines are the safest mode of transportation. Piedmont Natural Gas, with years of safe and continuous service, is committed to meeting or exceeding all local, State, and Federal natural gas pipeline safety regulations.

Most pipeline accidents occur when individuals or companies are not aware of the location of buried utilities

Brightly-colored natural gas pipeline markers indicate buried utilities are nearby, but they do not always indicate the exact location and depth of the pipeline. Markers are generally located at road, railway and river crossings and along fence lines and property boundaries, but pipelines do not always run in a straight line and markers may not be present in certain areas. It is very important to **CALL 811 BEFORE YOU DIG**. 811 is a federally-mandated number designated by the FCC to consolidate all local "Call Before You Dig" numbers and help save lives by minimizing damages to underground utilities.

SAFETY TAKES TEAMWORK Identify Potential Hazards

Natural gas is odorless, colorless, and lighter than air. If released, natural gas will rise and diffuse with air rapidly. The "natural gas smell" (rotten-egg-like) most people associate with natural gas is an odorant added by local gas utilities to assist in leak detection.

DID YOU KNOW?

If you suspect a leak, immediately leave the area on foot and call appropriate emergency contacts as outlined in this brochure.

How to recognize a leak

Use your senses of sight and smell to help recognize the situation.

* A "natural gas smell" or rotten-egg-like smell
* Dust, water, bubbles, or vegetation blowing into the air or around a pipeline
* Discolored or dead vegetation near the pipeline
* A shrill blowing or hissing sound
* Bubbling in a wet area, marshland, river or creek
* A dry spot in a moist field
* Fire apparently coming from the ground or burning above the ground

Impact of land use and construction practices on safety

* Always survey the area for evidence of pipeline right-of-way markers prior to any excavation or construction operations.
* Always contact the state One-Call service in advance of beginning any digging, drilling, ditching or constructing work no matter how small the project.
* Wait for appropriate personnel to mark the specific location of the pipeline and then proceed with care.
* Check with your local public officials about any future land use plans in the area of your project.

Accidents

If damage occurs to our pipeline, it is important that we are informed immediately for inspection, evaluation, and repairs. Earthquakes, wash-outs, lightening, drilling or blasting near the right-of-way may cause unseen damage to a pipeline. Even a minor dent can cause deterioration of the protective coating and present a potential hazard in the future.

Protect Yourself

An informed public is an essential component of safe natural gas pipeline operations. In addition to the safe practices outlined below, please obtain more detailed information from the Piedmont Natural Gas web site: **www.piedmontng.com** as well as other related resources listed in this brochure.

WHAT TO DO

(if you suspect a leak or imminent danger)

If ignition has NOT occurred...

* Turn off machinery or equipment in the immediate area
* Leave on foot and clear other people away from the area
* **PIEDMONT NATURAL GAS 24-HR EMERGENCY PHONE: 800-752-7504**
* If you feel danger is posing an imminent threat, call 911

If ignition HAS occurred...

* Safely remove yourself and others from the area of the burning natural gas
* CONTACT 911 EMERGENCY RESPONDERS

WHAT NOT TO DO:

* **Do NOT** light a cigarette or smoke in the area
* **Do NOT** start an engine or drive near the area of the leak
* **Do NOT** cause any friction that could cause a spark
* **Do NOT** attempt to operate valves on the pipeline
* **Do NOT** attempt to extinguish the burning natural gas

Responsibilities of the Pipeline Operator

Pipeline operations and maintenance activities are required to follow industry-wide policies and procedures and established best practices. Piedmont Natural Gas participates in the One-Call system and rigidly performs a broad range of safety precautions including aerial and ground leak patrols, natural gas sampling, preventative maintenance, the installation of pipeline markers, and the planning of emergency response procedures.

In accordance with federal regulations some areas near pipelines are designated as High Consequence Areas. For these areas, supplemental hazard assessment and prevention programs, known as Integrity Management Programs, have been developed. For more information about these plans contact the Customer Information Center at 1-800-752-7504.

ADDENDUM #1
ISSUED: August 22, 2019

SECTION II
WATER SYSTEM DESIGN SPECIFICATIONS

1. GENERAL

1.1 SPECIFICATION AND DESIGN MANUAL:

A. All projects within the jurisdiction of the Onslow Water and Sewer Authority (ONWASA) shall be designed and constructed in accordance with "*ONWASA's Manual of Specifications and Standards*, latest revision". Projects which are still in progress 5 years after the notice to proceed was issued and each 5 years thereafter shall be brought up to current specs.

B. Public water distribution systems shall conform to the design and construction requirements of the NC Department of Environmental Quality, NCAC Title 15A, Subchapter 18C, *Rules Governing Public Water Systems,* latest revision.

C. All structures and utilities shall comply with the applicable Areas of Environmental Concern (AEC) Standards, as amended, in accordance with the State Guidelines for AEC's (15 NCAC 7H) pursuant to the Coastal Area Management Act of 1974.

1.2 PERMITS:

A. Plan approvals, Water & Sewer: Prior to commencing construction, all plan approvals and permits for water and/or sewer shall be obtained. A preconstruction conference with ONWASA shall be held prior to commencing any construction.

B. Encroachment Permits: An encroachment permit shall be required from any Contractor or Developer wishing to excavate or place utilities on NCDOT or public right-of-ways.

C. Pavement Cuts: Pavement cuts in streets shall be repaired in accordance with the specific requirements of public agency on whose street or roadway the utility is being placed, as well as any other applicable requirements dictated in the approved encroachment permit. Open-cut or bored crossings shall otherwise adhere, as applicable, to specification Section 31 23 17-*Trenching*.

D. Developer shall obtain all other State and Local permits, as applicable (Air Quality, Erosion and Sedimentation Control, Zoning, etc.)

1.3 PLAN REVIEW AND OBSERVATION FEES:

All plan review and observation fees shall be paid prior to acceptance of project. Refer to the current ONWASA fee schedule for applicable fees.

2. WATER SYSTEM DESIGN STANDARDS

The purpose of this module is to establish "**Minimum Design Criteria**" for water system design on systems owned and maintained by, or systems that will be dedicated to, ONWASA.

2.1 DISTRIBUTION SYSTEM

A. General:

Distribution systems shall meet the minimum requirements of the NC Department of Environmental Quality, NCAC Title 15A, Subchapter 18C, *Rules Governing Public Water Systems,* latest revision.

1. Water Supply System: The Developer shall connect the subdivision or development with the water system at his/her expense, and shall construct it in such a manner as to serve adequately for both domestic use and for fire protection.
2. No new permanent structure or pond (storm water, wetland, retention/detention, synthetically lined, etc.) shall be constructed over water mains or located within water or sewer easements.
3. For developments, the Design Engineer shall design the water system to provide for complete coverage of the property frontage along the primary or secondary highway or roadway nearest to the development and all internal streets.
    a. Wherever the existing water system is adequate to support fire protection, projects with multiple phases shall be designed so that fire protection is available to each of the phases of development as they are constructed.

B. Design - System Hydraulic and Demand Design:

As part of the design, the Design Engineer shall perform a steady state analysis model of all proposed extensions using EPAnet, KyPipe, WaterCAD, or other approved compatible, software. The design data shall include a sketch of the system showing assumed minor losses, pipe roughness ("C") constants suitable for design (i.e. Hazen-Williams roughness constant = 130 for PVC), line lengths, fixed grade node elevations, node numbers, demands, pipe numbers, time of day of field test of hydrant (static pressure converted to elevation head) for verification of starting elevation head, the static water elevation in tank at the time a static pressure reading was taken and, ground elevation of hydrant tested. ONWASA will supply flow test data for the fire hydrant closest to the proposed development for each hydraulic analysis. A minimal cost shall be associated with this service.

1. Calibrate the model utilizing actual fire flow test results provided by ONWASA.
2. Average daily flows shall be estimated at 400 gpd per residential household. This estimate shall be modified as necessary based on specific zoning and land use data. Maximum daily flow and peak hourly flow shall be determined as follows:

    Maximum Daily flow = Average daily flow times 2.5
    Peak Hourly flow = Average daily flow times 3.5

3. The water distribution systems and extensions shall be designed to supply for demand of all customers while maintaining the following minimum pressures:
    1. 40 psi for maximum daily flow
    2. 30 psi for peak hourly flow
    3. 20 psi for average daily demand plus fire flow
        1. Utilizing actual fire flow data provided and applied to the hydrant tested, the farthest (innermost) point of the project shall have a minimum of 20 psi residual pressure
        2. The application of the minimum 500 gpm fire flow for design shall be applied at the farthest (innermost) hydrant(s) in the project and the farthest (innermost) point of the project shall have a minimum of 20 psi residual pressure

4. Pipeline Velocity: 3 to 6-fps normal working conditions shall be provided throughout the distribution system, although higher velocities in short lengths of pipe may be tolerated for brief periods. Sustained high discharge velocities can scour the pipe's interior and increase leakage.
5. Main Size: Water mains shall be sized in accordance with ONWASA's long-range water distribution system plans. Standard main sizes in ONWASA's distribution system are 2, 6, 8, 10, 12, 16, 24, and 30-inches. The minimum diameter of public water main is 2-inches. 4-inch diameter mains are not allowed. Fire Hydrants shall not be installed on mains less than 6-inches

in diameter. The inside diameter of the HDPE pipe shall be indicated on the Plans and shall match or exceed the inside diameter of the main upstream and downstream of the ends of the HDPE pipe.

6. Stub outs: Water distribution system shall be designed to allow for future extension of water main to adjacent properties. Water distribution system shall install a valve and kicker-joint (not less than 18-feet in length) at the end of main to allow for future extension.

7. Proposed developments shall connect to ONWASA's public water and/or sewer system if it is within1,000 linear feet or less by public right of way or public utility easement from the closest point of the development to the existing public water and/or sanitary sewer system. If the existing main is inadequate to provide fire protection flow, and another main of character sufficient to provide fire protection flow is within 1,000 linear feet or less by an existing or proposed public right of way or public utility easement, the proposed development shall connect to the main capable of providing the fire protection flow.

8. Waterlines of larger diameter proposed to be connected to existing waterlines of smaller diameter shall only be allowed by approval of the ENGINEERING DIRECTOR.

9. Looping/interconnectivity: Water mains shall be designed to be looped and interconnected as required by ENGINEERING DIRECTOR.

10. Water mains proposed at locations previously occupied by gas stations or other fuel storage areas shall be designed to include DIP and fittings both with nitrile gaskets. Existing water mains along or on properties where gas stations or other fuel storage areas are proposed shall be replaced with DIP and fittings with nitrile gaskets.

11. Valving: Valve shall be fully accessible from ground surface by means of a valve box.

    a) Valve Type/Size: Refer to Section 33 11 00 – *Water Utility Distribution Piping* of ONWASA's Standard Specifications.
    b) Valves shall be installed at all branches from feeder mains and between mains and hydrants according to the following schedule:
        i. One 6-inch valve shall be installed on each Fire Hydrant leg. Unless the fire hydrant assembly is within 50 LF of an intersection, a main-line valve shall be installed adjacent to the hydrant tee.
        ii. 2 valves at tees (excluding Fire Hydrant Tees unless as specified here-in)
        iii. 3 valves at crosses
        iv. An in-line valve shall be installed on the water line and shall not exceed the distances given below:

Line size	Distance
2, 6, or 8-inch mains	500 linear feet
10-inch mains and larger	100 linear feet per inch-diameter

If required, when tapping an existing live main and inserting a main line valve, the main being tapped must be shut off and a valve installed (cut-in) on the existing main within close proximity to the new connection. In-lieu of shutting off the existing main and cutting

in a valve, the ENGINEERING DIRECTOR may allow an "inserting" valve to be placed if the former is undesirable or impractical.

c) Downsizing Mains: When downsizing a main, locate a valve after the reducer on the side with the smaller diameter. However, the designer must evaluate thrust forces and accommodate the forces by placement of a thrust collar (if required) on the larger main.

d) Concrete Blocking under Valves: Provide concrete or solid brick blocking on solid foundation under valves placed on all mains and beneath valves connected to tapping sleeves.

C. Piping Material Applications:

1. General: Use pipe, fittings, and methods of joining in accordance with the following ONWASA Standard Specification Sections as applicable:
   a) *Section 33 05 19 – Pressure Piping Joint Restraint*
   b) *Section 33 05 23 – Trenchless Utility Installation*
   c) *Section 33 05 24 – Utility Horizontal Directional Drilling*
   d) *Section 33 11 00 – Water Utility Distribution Piping*
   e) *Section 33 12 13 – Water Service Connections*

2. Locator Tape: Brightly colored blue tape continuously printed with "WATER LINE" in large letters, minimum 6-inch wide by 4 mils thick, with magnetic detectable conductor manufactured for direct burial service shall be installed and buried 1.5 to 2 feet from the top of the water line to aid in locating the pipe if an excavation occurs

3. Tracer wire: 10-Gauge insulated wire blue in color shall be installed along the top of the water line to aid in locating the pipe for maintenance purposes. The wire shall be continuous and uninterrupted, and brought to the surface at marker posts as specified in Section 33 11 00.

4. Marker posts of concrete measuring 6" X 6" X 36" with bronze markers stamped "Buried Water Call 811 Before Digging" shall be installed directly above water mains at the locations of every bore entry and exit where water lines cross wetlands, streams, creeks, etc.. Installation shall be as specified in Section 13 11 00.

D. Joint applications:

PIPE	JOINT TYPE	COMMENT
UNDERGROUND APPLICATIONS		
Ductile Iron Pipe	Push-On	6-inch thru 30-inch
Ductile Iron Fittings	Mechanical Joint	6-inch thru 30-inch
PVC C900	Push-On	6-inch thru 12-inch
PVC 905	Push-On	14-inch and 16-inch

PE 3408 water service	Compression w/ solid stainless steel inserts	1-inch thru 2-inch
PVC ASTM D2241	Bell & Spigot w/ gasket	1-inch thru 2-inch
Brass Pipe	NPT threaded	Short sections of 2-inch
ABOVE GROUND APPLICATIONS		
Ductile Iron	Flange Joint	6-inch thru 30-inch
Brass	NPT threaded	1-inch thru 2-inch
Stainless Steel	NPT threaded	1-inch thru 2-inch

1. Galvanized pipe and galvanized fittings shall not be permitted in the ONWASA water system.
2. PVC glued or threaded pipe or fittings shall not be permitted in the ONWASA water system.
3. Provide transition couplings and special fittings with pressure equal to or exceeding the pressure rating of the pipe or fitting to which they will be either connected or fitted.
5. Do not use flanges, unions, or keyed couplings for new underground piping. With the approval of the ENGINEERING DIRECTOR, they may; however, be used in above ground applications such as vaults. 3-part unions may be used for repairs.
6. 90-degree bends shall be minimized to the extent possible.

E. Location:

Water mains shall be located within dedicated street right-of-way or a 20-foot (minimum) publicly dedicated permanent utility easement to ONWASA. Installation of utilities in easements shall be done only by consent of the ENGINEERING DIRECTOR.

F. Fire Hydrants:

1. Fire Hydrants shall not be installed on mains less than 6-inches in diameter.
2. Fire Hydrant Location: Hydrants shall be located in accordance with Appendix C, *Fire Hydrant Locations and Distribution* of the NC Fire Prevention Code, latest edition or per ONWASA's Standard Water Specifications whichever is more restrictive.
3. Fire Hydrant location requirements for uses other than residential single family: Fire Hydrant spacing and location shall be reviewed and approved by the ENGINEERING DIRECTOR and the Fire Marshall.
4. All Fire Hydrants shall be located within dedicated street right-of-way or a 20-foot permanent utility easement publicly dedicated to ONWASA.

5. No fire hydrant shall be buried by landscaping material, dirt or gravel above the maximum bury line painted by the factory on the hydrant barrel. Hydrant extensions are permitted for use to raise hydrants no more than 2'. Hydrants that require extensions in excess of 2' shall be replaced with hydrants of sufficient bury depths.

6. Minimum Fire Flow at Fire Hydrants: All projects involving extension of water mains shall be capable of meeting the minimum requirements of the North Carolina Fire Prevention Code, as updated from time to time, and shall be reviewed and approved by the local Fire Code Official. The minimum design flows shall be measured for a minimum of a five-minute period.

7. Maximum Distances from Structures:

   a) Residential: 250 feet by the pull of the hose method to the building.
   b) Commercial & Multi-family: See Appendix C of the NC Fire Prevention Code

8. Minimum distances from a structure: No new Fire Hydrant shall be located closer than 20-feet from a structure.

9. Fire Hydrant in relation to street: See Standard Details

10. Services on Fire Hydrant Branches: Services on Fire Hydrant branches are not permitted.

11. A Fire Hydrant shall be installed at the entrance of a subdivision if the nearest Fire Hydrant is more than 400 feet away.

12. Fire hydrants located inside the City of Jacksonville's Extra Territorial Jurisdiction (ETJ) area shall meet the requirements of the City of Jacksonville.

G. Pressure/Fire Flow:

1. Minimum System Pressure: The minimum water pressure for future extensions to the water distribution system shall be as follows:

   a) If there is sufficient pressure in the existing water distribution system that is within 1,000 linear feet from the nearest point on the property by way of a new or proposed public right of way or public utility easement, the future water distribution extension shall be designed for a minimum fire flow of **500 gpm at 20 psig residual**. The future extensions shall be design and constructed with fire hydrants as required in this specification.

   b) Where there is not sufficient pressure in the existing water distribution system to provide a minimum fire flow of **500 gpm at 20 psig residual**, the water distribution extension shall be sized to provide a normal minimum working pressure at all points within the distribution system of not less than **30 psi (gauge)** during periods of peak demand (fire flow).

2. The water distribution system and any extensions shall be designed to supply for a minimum fire flow of **500 gpm at 20 psig residual**.

3. Pressure Reducing Valves -The installation of pressure reducing valves shall be as required and installed per the NC State Plumbing Code covers the installation of pressure reducing valves. Pressure reducing valves are neither owned, installed, nor maintained, by ONWASA.

H. Bury:

Water mains shall be designed with a minimum bury of 36-inches cover and a maximum depth of 60 inches from bottom of main. AR

1. Water mains designed to cross under culverts shall be restrained ductile iron pipe with restrained vertical fittings (bends) to minimize the depth of cover on either side of the crossing. Maximum depth of bury shall be approved by the ENGINEERING DIRECTOR.

2. Water mains which have less than 36-inches of ground cover shall be approved by the applicable regulatory agency and the ENGINEERING DIRECTOR.

I. Horizontal and Vertical Blocking:

Concrete thrust blocking, restraint glands, tie rods, restrained joint pipe, and/or other means of restraint shall be provided at all changes in pipe direction. Concrete thrust blocking is not recommended where the blocking may bear on other utilities or where the area behind the block may be excavated in the future.

J. Dead end lines:

Blow-off assemblies shall be installed at the end of all water mains and as required for flushing, as directed by the ENGINEERING DIRECTOR. Temporary blow-off assemblies shall be installed on lines that may be extended. Permanent blow-off assemblies shall be installed on lines that will not be extended. The following blow-off sizes shall apply for the applicable main size:

Main Line Size	Blow-off Size Required	Blow-off Valve Size
Permanent Blow-off Assemblies		
6, and 8-inch mains	2-inch	2-inch
12-inch mains	4-inch	4-inch
16-inch to 20-inch mains and larger	6-inch	6-inch
24-inch mains	8-inch	8-inch
30-inch mains	12-inch	12-inch
Temporary Blow-off Assemblies		
6-inch thru 24-inch	2-inch	Valve to match main size

a) A temporary blow-off shall have a full 18-foot joint of pipe between the valve and the standpipe.

b) The maximum length of a permanent dead end 6 and 8-inch main shall be 700 feet and 1200 feet, respectively, unless approved by the ENGINEERING DIRECTOR. A Fire Hydrant shall be installed at the dead end.

K. Sag Vertical- Sag Blow-offs:

When directed by the ENGINEERING DIRECTOR, provide a sag blow-off when lines have severe sag where sediment can accumulate and retard flow in water line (such as when running beneath large streams, ditches or culverts).

L. Crest Vertical - Air Release/ Valves:

Where water mains are subject to air entrapment, provide an air release valve constructed in accordance with standard Details_WS_ARV as applicable, located at the highest elevation on the main. Where the main undulates along its length and several crests are encountered, a separate air release manhole will be required at each crest. The ENGINEERING DIRECTOR, before placement, shall approve the final actual location of all air release manholes. Typically, when the relative elevation difference in a water main (from the main's sag elevation to the crest elevation) is greater than 15-feet, an air release valve will be needed.

Air release/vacuum valves shall be 2-inch minimum. Refer to air release valve manufacturer's recommendations for air release sizing and quantity.

The valve shall be used to bleed air from the line as it is filled with water for testing.

Manhole Size Determination:

1. The minimum diameter of manholes shall be 4-feet.

2. Manholes with 16-inch diameter or larger pipe shall be a minimum of 6-feet in diameter.

M. Vertical upward thrust:

Vertical upward thrust at fittings or vertically deflected joints shall be resisted with thrust collars of adequate size and weight, pilings, or other acceptable methods approved by ONWASA. See standard Details_WS_TB3.

N. Relation of Water Mains to Sewer:

See specification *Section 33 11 00 – Water Utility Distribution Piping* for separation requirements between water mains and sewer mains, force mains, vacuum sewer and laterals and other related structures and between water mains and other utilities/structures.

O. Stream Crossings:

Where possible, all stream crossings shall be made below water level. Stream crossings may require Environmental Assessment unless directional bored. Stream crossings shall be made as close to perpendicular to the stream as possible. All stream crossings shall be made with ductile iron pipe.

3. **Below streambed crossing:** Unless otherwise approved by the ENGINEER DIRECTOR, stream crossings shall be completed with ductile iron piping and no less than 5-feet of cover in accordance with ONWASA's Standard Details.

4. **Above stream crossing:** Water mains crossing streams above normal water level shall be placed above the 25-year storm elevation when practical and otherwise meet DWQ requirements for stream crossings. Stream crossings above water level shall be constructed with piers or other suitable methods approved by the ENGINEERING DIRECTOR.

3. **Hanger Support from Bridges:** In the design of the aerial system, provide both details and calculations showing the hanger type, hanger capacity, hanger-to-bridge attachment type (mechanical or chemical), and capacity with a minimum safety factor of Three (3). Assume the pipe is full. Provide lateral bracing of hanger to a girder or to bottom of bridge deck. Two pipe

hangers per pipe joint shall be required. Provide plans showing the plan view and elevation of the water line crossing.

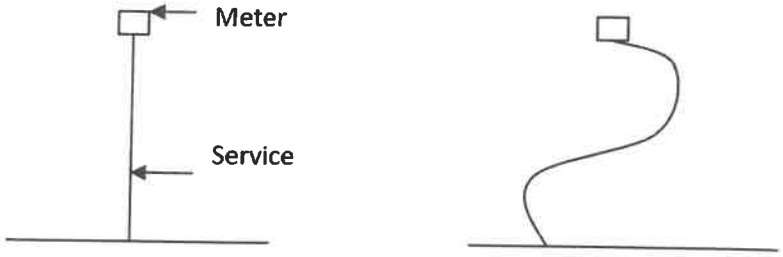
4. **Thermal Protection, allowance for main expansion:** Where aerial crossings are approved by ONWASA, install expansion devices as necessary to allow for expansion and contraction movement in pipe, such as on aerial bridge or creek crossings. Expansion joints are typically to be provided where the line transitions from aerial to underground. Provide calculations showing expected differential movement. To prevent freezing, provide either pipe insulation jackets that totally cover the pipe (so that the pipe and insulation is placed inside the hanger assembly) or an insulation system the covers both the pipe and hanger assembly.

P. Taps:

Taps shall be made in accordance with *Section 33 12 13 – Water Service Connections* of ONWASA's Standard Specifications.

Q. Water Services:

General: A water service shall be provided for each lot. The meter box shall be located 1- foot from the back of the curb, within the public right of way (see standard detail). Services shall be placed perpendicular to the main and shall not meander or snake in such a manner as to offset the meter from its main connection point (see schematic below). The meter box shall be set flush with the finished grade and shall not be installed in a ditch slope. In situations where the meter box is located outside of the public right-of-way, a water easement shall be provided to ONWASA.



Required Prohibited

For multi-family housing, individual water meters shall be required unless a variance is requested of, and approved by, the ONWASA Board of Directors and master metered.

Meter Location - double frontage lots: If the lot fronts two or more streets, the meter shall be located within 5-feet of the sewer service.

R. Water Meter Sizing:

1. Residential and Commercial Facilities: Water service connections shall be sized in accordance with AWWA Manual M22, "Sizing Water Service Lines and Meters" or the NC Plumbing Code, whichever is more restrictive, and subject to the approval of the ENGINEERING DIRECTOR. The number of gallons per minute required for the facility (flow demand), and the rate-of-flow provided by ONWASA (via flow test) to verify meter size shall determine the size of the proposed water

meter. Documentation of how the flow rate was determined (calculated) by the DESIGN ENGINEER shall be submitted for verification of meter size selection.

2. Irrigation systems shall be metered separately and shall be sized based on flow demand.

3. If the future flow demand is proposed or anticipated to increase (i.e. project phasing/expansion), provisions shall be made to install a meter box or vault, and connections for the future flow demand, but the meter shall be sized for current demands and shall be changed, as future flow demands require.

4. All improvements on the property side (outlet) of the meter shall be in accordance with the current Plumbing Codes. Properly sizing water service lines, backflow prevention devices, and pressure reducing valves to maintain adequate water flow and pressure from the meter to the structure and/or point of demand shall be the responsibilities of the property owner and/or DESIGN Engineer.

5. The DESIGN Engineer shall submit flow demand and pressure requirements to ONWASA for review. The DESIGN Engineer shall be responsible to insure head loss through meter meets project requirements.

6. Commercial Meters: In some cases, a unit may be supplied at the option of ONWASA through a Commercial Meter. Examples of when ONWASA may permit Commercial Meters include, but are not limited to the following:

   a. Units under common ownership such as apartments, multi-storied commercial buildings, recreational vehicle parks, mobile home parks and individual dwelling units containing not more than five hundred (500) square feet of heated living area.

   b. Condominiums under separated ownership which contain five (5) or more units per building.

   c. In no case shall master meters be allowed on multifamily developments in which individual units are sold.

S. Combination Vaults:

Vaults shall be designed and constructed to provide minimum clearances between the pipe, fittings or vault walls per the dimensions prescribed in the applicable vault detail(s). See Standard Details. See the applicable detail for the particular type application proposed.

T. Multiple Source Systems:

Water systems with multiple sources shall be required to install an approved Reduced Pressure Principle Assembly (RP) in accordance with ONWASA's *Water System Cross-Connection Control Ordinance*, latest revision.

U. Cross-connection prevention:

Approved backflow prevention assemblies shall be installed on the service line to all facilities where applicable in accordance with the ONWASA Utility Ordinance.

V. Testing:

Testing of completed water mains shall include the following:

1. Hydrostatic Testing: Perform testing in accordance with ONWASA Specifications, *Section 33 11 00 - Water Utility Distribution Piping* and *Section 33 12 13 – Water Service Connections*, as applicable.

2. Tracer Wire Testing for Continuity: Perform testing in accordance with ONWASA Specifications, *Section 33 11 00 - Water Utility Distribution Piping.*

3. Chlorination and Bacterial Test; HPC Test: Perform testing in accordance with ONWASA Specifications, *Section 33 13 00 - Disinfecting Water Utility Distribution.*

4. **DECHLORINATION**: The disposal of chlorinated water is the responsibility of the CONTRACTOR. Upon completion of retention period required for disinfection, the heavily chlorinated water shall be neutralized by chemical application before discharge from the main. A **de-chlorinating device is required**. Chlorine concentration of the water discharged from the main shall be no higher than 0.1ppm in excess of the residual in the existing system or is acceptable for domestic use.

SECTION 33 05 19
PRESSURE PIPING JOINT RESTRAINT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joint restraints

B. Related Sections:

1. *Section – Trenching31 23 16.13*
2. *Section – Water Utility Distribution Piping33 11 00*
3. *Section 33 34 00 – Force mains*

1.2 DESIGN REQUIREMENTS

A. The ENGINEERING DIRECTOR reserves the right to determine which method to utilize dependent on site conditions and application.

B. Each fitting shall be secured by two forms of restraint. Restraining glands and concrete thrust blocking are preferred. **Wedge-action restraint glands (i.e. MEGALUGS) are approved only for use on ductile iron pipe. Full-circumferential pipe restraint glands (i.e. Grip Rings) may be used on PVC or ductile iron pipe. ALL RESTRAINT GLANDS SHALL BE SPECIFICALLY DESIGNED FOR USE ON THE TYPE OF PIPE FOR WHICH THEY ARE BEING INSTALLED.** Other forms of restraint such as threaded rod, bell restraint harnesses, etc. may be approved by ONWASA on a case-by-case basis.

C. All joints on Fire Hydrant Assemblies shall be restrained.

D. All backside or reverse taps shall require the installation of a restraint joint system

E. Unless otherwise approved by ONWASA, all fittings shall require the installation of a restrained joint system.

1.3 SUBMITTALS

A. Design Data: Submit design calculations showing determination of restrained lengths and submit joint restraint details. Use joint restraint devices specifically designed for applications described in manufacturer's data.

PART 2 PRODUCTS

A. WEDGE-ACTION RESTRAINT GLANDS (i.e. MEGALUGS)

1. Manufacturers:
   a. Ebaa Iron Sales, Inc.
   b. Star Pipe Products, Inc.
   c. Sigma Corp.
   d. Smith-Blair

B. Shall Meet the Following Requirements:

1. Gland body, wedges, and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
2. Proper actuation of gripping wedges shall be ensured with torque-limiting twist off nuts.
3. Exterior shall be protected by manufacturer-applied epoxy, or polyester-based powder, coating system.
4. Working pressure of 350 psi for 3-inch through 16-inch and 250 psi for 18-inch through 48-inch, and shall include a minimum safety factor of 2 to 1 in all sizes.

5. Wedge-action restraints are not permitted for use on PVC pipe.

2.2 FULL-CIRCUMFERENTIAL PIPE RESTRAINT GLANDS (i.e. Grip Rings)

A. Shall Meet the Following Requirements:

1. Gland, ring, and follower gland shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
2. Shall be rated for the full working pressure of the pipe for which it is being installed, including an allowance for pressure surges.

2.3 BELL JOINT RESTRAINTS

A. Manufacturers:

1. Ebaa Iron Sales, Inc.
2. Star Pipe Products, Inc.
3. Sigma Corp.

B. Shall Meet the Following Requirements:

1. Restraint glands shall be manufactured of ductile iron conforming to ASTM A536.
2. Exterior shall be protected by manufacturer-applied epoxy, or polyester-based powder, coating system.
3. Shall be rated for the full working pressure of the pipe for which it is being installed, and must include a minimum safety factor of 2 to 1 in all sizes.

2.4 TIED JOINT RESTRAINT SYSTEMS

A. Materials:

1. Steel Types:

a. High Strength Low-Alloy Steel, ASTM A588, heat-treated.
b. High Strength Low-Alloy Steel, ASTM A588.
c. Carbon Steel ASTM A36.

B. Components:

1. Tie Bolts:

a. 5/8-inch for 2-inch and 3-inch mechanical joints, ¾-inch for 4-inch to 12-inch mechanical joints and flanged joints, ASTM A588, Grade B; ASTM A325, Type 3, except increase tensile strength of full-body threaded section to 40,000 pounds minimum for 5/8-inch and 60,000 pounds minimum for ¾-inch by heat-treating (quenching and tempering) to manufacturer's reheat and hardness specifications.
b. ¾-inch for 14-inch to 24-inch mechanical joints, ASTM A588, Grade B; ASTM A325, Type 3.
c. 1-inch for 30-inches and larger mechanical joints and flanged joints, ASTM A588/, Grade B; ASTM A325, Type 3; except increase tensile strength of full-body thread section to 100,000 pounds minimum by heat-treating (quenching and tempering) to manufacturer's reheat and hardness specifications.

2. Tie Nut: Hex nut for each tie bolt and tie rods; ASTM A563, Grade C3; plain, zinc plated, or galvanized.

3. Tiepin: ¾-inch round bar stock for use on bends and hydrants, 6-inch hairpin shape, ASTM A588; ANSI B1.1; plain, zinc plated, or galvanized.
4. Tie Coupling: Used to extend continuous threaded rods and provided with center stop to aid installation; ASTM A588; plain, zinc plated, or galvanized.

5. Tie Clamp: Retainer clamp for ductile iron, asbestos cement and polyvinyl chlorite, push-on pipe in front of bell; ASTM A36; ASTM A307; ASTM A563, Grade A; plain, zinc plated, or galvanized.
6. Tie Rod: Continuous threaded rod for cutting to desired lengths; ASTM A588, Grade B; ASTM A325, Type 3; ANSI B1.1; plain zinc plated, or galvanized.
7. Tie Bar: Steel bar used to restrain push-in plugs; ASTM A36; plain, zinc plated, or galvanized.
8. Tie Washer: Round flat washers; ASTM A588, ASTM F436, Type 3; plain, zinc plated, or galvanized.

C. FACTORY APPLIED FINISHES – STEEL

1. Items to be zinc plated or galvanized to meet the following requirements:
   a. ASTM B633 for electrodeposited coating of zinc on steel.
   b. ASTM A153 for galvanizing iron and steel hardware.
   c. Galvanizing for rolled, pressed, and forged steel shapes: ASTM A123; minimum 2.0 ounces per square foot coating thickness; galvanize after fabrication.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify pipe and fittings are ready to receive work.

B. Field measure and verify conditions.

C. Clean surfaces of pipe and fittings to receive joint restraint.

3.2 INSTALLATION

A. Excavate and Backfill in accordance with *Section 31 23 17-Trenching*.

B. Install pipe and fittings in accordance with applicable utility Specification Section.

C. Install joint restraint system so joints are mechanically locked together to prevent joint separation.

3.3 ERECTION TOLERANCES

A. Torque all restraint system fasteners in accordance with manufacturers' instructions.

END OF SECTION

SECTION 33 05 23
TRENCHLESS UTILITY INSTALLATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavation and backfill for approach trenches and pits.
2. Excavation for casing pipe.
3. Bore-and-jacking.
4. Carrier pipe.
5. Disposal of excess materials.

B. Related Sections:

1. *Section – Trenching.31 23 16.13*
2. *Section – Water Utility Distribution Piping.33 11 00*
3. *Section 33 31 13 – Gravity Sewers*
4. *Section 33 34 00 – Force Mains*

1.2 REFERENCES

A. NCDOT Standard Specifications:

1. Standard Specifications for Roads and Structures, latest edition, published by the North Carolina Department of Transportation.

1.3 DESIGN REQUIREMENTS

A. Design casing pipe liner joints of leak-proof construction. Design for earth and/or other pressures present.

1. Highway Crossings: Design tunnel for earth and/or other pressure loads present, plus AASHTO H20 live loading.
2. Railroad Crossings: Design tunnel for earth and/or other pressure loads present, plus railroad E80 live loading with 50 percent added for impact.
3. Design bracing, backstops, and use jacks of sufficient rating for continuous jacking without stoppage, except for adding pipe sections and as conditions permit, to minimize tendency of ground material to "freeze" around casing pipe.

1.4 DEFINITIONS

A. Owner: Onslow Water and Sewer Authority - ONWASA.

1.5 SUBMITTALS

A. Product Data: Submit data on casing pipe, carrier pipe, pipe supports, and accessories.

B. Project Record Documents: Record actual locations of piping, thrust restraints, and invert elevations.

C. Installation Plan: Submit description of proposed construction plan, dewatering plan, and plan to establish and maintain vertical and horizontal alignment.

D. Submit emergency response procedures to handle situations when conduit is compromised and jeopardizes integrity of installation or safety.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

F. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of casing or tunnel liner, carrier pipe, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with Sections 1540 and 1550 of NCDOT Standard Specifications, NUCA Trenchless Excavation Construction Equipment and Methods Manual, NUCA Pipe Jacking & Micro-tunneling Design Guide, and AREMA when jacking under railroads.

B. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1. Work Experience: Include projects of similar magnitude and conditions.
2. Furnish list of references upon request.

1.9 PRE-INSTALLATION MEETINGS

A. Convene with ONWASA minimum one week prior to commencing work of this Section.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Protect piping and jacking systems from entry of foreign materials and water by temporary covers, completing sections of work, and isolating parts of completed system.

C. Accept system components on site in manufacturer's original containers or configuration. Inspect for damage.

D. Use wooden shipping braces between layers of stacked pipe. Stack piping lengths no more than three layers high.

E. Store field joint materials indoors in dry area in original shipping containers. Maintain storage temperature of 60 to 85 degrees F.

F. Support casing and carrier pipes with nylon slings during handling.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Conduct operations so as not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.12 FIELD MEASUREMENTS

A. Verify invert elevations of existing work prior to excavation and installation of casing or tunnel.

PART 2 PRODUCTS

2.1 CASING AND JACKING PIPE MATERIALS

A. Steel Casing Pipe: ASTM A53 or ASTM A139, 35,000 psi minimum yield strength, minimum wall thickness as indicated in this Section, in the Plans, or as required by the applicable authority (e.g. NCDOT, applicable Railroad Authority, etc.), whichever is more restrictive, full circumference welded joints in accordance with AWS D1.1 to withstand excavation forces.

2.2 CARRIER PIPE MATERIALS

A. Carrier pipe shall be restrained joint ductile iron pipe as specified in *Section 33 11 00 - Water Utility Distribution Piping, Section 33 31 13 - Gravity Sewers, or Section 33 34 00 - Force Mains*, whichever is applicable.

2.3 GROUT AND COVER MATERIALS

A. Soil Backfill for Trench Approaches and Pits to Finish Grade: As specified in *Section 31 23 17 - Trenching.*

B. Fill and Seal Grout at Pipe Ends: Mortar conforming to Section 1040 of NCDOT Standard Specifications proportioned as described below. Do not add more water than is necessary to make a workable mixture.

1. Mix No. 1: 1 part Portland cement, 1/4 part hydrated lime, 3-3/4 parts mortar sand (maximum).
2. Mix No. 2: 1 part Portland cement, 1 part masonry cement, 6 parts mortar sand (maximum).

C. Pressure Grout Mix: One part Portland cement and six parts mortar sand mixed with water to consistency applicable for pressure grouting.

2.4 ACCESSORIES

A. Supports and Insulators:

1. Steel and Plastic: 14 gauge stainless steel band, stainless steel flange bolts, heavy duty PVC liner, polyethylene or phenolic skids.

B. Steel Strapping: ASTM A36.

C. Concrete: Class A Concrete conforming to Section 1000 of the NCDOT Standard Specifications.

1. Compressive strength of 3,000 psi at 28 days.
2. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular aggregate.
3. Maximum slump of 3 ½-inches for vibrated concrete and 4-inch for non-vibrated concrete.
4. Minimum cement content of 564 pounds per cubic yard for vibrated concrete and 602 pounds per cubic yard for non-vibrated concrete.

PART 3 EXECUTION

3.1 GENERAL: Entire project site shall be kept in strict accordance with OSHA Regulations.

3.2 EXAMINATION

A. Verify connection to existing piping system size, location, and invert elevations are in accordance with Drawings.

3.3 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities indicated to remain from damage.

C. Notify utility company to remove and relocate utilities.

D. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Establish minimum separation from other utility piping in accordance with all applicable local and state requirements.

3.4 EXCAVATION AND BACKFILL

A. Excavate and backfill in accordance with *Section 31 23 17 – Trenching.*

3.5 DEWATERING

A. Intercept and divert surface drainage precipitation and groundwater away from excavation through use of dikes, curb walls, ditches, pipes, sumps, or other means.

B. Develop substantially dry subgrade for prosecution of subsequent operations.

C. Comply with all Federal, State and local requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

3.6 EXISTING WORK

A. Maintain access to existing facilities and other remaining active installations requiring access. Modify installation as necessary to maintain access.

3.7 PITS OR APPROACH TRENCHES

A. Excavate approach trenches or pits in accordance with the Plans and as site conditions require.

B. Ensure casing entrance face as near perpendicular to alignment as conditions permit.

C. Establish vertical entrance face at least 1-foot above top of casing.

D. Install dewatering measures and excavation supports as specified in *Section 31 23 17 - Trenching.*

3.8 CASING PIPE INSTALLATION

A. Boring:

1. Push pipe into ground with boring auger rotating within pipe to remove spoil. Do not advance cutting head ahead of casing pipe except for distance necessary to permit cutting teeth to cut clearance for pipe. Arrange machine bore and cutting head to be removable from within pipe. Arrange face of cutting head to provide barrier to free flow of soft material.
2. When unstable soil is encountered during boring retract cutting head into casing to permit balance between pushing pressure and ratio of pipe advancement to quantity of soil.
3. When voids develop greater than outside diameter of pipe by approximately one inch, pressure grout to fill voids.
4. When boring is obstructed, abandon boring, relocate jack or tunnel as directed by ONWASA.
5. Boring rig shall have laser-guided apparatus or other device to accurately align the encasement to the grade on the Drawings. Report in writing any deviation in the alignment and grade from that shown on Drawings.

6. Obstructions encountered during the boring operation or deflections in the bore resulting in less than 36-inches of soil cover above the casing unless otherwise approved by ONWASA, or less vertical separation between the surface and the top of the casing pipe as required by the applicable authority (e.g. NCDOT, applicable Railroad Authority) shall require the bore to be abandoned.
7. The abandonment procedure shall consist of cutting off the excess pipe, capped then filled with Portland cement grout (1:3 parts cement to sand) at sufficient pressure to fill all voids.

Encasement Pipe Table

Carrier Pipe Nominal Diameter	Encasement Pipe Diameter	Minimum Thickness
4"	8" (I.D.)	0.188"
6"	12" (I.D.)	0.188"
8"	16" (I.D.)	0.250"
10"	18" (I.D.)	0.250"
12"	20" (I.D.)	0.250"
16"	26"	0.312"
18"	28"	0.312"
20"	30"	0.312"
24"	36"	0.375"

B. Jacking:

1. Construct adequate thrust wall normal to proposed line of thrust.
2. Impart thrust load to pipe through suitable thrust ring sufficiently rigid to ensure uniform distribution of thrust load on full pipe circumference.

C. Drilling and Jacking:

1. Use oil field type rock roller bit or plate bit made up of individual roller cutter units solidly welded to pipe which is turned and pushed for its entire length by drilling machine to give bit necessary cutting action.
2. Inject high density slurry (oil field drilling mud) to head as cutter lubricant. Inject slurry at rear of cutter units to prevent jetting action ahead of pipe.

D. Mining and Jacking: Utilize manual hand mining excavation from within casing pipe as casing is advanced with jacks, allowing minimum ground standup time ahead of casing pipe.

E. Length of encasement shall be determined as follows:

1. Cut Sections: Ditch line to ditch line
2. Fill Sections: 5-feet beyond toe of slope
3. Curb Sections: 3-feet beyond curb
4. Future highway or railroad right of way: Extend full width of R/W or unless otherwise noted.

3.9 PRESSURE GROUTING

A. Pressure grout annular space between casing pipe and surrounding earth. Pressure levels shall not be such that damage occurs to adjacent areas (i.e. pavement).

3.10 CARRIER PIPE INSTALLATION

A. Clean, inspect, and handle pipe in accordance with applicable Section for carrier pipe.

B. Exercise care to prevent damage to pipe joints when carrier pipe is placed in casing.

C. Support pipeline within casing so no external loads are transmitted to carrier pipe. Attach supports to barrel of carrier pipe; do not rest carrier pipe on bells.

1. Use minimum 2 supports per joint of carrier pipe as shown in ONWASA's Standard Detail.

D. Grout ends of casing to seal.

3.11 TOLERANCES

A. Do not over cut excavation by more than 1-inch greater than outside diameter of casing pipe.

B. Install casing pipe to vertical and horizontal alignment on Drawings within plus or minus 3-inches prior to installation of carrier pipe.

C. Install pipe bells with minimum ½-inch clearance to casing.

3.12 FIELD QUALITY CONTROL

A. Compaction Testing: As specified in *Section 31 23 17 - Trenching*.

END OF SECTION

SECTION 33 11 00
WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings for potable water line and fire water line.
2. Valves and Valve Boxes
3. Fire Hydrant Assembly.
4. Tapping Sleeves and Valves.
5. Air Release valves.
6. Pipe Markers.
7. Thrust Blocking.
8. Pressure Testing

B. Related Sections:

1. *Section 03 11 13 - Cast-in-place Concrete*
2. *Section – Trenching31 23 16.13*
3. *Section - Utility Manholes and Structures33 05 13*
4. *Section 33 05 19 - Pressure Piping Restraint.*
5. *Section 33 05 23 - Trenchless Utility Installation*
6. *Section - Utility Horizontal Directional Drilling33 05 23.13*
7. *Section 33 12 13 - Water Service Connections*
8. *Section 33 13 00 - Disinfecting of Water Utility Distribution*

1.2 DEFINITIONS

A. Owner: Onslow Water and Sewer Authority - ONWASA.

1.3 QUALITY ASSURANCE

A. All pipes, fittings, valves, and appurtenances shall be appropriately marked for identification purposes. The materials, methods of manufacture and completed pipes, fittings, valves, and appurtenances shall be subject to inspection and rejection at all times. ONWASA and ENGINEER have the right to make inspections.

B. Perform Work in accordance with ONWASA Standards and Sections 1500, 1510, and 1515 of NCDOT Standard Specifications except as modified here-in

C. Brass and bronze materials in contact with potable water shall contain No Lead Alloy (UNS/CDA No. C89833).

D. PVC pipe that has faded color due to extended exposure to sun and weather shall not be acceptable for use

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, services, valves, fire hydrant assemblies, thrust restraints, and invert elevations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with manufacturer's name and pressure rating labeling in place.

B. Block individual and stockpiled pipe lengths to prevent moving.

C. Do not place pipe or pipe materials on private property without written consent of the property owner or in areas obstructing pedestrian or vehicle traffic.

D. Store PVC pipe out of sunlight or under black polyethylene plastic or other suitable opaque material. Store rubber gasket rinds in shipping cartons out of sunlight and away from oil and grease until ready for use.

E. At no time shall other pipes or material be placed in the pipes.

PART 2 PRODUCTS

2.1 WATER PIPING

A. Ductile Iron Pipe (DIP): AWWA C151. Bituminous outside coating: AWWA C151. Cement Mortar Lining: AWWA C104. All water mains 18-inches in diameter and greater shall be ductile iron.

1. Pressure Class: 350 for pipe 12" in diameter and less
2. Pressure Class: 250 for pipe 14" in diameter and up
3. Fittings: Ductile Iron, AWWA C110. Compact Fittings, Ductile Iron, AWWA C153.
   a. Coating: Bituminous Coating, AWWA C110.
   b. Lining: Cement Mortar Lining, AWWA C104.
4. Joints:
   a. Mechanical Joints: AWWA C111.
   b. Push-On Joints: AWWA C111.
   c. Flanged Joints: AWWA C115. (Above ground installation only)
   d. Boltless Restrained Joints: Boltless, push-on type, joint restraint independent of joint seal. Conform to pipe manufacturers specifications. Required for carrier pipe installed through steel casing.
   e. Restrained Joints: Per *Section 33 05 19 – Pressure Piping Joint Restraint.*

B. Polyvinyl Chloride (PVC): AWWA C900 (6-inch to 12-inch), AWWA C905 (14-inch through 16-inch), and SDR-21 (2-inch in diameter). All PVC water mains shall be marked with NSF 61 designation for potable water use.

1. Pipe Class: PVC C900 and C905
   a. Pressure Rating: 235 psi minimum
   b. Color: Blue
   c. Fittings: Ductile Iron, AWWA C110. Compact Fittings, Ductile Iron, AWWA C153
   d. Joints:
      1. ASTM D3139 PVC with ASTM F477 flexible elastomeric seals. Solvent-cement couplings are not permitted.
      2. Ductile Iron, Mechanical Joint, AWWA C110
2. Pipe Class: SDR-21, Iron Pipe Size (IPS), ASTM D2241, ASTM D1784
   a. Pressure Rating: 200 psi minimum
   b. Fittings:
      1. Ductile Iron, AWWA C110. Compact Fittings, Ductile Iron, AWWA C153
   c. Joints:
      1. ASTM D3139 PVC with ASTM F477 flexible elastomeric seals. Solvent-cement fittings are not permitted.
      2. Ductile Iron, Mechanical Joint, AWWA C110

C. Polyethylene Pipe: See *Section 33 05 24 – Utility Horizontal Directional Drilling*

2.2 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves

1. Manufacturers:
   a. M&H Company.
   b. Mueller Company.
   c. Romac
   d. Ford Meter Box Company
2. Requirements:
   a. Stainless Steel, ductile iron or cast-iron dual compression type.
   b. Outlet Flange Dimensions and Drilling: MSS SP-60.

B. Tapping Valves:

1. Manufacturers:
   a. M&H Company
   b. American Flow Control
   c. Mueller
   d. Clow
2. Requirements:
   a. AWWA C500, non-rising stem. Inlet flanges shall conform to ANSI B16.1, Class 125 and MSS SP-60.
   b. Mechanical joint outlets shall conform to AWWA C111.
   c. Operating Nut: 2-inch square
   d. Coating: AWWA C550, interior and exterior
   e. Maximum Working Pressure: 250 psi

2.3 RESILIENT WEDGE GATE VALVES

A. Manufacturers:

1. M&H Company.
2. Mueller Company.
3. American Flow Control
4. Clow

B. Resilient Wedge Gate Valves: AWWA C509 or C515; iron body, bronze or ductile iron.

1. Elastomeric Polydisulfide (EPDM) encapsulated valve gate
2. Stem: Non-rising bronze stem.
3. Operating Nut: 2-inch Square; open counterclockwise unless otherwise indicated.
4. Ends: Mechanical joint end connections for valves greater than 2-inch. IBBM end connections for 2-inch gate valves. Flanged joints are approved for above-ground or in-vault installations only.
5. Coating: AWWA C550; interior/exterior.
6. Maximum Working Pressure: 250 psi

2.4 BUTTERFLY VALVES

A. Manufacturers:

1. Clow.
2. M&H Company.
3. Mueller Company.

B. Size 4-Inch to 24-Inch for above ground applications: AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, ten infinite position lever handle (unless otherwise shown on the Drawings).

C. Size 16-Inch and larger for buried applications: AWWA C504, iron body per ASTM A126 Class B, cast iron disc per ASTM A48A capable of an uninterrupted 360 degree seating edge, solid 316

stainless steel disc seating edge, 316 stainless steel torque screw to secure disc to valve shaft, elastomeric polydisulfide (EPDM) seat molded in and vulcanized to valve body, traveling nut manual actuators.

2.5 VALVE BOXES

A. Valve boxes shall be of roadway extension type, of proper length and base size with suitable detachable cover, coated inside and out with a good asphaltum paint, domestically casted. Boxes shall be Tyler Union 6850 Series, Bingham & Taylor I5B20W, or East Jordan Iron Works 8550 Series two-piece valve box, screw type. The cast iron lid shall be marked "WATER"

2.6 FIRE HYDRANT ASSEMBLY

A. Manufacturers:

1. Mueller Company, Centurion.
2. Clow, Medallion

B. Furnish materials in accordance with ONWASA requirements.

C. Dry-barrel Break-away Type: AWWA C502; cast-iron body, compression type valve.

1. Bury Depth: As indicated on the Drawings.
2. Inlet Connection: 6-inch mechanical joint shoe connection.
3. Valve Opening: 4 ½-inch diameter.
4. Ends: Mechanical Joint.
5. Bolts and Nuts: Corrosion resistant.
6. Coating: AWWA C550; interior.
7. Direction of Opening: Counterclockwise.
8. Operating Nut: National Standard Pentagon (1 ½-inchpoint to flat).
9. Self-draining, non-freezing, 2-inch mechanical joint shoe inlet connection, one 2 ½-inch NST outlet connection with a 2 1/8-inch bronze main seat valve opening

D. One pumper, two hose nozzles.

1. (2) 2 ½-inch and (1) 4 ½-inch outlets – National Standard threads.
2. Attach nozzle caps by separate chains.
3. Storz Adapters shall be installed on the 4 1/2" outlets

E. Finish: Primer and two coats of enamel, painted fire hydrant red above ground line.

F. Fire Hydrant Extensions: maximum 24" per hydrant

2.7 AIR RELEASE/VACUUM VALVES

A. Manufacturers:

1. Crispin Valve Co. (AL SERIES)
2. Valmatic Valve and Manufacturing Corp. (Series 100)

B. Air release valves shall be located at all high points along water mains where the distance between the high point and the low point in the pressure main exceeds fifteen feet (15') in elevation. ONWASA may require additional air release valves to be provided at other locations where it is determined that the possibility exists for the accumulation of excess air in the main.

2.8 UNDERGROUND PIPE MARKERS

A. Locator Tape: Brightly colored blue tape continuously printed with "WATER LINE" in large letters, minimum 6-inch wide by 4 mils thick shall be installed and buried 1.5 to 2 feet from the top of the water line

B. Tracer wire: 10-Gauge insulated wire blue in color shall be installed along the top of the water line to aid in locating the pipe for maintenance purposes. The wire shall be continuous and uninterrupted, and brought to the surface as specified in this Section.

2.9 ABOVE-GROUND PIPE MARKERS

A. The standard above-ground utility markers shall be Rhino Tri-View Markers, Model No TVF66UB. Above-ground utility markers designed to provide access to tracer wire shall be Rhino Tri-View markers, Model No.TVTI66UW2. Decals as shown in ONWASA's Standard Detail shall be placed on all three sides. Above-ground pipe markers are not required inside residential developments.

B. Concrete monument markers 6" X 6" X 36" reinforced with rebar with bronze utility markers stamped "WARNING BURRIED WATER MAIN, CALL 811 BEFORE YOU DIG" drilled and epoxied into the top of the monument per Standard Detail .Concrete monument markers shall be installed to a depth of 18" immediately above the water main at the entry and exit site of all directional drill locations where water mains cross any body of water or wetland area. When installation takes place after the work has been completed, the monuments shall be installed only after confirming the location of the water main below.

2.10 METER AND METER ENCLOSURES- See *Section 33 12 13 – Water Service Connections*

2.11 CONCRETE FOR THRUST RESTRAINT, ENCASEMENT AND CRADLES

A. Concrete: Class B Concrete conforming to Section 1000 of the NCDOT Standard Specifications.

1. Compressive strength of 2,500 psi at 28 days.
2. Water cement ratio of 0.488 with rounded aggregate and 0.567 with angular aggregate.
3. Maximum slump of 2 ½-inches for vibrated concrete and 4-inch for non-vibrated concrete.
4. Minimum cement content of 508 pounds per cubic yard for vibrated and 545 pounds per cubic yard for non-vibrated concrete.

2.12 BEDDING AND COVER MATERIALS

A. Backfill around Pipe and Above Pipe: As specified in *Section 31 23 17 -Trenching.*

B. Reference WS_ED "Water Main Embedment Details" in Details.

2.13 ACCESSORIES

A. Steel rods, bolt, lugs and brackets: ASTM A36 or ASTM A307 carbon steel.

B. Polyethylene Jackets: AWWA C105 polyethylene jacket. Single layer, lapped over pipe joint, and secured with 10-mil polyethylene tape.

PART 3 EXECUTION

3.1 GENERAL: Entire Project site shall be in strict accordance with OSHA Regulations.

3.2 PREPARATION

A. Prior to Start of Construction

1. Materials will be checked at the site of construction to verify conformance with approved materials. Any materials not in accordance with ONWASA Standards or approved by the Technical Operations Supervisor, or his designee, at the job site will not be assumed for use.

CONTRACTOR will be directed to remove these materials from the area before work can proceed. CONTRACTOR may be directed to expose any work suspected of containing Inferior materials. Failure, by the Inspector, to notice faulty materials or work does not relieve the CONTRACTOR of his responsibility to provide a completed final product that meets the requirements of the plans and specifications. Any inferior materials discovered will be replaced without charge for rework to ONWASA.

2. ONWASA requires a minimum of forty eight (48) hours' notice before construction is to begin so that ONWASA can schedule construction inspection for the work. Should the prosecution of the work for any reason be temporarily discontinued, the CONTRACTOR shall notify ONWASA at least twenty-four (24) hours in advance of resuming operations.

B. Surveys, Lines and Grades

1. The CONTRACTOR shall establish a Project survey control network, with both horizontal (NAD 83 datum or latest correction) and vertical (NAVD 88 datum or latest correction) controls, and develop and make any detailed surveys he deems necessary to construct the project in accordance with the contract requirements. The CONTRACTOR shall carefully preserve all reference points or existing survey markers and in the case of willful or careless destruction thereof, the CONTRACTOR shall be charged with the resulting expense, and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

C. Traffic Flow and Safety

1. The CONTRACTOR shall maintain traffic flow and control at all times. CONTRACTOR shall comply with all requirements, suggestions and/or directions of the local Police Department, North Carolina Department of Transportation, and maintain OSHA Compliance concerning traffic control and safety. All necessary precautions shall be taken to affect the full safety of the public as well as the workmen on the job. In any section of the work for which ONWASA must obtain an encroachment from the N.C. Department of Transportation for cutting a paved street, or working in the DOT right-of-way, the CONTRACTOR shall follow the requirements as set out in the approved DOT Encroachment Agreement. The DOT approved traffic control plan shall set forth the method and manner by which the CONTRACTOR shall provide for the convenience and safety of the traveling public. However, if during construction, it is determined by ONWASA, Police Department, DOT or the CONTRACTOR that additional measure is needed; the CONTRACTOR shall discontinue work and implement whatever measures are required for the safety of the public. Work shall not resume until the required safety measures are in place.
2. All encroachment bonds required by the Department of Transportation will be secured by the CONTRACTOR at his own expense.
3. No extra payment will be allowed for securing the required bond or for the implementation of a traffic control plan. The costs of the bond and implementation of traffic control measures shall be included in the bid price for each item in the proposal.

D. Water Service Cut-Off

1. When there are CITY OF JACKSONVILLE and ONWASA waterlines within the limits of a project. The following procedure applies to both the CITY OF JACKSONVILLE and ONWASA.

2. The CITY OF JACKSONVILLE/ONWASA requires adherence to the following procedures prior to shutting off water service on any existing CITY OF JACKSONVILLE/ONWASA lines:

   a. The CONTRACTOR must receive approval for shut-off from the CITY OF JACKSONVILLE Public Utilities Director/ ONWASA Distribution/Collections Superintendent. Generally, shut-offs must occur from 9 a.m. to 11 a.m. and 2 p.m. to 4 p.m. on weekdays.
   b. After receiving approval, CONTRACTOR shall notify affected residents twenty-four (24) hours in advance of beginning operation.

c. All valves to be closed or opened are to be operated by the CITY OF JACKSONVILLE Public Utilities Department/ONWASA.

3. If any water mains are damaged and service interrupted, the utility OWNER (CITY OF JACKSONVILLE or ONWASA) shall immediately be contacted and CONTRACTOR shall conduct repairs in accordance with the utility OWNER'S specifications and requirements, in order to restore water to the customers.

4. NO ONWASA valves are to be operated without prior approval of the ONWASA Distribution/Collections Superintendent (910.937.7560). Except in emergency situations, the Contractor shall request approval in writing (e-mail is preferable) no less than 48-hours prior to event, stating reason, length of outage, and number and location of customers affected.

5. Verify existing conditions before starting work. Verify existing water main size, location, and inverts are as indicated on Drawings.

3.3 EXCAVATION

A. Excavate pipe trench in accordance with *Section 31 23 17 - Trenching* for Work of this Section.

B. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

C. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation. . The Contractor is responsible for utilizing dewatering systems in accordance with good standard practice. The dewatering systems must be efficient enough to lower the water level in advance of the excavation and to maintain it continuously to keep the trench bottom and sides firm and dry. Groundwater shall not be allowed to rise around the pipe until after the trench is backfilled. Disposal of groundwater shall be in a suitable manner so as to not cause damage to adjacent property or facilities, or be a threat to public health. Pipe shall not be installed in a wet or frozen trench.

D. Provide sheeting and shoring as required.

E. Place bedding material at trench bottom and shape for accurate placement and proper support of pipe.

F. Carefully place and tamp bedding material so as not to damage or displace joints or pipe. Do not drop material directly on pipe.

G. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION – PIPE AND FITTINGS

A. Installation of waterlines shall be located within dedicated street right of ways or a 20-foot (minimum) water main easement publicly dedicated to ONWASA.

B. Install ductile iron pipe and fittings in accordance with AWWA C600 and manufacturer's instructions unless stricter requirements are noted in this Section.

C. Install PVC pipe in accordance with AWWA C605 and manufacturer's instructions unless stricter requirements are noted in this Section.

D. PVC pipe shall be deflected onto a radius no smaller than 1.2 times the minimum radius set out in the PVC Pipe Handbook. Ductile iron joint deflections shall be no greater than 80 percent of the maximum set out in the Ductile Iron Handbook.

E. Each fitting and section of pipe shall be inspected for defects prior to installation.

F. Each fitting shall be secured by two forms of restraint. Restraining glands and concrete thrust blocking are preferred. Wedge-action restraint glands (i.e. MEGALUGS) are approved only for use on ductile iron pipe. Full-circumferential pipe restraint glands (i.e. Grip Rings) may be used on PVC or ductile iron pipe. All restraint glands shall be designed for use on the type of pipe for

which they are being installed. Other forms of restraint such as threaded rod, bell restraint harnesses, etc. may be approved by ONWASA on a case-by-case basis.

G. Handle and assemble pipe in accordance with manufacturer's instructions and as indicated on Drawings.

H. Required Separation Between Pipe Systems:

1. Lateral Separation of Sewer and Water Mains. Water mains shall be laid at least 10- feet laterally from existing or proposed sewers, unless local conditions or barriers prevent a 10-foot lateral separation -- in which case
   a. The water main is laid in a separate trench, with the elevation of the bottom of the water main at least 18-inches above the top of the sewer; or
   b. The water main is laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation *of* the bottom of the water main at least 18-inches above the top of the sewer.
2. Crossing a Water Main over a Sewer. Whenever It is necessary for a water main to cross over a sewer or storm sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 18-inches above the top of the sewer or storm sewer, unless local conditions or barriers prevent an 18-inch vertical separation -- in which case both the water main and the sewer or Storm Sewer shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10-feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.
3. Crossing a Water Main under a Sewer or storm sewer. Whenever it is necessary for a water main to cross under a sewer or storm sewer, both the water main and the sewer shall be constructed of ferrous materials and with joints equivalent to water main standards for a distance of 10-feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing. If water line is incased and the steel casing is run 10 feet past the sewer pipe, will it be allowed not to change the force main or gravity sewer to a ferrous material?
4. In accordance with NCAC Title 15A Ch.18C Section 0.0906 and NCAC Title 15 Ch.2 M 0.0200, ONWASA interpretation of this ruling shall be as follows for a new development; Whenever a Sewer Main crosses above or below a water main and the minimum clearance will not be met, both pipes shall be constructed of ferrous material for a distance of 10-feet on center in each direction, however, any areas pre-existing shall be handled on a case by case basis.
5. Crossing a Water Main or Sewer Main under a Storm Sewer Main.
   a. When water mains cross under a storm sewer main with less than 24-inches separation at depths of 6' or less, the main may be deflected to provide 24-inches of separation and shall be constructed of ductile iron pipe or as shown on the plans. One joint of pipe shall be centered under the storm drain
   b. When water mains cross under a storm sewer main with less than 24-inches separation at depths greater than 6', the main must be lowered as shown in the Culvert Crossing Detail utilizing restrained joint ductile iron pipe for the entire length of the crossing structure.
   c. When sewer mains cross under a storm sewer with less than 24-inches separation, the main shall be constructed of ductile iron pipe or as shown on the plans. One joint of pipe shall be centered under the storm drain. Install pipe in locations and at grades as specified, except as otherwise permitted by ONWASA. Pipe shall be installed to designed elevation to within tolerance of ½-inch.

I. The pipe and fittings shall be kept thoroughly clean of any water, earth, stones, or other debris until work is completed and accepted by ONWASA. Open ends of the pipe shall be capped or plugged with a water-tight fitting during periods of work stoppage.

J. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. The use of chisels or hand saws will not be permitted. Grind edges smooth with beveled end for push-on connections.

K. Remove scale and dirt on inside and outside before assembly.

L. Pigging is required for pipe 8-inches in diameter and greater.

M. Flanged Joints: Not to be used in underground installations except within structures.

N. Install in open cut, except where otherwise required or permitted by ONWASA.

1. Where installed by free boring, extend hole 5 feet each side of pavement, thread pipe into hole from boring pit with leading end of first pipe covered to prevent damage and the entry of earth, and fill space around pipe with grout.
2. All piping that is dry-bored shall be ductile iron.
3. Where installed within steel encasement pipe, refer to *Section 33 05 23 - Trenchless Utility Installation*.
4. Install concrete monument markers directly above the pipe at the entrance and exit points of the bore

O. Install pipe with no high points unless shown on the plans. If unforeseen field conditions arise which necessitate high points, install air release valves as directed by the ENGINEER.

P. Install pipe to allow for expansion and contraction without stressing pipe or joints.

Q. Install access fittings to permit required testing.

R. When necessary to cut pipe at fittings, valves, or elsewhere, the remaining portions may be used to minimize the number of scrap pieces when the work is complete; however, scrap pieces less than 5-feet in length shall not be used.

S. Install underground marking tape continuously above pipe line 12 to 18 inches below the ground surface.

T. Install and secure trace wire to the pipe with duct tape near every bell and at the center of each pipe joint. The wire shall be fastened securely to all fittings as directed by ONWASA. Splices in the tracer wire shall be connected by means of a waterproof and corrosion-proof connectors designed for direct bury applications. Standard wire nuts are not acceptable. The connection shall then be completely wrapped in electrical tape. There shall be no exposed bare wire. The tracer wire shall be made accessible through above-ground utility markers as specified in this Section. In residential developments, trace wire shall be made accessible in valve boxes, vaults, etc.

U. Install above-ground utility markers at horizontal bends, main-line valve boxes (not within 10 feet of a fire hydrant assembly branch), each side of a roadway crossing, and along the piping alignment. The maximum spacing for the above-ground utility markers shall be 500 linear feet. In locations where there are multiple horizontal bends in close proximity, one marker will be sufficient to demonstrate the change in direction. Utility markers designed to provide access to tracer wire shall be installed at every third marker, or every 1000 feet of pipe, whichever is less. Concrete monument markers shall be installed at the ends of directional bores and bank edge of all channels crossed by directional bores, Tracer wire accessible above-ground utility markers shall also be installed at ends of directional bores.

V. Establish elevations of buried piping with not less than 3-feet of cover. Measure depth of cover from final surface grade to top of pipe barrel.

W. Backfill trench in accordance with *Section 33 23 17 – Trenching*.

X. Make connections at such times and using fittings as approved by ONWASA. Connections to existing pipes shall be made by ductile iron mechanical joint sleeves with transition gaskets as necessary, or stab fit, wide range gasketed sleeves (i.e. Hymax Coupling) suitable for water service as determined by the sleeve manufacturer. Flexible couplings (i.e. Fernco) shall not be permitted on water mains.

3.5 INSTALLATION – FIRE HYDRANT ASSEMBLY

A. Install Fire Hydrant; use hydrant tees, provide support blocking and drainage gravel; do not block drain hole. Fire Hydrant Assemblies will require installation of a restraint joint system.

B. Set hydrants plumb with pumper nozzle facing roadway; set hydrants with centerline of pumper nozzle 18-inches above finished grade and ensure the finish grade includes any foreseen landscaping material such as rock, mulch or sod, etc. Under no circumstances shall the hydrant maximum bury line fall below the finish grade.

C. When hydrant extensions are necessary, they shall be installed prior to testing. No more than one hydrant extension shall be installed on any hydrant and hydrants shall not be extended more than 2'. If a hydrant requires an extension greater than 2', it shall be replaced with a hydrant of adequate height for the location.

D. Paint hydrants fire hydrant red to ground line.

E. After hydrostatic testing, flush hydrants and check for proper drainage.

F. When construction conditions require, Fire Hydrant Assemblies shall be protected with the installation of bollards.

G. Fire hydrants located inside the City of Jacksonville's Extra Territorial Jurisdiction (ETJ) area shall meet the requirements of the City of Jacksonville.

3.6 INSTALLATION – VALVES

A. Install valves in conjunction with pipe installation; set valves plumb.

B. Provide buried valves with valve boxes installed flush with finished grade and centered over the valve so that the operating nut is easily and fully accessible.

C. Adjust valve boxes to final grade at the time designated by ONWASA.

D. Install concrete support underneath valves as indicated in the Detail.

E. All valve boxes outside pavement shall have a standard concrete valve collar or a 2' x 2' x 4" pad of concrete poured around the valve boxes. Where there are multiple valve boxes in close proximity and the valve boxes are too close to install whole valve pads on each one, a single concrete pad shall be poured of sufficient size to provide a minimum of 8" of concrete around the outer edge of the valve boxes. No valve pads are to be cut.

3.7 INSTALLATION – AIR RELEASE / VACUUM VALVES

A. Air release/vacuum valves shall be installed in minimum 5-foot inside diameter vented manholes with solid concrete bottoms in accordance with *Section 33 05 14 – Utility Manholes and Structures* and ONWASA's Standard Details.

3.8 INSTALLATION - TAPPING SLEEVES AND VALVES

A. Install tapping sleeves and valves in accordance with ONWASA requirements, as indicated on Drawings, and in accordance with manufacturer's instructions. ONWASA is to be notified a minimum of 48 hours prior to any tap being made. ONWASA's requirements include pressure testing the tapping sleeve in the presence of an ONWASA representative.

B. Once installed, tapping sleeves shall be pressure tested at 100 psi (water pressure) for 10 minutes to ensure no leakage.

C. Whenever a reverse tap (backside tap) is required, all fittings **MUST** be restrained from the wet tap valve all the way to the casing using stainless steel threaded rod as well as restraint glands (mega-lugs or grip rings).

D. Only licensed UTILITY CONTRACTORS will be allowed to make taps on ONWASA water lines.

3.9 INSTALLATION - CONCRETE THRUST RESTRAINT

A. Provide concrete thrust restraint for valves, tees, bends, caps, plugs, and dead ends with concrete thrust blocks as indicated on the Drawings. Thrust should be located to resist resultant force and so pipe and fittings will be accessible for repair

B. Fittings shall be wrapped in polyethylene prior to pouring the concrete thrust blocking to protect the fittings, glands, bolts, etc. from direct contact with the concrete.

C. The concrete for the thrust blocks shall be mixed outside the excavation in a clean container with potable water. Mixing of concrete in the excavation using ground or surface water, or placement of dry, unmixed bags of concrete behind fittings shall not be allowed.

D. Pour concrete thrust blocks against undisturbed earth. Do not encase fittings, glands, bolts, etc.

3.10 INSTALLATION - POLYETHYLENE ENCASEMENT

A. Encase Ductile Iron Piping in polyethylene where indicated on Drawings to prevent contact with surrounding backfill material.

B. Install in accordance with AWWA C105.

C. Terminate encasement 3 to 6-inches above ground where pipe is exposed.

3.11 INSTALLATION - JOINT RESTRAINT

A. Install joint restraint in accordance with *Section 33 05 19 – Pressure Piping Joint Restraint.*

3.12 INSTALLATION - SERVICE CONNECTIONS

A. Install service connections in accordance with *Section 33 12 13 – Water Service Connections.*

3.13 BACKFILLING

A. Backfill and compact around sides and to top of pipe in accordance with *Section 31 23 17 - Trenching.*

B. Maintain optimum moisture content of material to attain required compaction density.

3.14 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with *Section 33 13 00 - Disinfecting Water Utility Distribution.*

3.15 FIELD QUALITY CONTROL

A. The Contractor shall conduct preliminary pressure, leakage, and tracer wire testing prior to the witnessed tests to verify the tests will pass on the first attempt. If the Contractor schedules a required test in advance and the test is not ready to begin at the scheduled time, the Contractor will be required to reimburse ONWASA for all costs to ONWASA associated with the delay.

B. Check valve boxes after installation to ensure the valves are installed plumb and centered over the valve operating nut. Remove stones, dirt, debris, and backfill material.

C. Compaction Testing: Perform soil compaction tests in accordance with *Section 31 23 17 - Trenching.*

D. Trace Wire Testing: Contractor shall perform a continuity test on all trace wire in the presence of an ONWASA representative. If the trace wire is found to be not continuous after testing, the Contractor shall repair or replace the failed segment of the wire. Continuity test shall be repeated as necessary.

E. Notification: Notify ONWASA and, if necessary, the testing agency 72 hours in advance of all required testing and have test witnessed.

F. Test Pressure: Not less than 150 psi. The test will result in automatic failure if the test pressure drops below 150 psi and fails a leakage test.

G. Prior to conducting pressure testing, the Contractor shall demonstrate to the ONWASA Representative that all valves in the system are fully opened.

H. Pressure and Leakage Test Procedure:

1. Pressure and leakage testing is the responsibility of the Contractor, who shall provide all materials, labor, and equipment, and pay for the total volume of water used. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct pressure and leakage tests in accordance with AWWA C600 unless otherwise required by this Section.
2. Conduct tests for at least two-hour duration.
3. Pipeline installations that lose more than 5 psi at completion of the Hydrostatic Pressure Test will be required to pass an Allowable Leakage Test.
4. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and apply test pressure. At conclusion of tests, remove corporation cocks and plug resulting piping openings.
5. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
6. Examine exposed piping, fittings, valves, hydrants, and joints carefully during pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
7. No pipeline installation will be approved when leakage test, if required, is greater than that determined by the following formula:

$$AL = \left(\frac{L}{5280}\right) \cdot \left(\frac{D \cdot 10}{12}\right)$$

AL = allowable leakage over 2-hour test period at 150 psi, in gallons
L = length of pipe tested, in feet
D = nominal diameter of pipe, in inches

8. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.
9. Test must be witnessed by ONWASA and the Certifying Engineer. Both parties must complete and sign ONWASA's Leakage/Hydrostatic/Chlorination and Flushing Form before the water line will be approved.

3.16 COMPLETION OF TESTS

A. After successful completion of testing, mains shall be flushed and cleaned and all connections made prior to acceptance.

3.17 CONNECTION TO EXISTING WATER SUPPLY SYSTEM

A. No connection shall be made to the existing water system unless and until the CONTRACTOR has obtained all necessary approvals from ONWASA.

B. Connections shall be made by approved methods and in accordance with the requirements of these specifications and ONWASA.

C. No pipe shall be opened until the new system is complete, tested and approved in accordance with these specifications, ONWASA's requirements under them, Final Approval has been received from the North Carolina Division of Environmental Quality, Division of Public Water Supply and (for projects with sanitary sewer systems) the North Carolina Division of Environmental Quality, Division of Water Quality has acknowledged receipt of the Engineer's Certification. Projects with off-site septic systems or private sewer systems must provide ONWASA with a copy of the approval letter of the permitting authority prior to water being turned on.

D. **IF MORE THAN 30 DAYS PASS BETWEEN INITIAL CHLORINATION AND THE PLACEMENT OF THE WATER LINES INTO SERVICE, THE NEW SYSTEM MUST BE RECHLORINATED AND PASS AN NEW BACTERIOLOGICAL TEST.**

END OF SECTION

SECTION 33 12 13
WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings for domestic water service connections to buildings.
2. Corporation stop assembly.
3. Curb stop assembly.
4. Water meters and meter setting equipment.
5. Backflow preventers.
6. Bedding and cover materials.

B. Related Section:

1. *Section – Trenching31 23 16.13*
2. *Section – Utility Manholes and Structures33 05 13*
3. *Section 33 11 00 - Water Utility Distribution Piping*
4. *Section 33 13 00 - Disinfecting of Water Utility Distribution*

1.2 DEFINITIONS

A. Owner: Onslow Water and Sewer Authority - ONWASA

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ONWASA Standards and Sections 1500, 1510, and 1515 of NCDOT Standard Specifications.

B. All pipes, fittings, valves, and appurtenances shall be appropriately marked for identification purposes. The materials and methods of manufacture, and completed pipes, fittings, valves, and appurtenances shall be subject to inspection and rejection at all times. ONWASA and ENGINEER have the right to make inspections.

C. Brass and bronze materials in contact with potable water shall contain No Lead Alloy (UNS/CDA No. C89833).

1.4 DELIVERY, STORAGE, AND HANDLING

A. During loading, transporting, and unloading of materials and products, exercise care to prevent any damage.

B. Store products and materials off ground and under protective coverings and custody, away from walls and in manner to keep these clean and in good condition until used.

C. Exercise care in handling precast concrete products to avoid chipping, cracking, and breakage.

PART 2 PRODUCTS

2.1 WATER PIPING AND FITTINGS

A. Polyethylene Pipe: AWWA C901 CTS Equivalent O.D.

1. Standard Dimension Ratio: SDR-9
2. Pressure Rating: 200 psig
3. Fittings: AWWA C901 molded or fabricated.
4. Joints: Compression

B. Polyvinyl Chloride(PVC): SDR-21, Iron Pipe Size (IPS), ASTM D2241, ASTM D1784. All PVC water service lines shall be marked with NSF 61 designation for potable water use.

1. Pressure Rating: 200 psi minimum
2. Fittings:
   a. PVC fittings conforming to pipe requirements pressure rated to exceed pipe class.
   b. Ductile Iron, AWWA C110. Compact Fittings, Ductile Iron, AWWA C153
3. Joints:
   a. ASTM D3139 PVC with ASTM F477 flexible elastomeric seals for the pipe.
   b. Ductile Iron, Mechanical Joint, AWWA C110

2.2 CORPORATION STOP ASSEMBLY (for ¾ -inch and 1-inch taps)

A. Manufacturers:

1.	Ford Meter Box Company.	Model FB 1000-3-G-NL
2.	Mueller Company.	Model B-25008-N
3.	A.Y. McDonald Mfg. Co.	Model 74701 BT (Ball Valve Only).
4.	Cambridge Brass, Inc.	Model 301-NL-A3GJ3

Model numbers listed in this Section may be specific to a certain size, and may change due to size variations in the equipment. Features of each respective make and model listed in this Section shall remain the same.

Corporation stop assemblies will not be permitted on 1 1/2-inch and larger service taps. IBBM gate valves meeting the requirements of *Section 33 11 00 – Water Utility Distribution Piping* shall be installed for 1 ½-inch and larger service taps.

2.3 SERVICE SADDLES (¾-inch–2-inch Service Taps)

A. Manufacturers:

1. Romac Industries, Inc
2. Smith-Blair, Inc.
3. A. Y. McDonald Mfg. Co.
4. Mueller Company
5. Ford Meter Box Company

B. Brass and Bronze, single strap service saddles, manufactured specifically for the type of pipe being tapped, shall be installed on water mains 6-inches in diameter or less.

Double or triple-stud stainless steel service saddles, manufactured specifically for the type of pipe being tapped, shall be installed for all 2-inch and greater service taps, all SDR-26 PVC and AC water mains, and all water mains 8-inches in diameter and greater. Single-stud stainless steel service saddles are not acceptable. Service saddles for all SDR- 26 PVC and AC water mains shall be long and Romac style306 or Smith and Blair model 373.

C. 1 1/2-inch services will require a 2-inch service tap and 2-inch IBBM gate valve. The service may be reduced down from 2-inch diameter to 1 1/2-inch diameter downstream of the gate valve.

D. Insert for poly-tube shall be solid one piece Stainless Steel at compression fitting.

2.4 METER SETTING EQUIPMENT

A. Manufacturers:

1.	Ford Meter Box Company.	Model VB 72-7W-4133FPG-NL
2.	Mueller Company.	Model B2404-42-N
3.	A. Y. McDonald Mfg. Co.	Model 724-207-JXTD33-NL (Ball Valve Type Only)
4.	Cambridge Brass	Model 6020NL – 207H3D3-UO

Model numbers listed in this Section may be specific to a certain size, and may change due to size variations in the equipment. Features of each respective make and model listed in this Section shall remain the same.
NO METER SETTERS WILL BE AUTHORIZED ON 1½-INCH OR LARGER TAPS.

B. Outside Meter Setting:

1. Meter Yokes: Copper or iron, riser type assembly with bronze inlet inverted key angle valve expansion type outlet connection and Ell fitting; flared copper tubing connections both ends.
2. Meter Yokes: Copper or iron, inlet and outlet horizontal or vertical setting with matching couplings, fittings, and stops.

2.5 WATER METERS

A. ONWASA shall furnish and install 1-inch and smaller water meters.

B. ONWASA shall furnish 1 1/2-inch and larger meters at the current cost to ONWASA. Contact ONWASA for current pricing information and the amount of time necessary to order and receive the prepaid meters. The Contractor shall install the meters provided.

2.6 METER BOXES

A. Meter boxes for 2-inch meters and smaller shall be Oldcastle Precast Carson Model, DFW or NDS with solid HDPE plastic base. Meter boxes for 1 1/2-inch meters shall be jumbo-type. Brick supports shall be installed underneath meter boxes to prevent settling.
B. Meters greater than 2-inches shall be installed inside of a precast concrete vault.
C. Meter box lids for standard size meter boxes shall be constructed of solid cast iron, shaped to fit the meter box base. Plastic lids are acceptable for jumbo-type meter boxes.

The size of the meter box shall be sized to accommodate the equipment to be installed.

2.7 BACKFLOW PREVENTERS

A. Furnish materials in accordance with *ONWASA Backflow and Cross Connection Standards*. See ONWASA's website for requirements.

2.8 PRECAST CONCRETE VAULT

A. Conform to *Section* 33 05 14 - *Utility Manholes and Structures*.

B. Shape and Size: As indicated on Drawings.

2.9 CONCRETE

A. Concrete: Class B Concrete conforming to Section 1000 of the NCDOT Standard Specifications.

1. Compressive strength of 2,500 psi at 28 days.
2. Water cement ratio of 0.488 with rounded aggregate and 0.567 with angular aggregate.
3. Maximum slump of 2 ½-inches for vibrated concrete and 4-inch for non-vibrated concrete.
4. Minimum cement content of 508 pounds per cubic yard for vibrated and 545 pounds per cubic yard for non-vibrated concrete.

2.10 BEDDING AND COVER MATERIALS

A. Backfill around pipe and above pipe: As specified in *Section 31 23 17 -Trenching*.

PART 3 EXECUTION

3.1 GENERAL: Entire Project site shall be kept in strict accordance with OSHA Regulations.

3.2 PREPARATION

A. Prior to Start of Construction

1. Materials will be checked at the site of construction to verify conformance with approved materials. Any materials not in accordance with ONWASA Standards or approved by the Technical Operations Supervisor, or his designee, at the job site will not be assumed for use. CONTRACTOR will be directed to remove these materials from the area before work can proceed. CONTRACTOR may be directed to expose any work suspected of containing Inferior materials. Failure, by the Inspector, to notice faulty materials or work does not relieve the CONTRACTOR of his responsibility to provide a completed final product that meets the requirements of the plans and specifications. Any inferior materials discovered will be replaced without charge for rework to ONWASA.
2. ONWASA requires a minimum of forty-eight (48) hours' notice before construction is to begin so that ONWASA can schedule construction inspection for the work. Should the prosecution of the work for any reason be temporarily discontinued, the CONTRACTOR shall notify ONWASA at least twenty-four (24) hours in advance of resuming operations.

B. Surveys, Lines and Grades

1. The CONTRACTOR shall establish a project survey control network, with both horizontal (NAD 83 datum or latest correction) and vertical (NAVD 88 datum or latest correction) controls, and develop and make any detailed surveys he deems necessary to construct the project in accordance with the contract requirements. The CONTRACTOR shall carefully preserve all reference points or existing survey markers and in the case of willful or careless destruction thereof, the CONTRACTOR shall be charged with the resulting expense, and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

C. Traffic Flow and Safety

1. The CONTRACTOR shall maintain traffic flow and control at all times. CONTRACTOR shall comply with all MUTCD requirements as well as any requirements, suggestions and/or directions of the local Police Department, North Carolina Department of Transportation, and maintain OSHA Compliance concerning traffic control and safety. All necessary precautions shall be taken to affect the full safety of the public as well as the workmen on the job. In any section of the work for which ONWASA must obtain an encroachment from the N.C. Department of Transportation for cutting a paved street, or working in the DOT right-of-way, the CONTRACTOR shall follow the requirements as set out in the approved DOT Encroachment Agreement. The DOT approved traffic control plan shall set forth the method and manner by which the CONTRACTOR shall provide for the convenience and safety of the traveling public. However, if during construction, it is determined by ONWASA, Police Department, DOT or the CONTRACTOR that additional measure is needed; the CONTRACTOR shall immediately cease operations and implement whatever measures are required for the safety of the public. Work shall not resume until all necessary measures are in place
2. All encroachment bonds required by the Department of Transportation will be secured by the CONTRACTOR at his own expense.
3. No extra payment will be allowed for securing the required bond or for the implementation of a traffic control plan. The costs of the bond and implementation of traffic control measures shall be included in the bid price for each item in the proposal.

D. Water Service Cut-Off

1. When there are CITY OF JACKSONVILLE and ONWASA waterlines within the limits of a project. The following procedure applies to both the CITY OF JACKSONVILLE and ONWASA.
2. The CITY OF JACKSONVILLE/ONWASA requires adherence to the following procedures prior to shutting off water service on any existing CITY OF JACKSONVILLE/ONWASA lines:

a. The CONTRACTOR must receive approval for shut-off from the CITY OF JACKSONVILLE Public Utilities Director/ ONWASA Distribution/Collections Superintendent. Generally, shut-offs must occur from 9 a.m. to 11 a.m. and 2 p.m. to 4 p.m. on weekdays.
b. After receiving approval, CONTRACTOR shall notify affected residents twenty-four (24) hours in advance of beginning operation.
c. All valves to be closed or opened are to be operated by the CITY OF JACKSONVILLE Public Utilities Department/ONWASA.

3. If any water mains are damaged and service interrupted, the utility OWNER (CITY OF JACKSONVILLE or ONWASA) shall immediately be contacted and CONTRACTOR shall conduct repairs in accordance with the utility OWNER'S specifications and requirements, in order to restore water to the customers.
4. NO ONWASA valves are to be operated without prior approval of ONWASA Distribution/Collections Superintendent (910.937.7560). Except in emergency situations, the Contractor shall request approval in writing (e-mail is preferable) no less than 48-hours prior to event, stating reason, length of outage, and number and location of customers affected.
5. Verify existing conditions before starting work. Verify existing water main size, location, and inverts are as indicated on Drawings.

E. Verify building service connection and water main size, location, and invert are as indicated on Drawings.

3.3 INSTALLATION - CORPORATION STOP ASSEMBLY

A. Make connection for each different kind of water main using suitable materials, equipment and methods approved by the ONWASA.

B. Provide service clamps for mains other than of cast iron or ductile iron mains.

C. Screw corporation stops directly into tapped and threaded iron main at 10 and 2 o'clock position on main's circumference; locate corporation stops at least 12-inches apart longitudinally and staggered.

D. For plastic pipe water mains, provide full support for service clamp for full circumference of pipe, with minimum 2-inch width of bearing area; exercise care against crushing or causing other damage to water mains at time of tapping or installing service clamp or corporation stop.

E. Use proper seals or other devices so no leaks are left in water mains at points of tapping; do not backfill and cover service connection until approved by ONWASA.

3.4 EXCAVATION, BEDDING AND BACKFILL

A. Excavate pipe trench in accordance with *Section 31 23 17 - Trenching* for Work of this Section.

B. Place bedding material at trench bottom in accordance with *Section 31 23 17 - Trenching.*

C. Backfill around sides and to top of pipe with cover fill, tamp in place in accordance with *Section 31 23 17 - Trenching.*

D. Maintain optimum moisture content of fill material to attain required compaction density.

3.5 INSTALLATION - PIPE AND FITTINGS

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with proper flanges or unions.

D. Group piping with other site piping work whenever practical.

E. Install pipe to indicated elevation to within tolerance of 5/8-inch.

F. Route pipe in straight line.

G. Install pipe to allow for expansion and contraction without stressing pipe or joints.

H. Install access fittings to permit disinfection of water system performed under *Section 33 13 00 – Disinfecting Water Utility Distribution.*

I. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

J. Establish elevations of buried piping with not less than 3-feet of cover.

K. Backfill trench in accordance with *Section 31 23 17 - Trenching.*

3.6 INSTALLATION - CURB STOP ASSEMBLY

A. Set curb stops on solid bearing of compacted soil.

B. Center and plumb curb box over curb stops. Set box cover flush with finished grade.

3.7 INSTALLATION - BACKFLOW PREVENTERS AND WATER METERS

A. Install positive displacement meters in accordance with AWWA M6, as indicated on Drawings, and in accordance with manufacturer's instructions.

B. Install backflow preventers where indicated on Drawings and in accordance with *ONWASA Cross Connection Standards.*

C. Comply with ONWASA requirements and applicable plumbing codes regarding testing and installation requirements.

3.8 SERVICE CONNECTIONS

A. Install water service in accordance with ONWASA requirements with backflow preventer and water meter.

3.9 PRECAST CONCRETE VAULT

A. Shape and Size: As indicated on the Drawings.

B. Install in accordance with *Section 33 05 14 – Utility Manholes and Structures.*

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with *Section 33 13 00 – Disinfecting Water Utility Distribution.*

3.11 FIELD QUALITY CONTROL

A. The Contractor shall conduct preliminary pressure and leakage testing prior to the witnessed tests to verify the tests will pass on the first attempt. If the Contractor schedules a required test in advance and the test is not ready to begin at the scheduled time, the Contractor will be required to reimburse ONWASA for all costs to ONWASA associated with the delay.

B. Compaction Testing: Perform soil compaction tests in accordance with *Section 31 23 17 - Trenching.*

C. Notification: Notify ONWASA and, if necessary, the testing agency 72 hours in advance of all required testing and have witness test.

D. Test Pressure: Not less than 150 psi, the test will result in automatic failure if the test pressure drops below 150 psi.

E. Pressure and Leakage Test Procedure:
Pressure and leakage testing shall be in accordance with the Pressure and Leakage Test Procedure set out in section 33 11 00 -11,

1. Water Utility Distribution Piping, of this Manual.

3.12 CONNECTION TO EXISTING WATER SUPPLY SYSTEM

A. Connections to existing water supply systems shall be in accordance with the requirements set out in section 33 11 00-12, Water Utility Distribution Piping, of this manual.

END OF SECTION

SECTION 33 13 00
DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes disinfection of potable water distribution and transmission system; and testing and reporting results.

B. Related Sections:

1. *Section 33 11 00 - Water Utility Distribution Piping*
2. *Section 33 12 13 - Water Service Connections.*

1.2 REFERENCES

A. American Water Works Association:

1. AWWA B300 - Hypochlorite.
2. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
3. AWWA C651 - Disinfecting Water Mains.

1.3 REPORTS

A. Disinfection Report: Must comply with ANSI\AWWA C-651, *Disinfecting Water Mains, latest revision.*

1. Type, form and application method of disinfectant used.
2. Date, time and quantity of disinfectant injection start and time of completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24 hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

B. Bacteriological Report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certify water conforms, or fails to conform, to bacterial standards of ONWASA.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651; maintain one copy of document on site.

B. Water Quality Certificate: Provide documentation to certify water conforms to quality standards of authority having jurisdiction, suitable for human consumption.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Aqueous Solution of Hypochlorite (lime, calcium, sodium)

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify piping system has been cleaned, inspected, and pressure tested.

B. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Disinfection is the responsibility of the Contractor, who shall provide all materials, labor, and equipment necessary, and pay for the total volume of water used.

B. Provide and attach required equipment to perform the Work of this Section.

C. Perform disinfection of water distribution system after each line between valves has been tested and all necessary repairs made.

D. Water containing not less than 50 parts per million and not more than 100 parts per million of chlorine shall be placed in the line at a slow rate and in such proportion that the required chlorine content is evenly distributed in the main.

E. Maintain disinfectant in system for 24 hours minimum, with not less than 10 parts per million residual after 24 hours.

F. Unless otherwise approved by ONWASA, sampling points shall be spaced no greater than 1000 LF of completed pipeline apart and there shall be a minimum of 2 samples collected for any project regardless of pipe length.

G. Flush, circulate, and clean until required cleanliness (purity) is achieved; use municipal domestic water. The minimum flushing rate for pipes shall be as follows:

2"	30 gpm
4"	100 gpm
6"	200 gpm
8"	400 gpm
10"	600 gpm
12"	900 gpm
16"	1,600 gpm

H. 18" 2,000 gpm Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. ONWASA will transport the bacteriological testing samples from the site to a third-party testing agency for analysis. The results will be sent to ONWASA for review, and then forwarded to the Design Engineer. The Contractor shall be responsible for all testing fees.

B. Disinfection, De-chlorination, Flushing, and Sampling:

1. Notify ENGINEER and ONWASA 72 hours in advance of test and have witness test.
2. Disinfect pipeline installation in accordance with AWWA C651. Use of liquid chlorine is not permitted.
3. **DECHLORINATION**: The disposal of chlorinated water is the responsibility of the CONTRACTOR. Upon completion of retention period required for disinfection, the heavily chlorinated water shall be neutralized by chemical application before discharge from the main. **A de-chlorinating device is required**. Chlorine concentration of the water discharged from the main shall be no higher than 0.1ppm in excess of the residual in the existing system or is acceptable for domestic use.
4. After final flushing and before pipeline is connected to existing system or placed in service, employ an approved independent testing laboratory to sample, test, and certify water quality suitable for human consumption.

5. **IF MORE THAN 30 DAYS PASS BETWEEN INITIAL CHLORINATION AND THE PLACEMENT OF THE WATER LINES INTO SERVICE, THE NEW SYSTEM MUST BE RECHLORINATED AND PASS AN NEW BACTERIOLOGICAL TEST.**

END OF SECTION

ADDENDUM #1
ISSUED: August 22, 2019

TECHNICAL SPECIFICATIONS

FOR

SEWER EXTENSIONS
AND
SEWAGE PUMPING STATION

TO SERVE

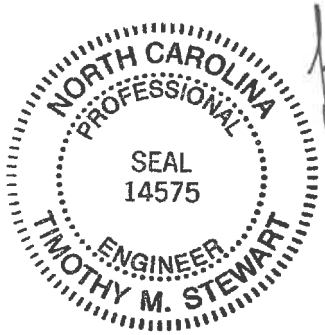
STUMP SOUND ELEMENTARY SCHOOL

ONSLOW COUNTY, NORTH CAROLINA

OWNER:

Onslow County Schools
Jacksonville, North Carolina

April 2019



4-26-19

PARKER & ASSOCIATES, INC.
ENGINEERS • SURVEYORS • PLANNERS
JACKSONVILLE, NORTH CAROLINA

(910) 455-2414 | 306 New Bridge Street | P.O. Box 976 | Jacksonville, NC 28541-0976
Firm License Number F-0108 | www.parkerjacksonville.com

PROJECT INFORMATION SHEET

OWNER:

Onslow County Schools
200 Broadhurst Road
Jacksonville, NC 28540

Contact Person: Mr. Steve Myers
Chief of Operations
(910) 455-2211 Ext. 20500

ENGINEER:

Parker & Associates, Inc.
P. O. Box 976
Jacksonville, North Carolina 28541-0976

Contact Person: Mr. Timothy M. Stewart, P.E.
(910) 455-2414

UTILITY:

Onslow Water & Sewer Authority
228 Georgetown Road
Jacksonville, NC 28540

Contact Person: Mr. David M. Mohr, P.E., Engineering Director
(910) 455-0722

TABLE OF CONTENTS

CONSTRUCTION STAKING QUALITY ASSURANCE

CONTRACTOR SHALL INSURE THAT HE AND ALL HIS WORKERS (CONTRACTORS, SUBCONTRACTORS AND OTHER SITE PERSONNEL) DO NOT DAMAGE CONSTRUCTION STAKES OR OTHER MEASURES USED IN LAYING OUT THE PROJECT WHETHER BY PARKER & ASSOCIATES OR ANOTHER ENTITY INCLUDING THOSE UNDER THE EMPLOY OF THE CONTRACTOR. CONTRACTOR SHALL CAUSE HIS WORKERS TO OBSERVE AND VERIFY TO THE FULLEST EXTENT PRACTICABLE THAT STAKES, OTHER MEASURES AND GRADES ARE, OR APPEAR TO BE, ACCURATE AND CORRECT, AND IMMEDIATELY, BUT PRIOR TO ANY ASSOCIATED WORK, NOTIFY THE STAKING ENTITY OF ANY POTENTIAL CONFLICT, ERROR OR QUESTION REGARDING THE WORK. PARKER & ASSOCIATES SHALL NOT BE RESPONSIBLE IF ALL OF THE ABOVE MEASURES ARE NOT STRICTLY ADHERED TO. PARKER & ASSOCIATES SHALL NOT BE RESPONSIBLE WHERE, DUE TO DAMAGE, ITS STAKING CANNOT BE VERIFIED. FOR CRITICAL OR COSTLY COMPONENTS OF THE WORK, WHERE THE CONTRACTOR BELIEVES THAT STAKING MAY NOT BE PRESERVED, THE CONTRACTOR SHALL REQUEST THE STAKING ENTITY TO PLACE STAKING IN AN AREA WHERE ITS PRESERVATION CAN BE INSURED.

JOBSITE SAFETY

NEITHER THE PROFESSIONAL ACTIVITIES OF THE DESIGN PROFESSIONAL, NOR THE PRESENCE OF THE DESIGN PROFESSIONAL OR THE DESIGN PROFESSIONAL'S EMPLOYEES AND SUBCONSULTANTS AT A CONSTRUCTION SITE, SHALL RELIEVE THE CONTRACTOR AND ANY OTHER ENTITY OF THEIR OBLIGATIONS, DUTIES, AND RESPONSIBILITIES INCLUDING, BUT NOT LIMITED TO, CONSTRUCTION MEANS, METHODS, SEQUENCES, TECHNIQUES, OR PROCEDURES NECESSARY FOR PERFORMING, SUPERINTENDING, OR COORDINATING ALL PORTIONS OF THE WORK OF CONSTRUCTION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND ANY HEALTH OR SAFETY PRECAUTIONS REQUIRED BY ANY REGULATORY AGENCIES. THE DESIGN PROFESSIONAL AND DESIGN PROFESSIONAL'S PERSONNEL HAVE NO AUTHORITY TO EXERCISE ANY CONTROL OVER ANY CONSTRUCTION CONTRACTOR OR OTHER ENTITY OR THEIR EMPLOYEES IN CONNECTION WITH THEIR WORK OR ANY HEALTH OR SAFETY PRECAUTIONS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR JOBSITE SAFETY. THE DESIGN PROFESSIONAL AND THE DESIGN PROFESSIONAL'S CONSULTANTS SHALL BE INDEMNIFIED AND SHALL BE MADE ADDITIONAL INSUREDS UNDER THE CONTRACTOR'S GENERAL LIABILITY INSURANCE POLICY.

There is an underground natural gas pipeline near you

Piedmont Natural Gas is an energy services company primarily engaged in the distribution of natural gas to over one million residential, commercial and industrial utility customers in North Carolina, South Carolina and Tennessee. Natural Gas pipeline markers containing contact phone and emergency information indicate the presence of underground utilities but may not be posted in many areas throughout the system. For more pipeline location information, call your state One-Call center or see the National Pipeline Mapping System online at http://www.npms.phmsa.dot.gov

Pipelines are the safest method of transportation for natural gas

According to the National Transportation Safety Board, pipelines are the safest mode of transportation. Piedmont Natural Gas, with years of safe and continuous service, is committed to meeting or exceeding all local, State, and Federal natural gas pipeline safety regulations.

Most pipeline accidents occur when individuals or companies are not aware of the location of buried utilities

Brightly-colored natural gas pipeline markers indicate buried utilities are nearby, but they do not always indicate the exact location and depth of the pipeline. Markers are generally located at road, railway and river crossings and along fence lines and property boundaries, but pipelines do not always run in a straight line and markers may not be present in certain areas. It is very important to **CALL 811 BEFORE YOU DIG**. 811 is a federally-mandated number designated by the FCC to consolidate all local "Call Before You Dig" numbers and help save lives by minimizing damages to underground utilities.

SAFETY TAKES TEAMWORK Identify Potential Hazards

Natural gas is odorless, colorless, and lighter than air. If released, natural gas will rise and diffuse with air rapidly. The "natural gas smell" (rotten-egg-like) most people associate with natural gas is an odorant added by local gas utilities to assist in leak detection.

DID YOU KNOW?

If you suspect a leak, immediately leave the area on foot and call appropriate emergency contacts as outlined in this brochure.

How to recognize a leak

Use your senses of sight and smell to help recognize the situation.

* A "natural gas smell" or rotten-egg-like smell
* Dust, water, bubbles, or vegetation blowing into the air or around a pipeline
* Discolored or dead vegetation near the pipeline
* A shrill blowing or hissing sound
* Bubbling in a wet area, marshland, river or creek
* A dry spot in a moist field
* Fire apparently coming from the ground or burning above the ground

Impact of land use and construction practices on safety

* Always survey the area for evidence of pipeline right-of-way markers prior to any excavation or construction operations.
* Always contact the state One-Call service in advance of beginning any digging, drilling, ditching or constructing work no matter how small the project.
* Wait for appropriate personnel to mark the specific location of the pipeline and then proceed with care.
* Check with your local public officials about any future land use plans in the area of your project.

Accidents

If damage occurs to our pipeline, it is important that we are informed immediately for inspection, evaluation, and repairs. Earthquakes, wash-outs, lightening, drilling or blasting near the right-of-way may cause unseen damage to a pipeline. Even a minor dent can cause deterioration of the protective coating and present a potential hazard in the future.

Protect Yourself

An informed public is an essential component of safe natural gas pipeline operations. In addition to the safe practices outlined below, please obtain more detailed information from the Piedmont Natural Gas web site: **www.piedmontng.com** as well as other related resources listed in this brochure.

WHAT TO DO

(if you suspect a leak or imminent danger)

If ignition has NOT occurred...

* Turn off machinery or equipment in the immediate area
* Leave on foot and clear other people away from the area
* **PIEDMONT NATURAL GAS 24-HR EMERGENCY PHONE: 800-752-7504**
* If you feel danger is posing an imminent threat, call 911

If ignition HAS occurred...

* Safely remove yourself and others from the area of the burning natural gas
* CONTACT 911 EMERGENCY RESPONDERS

WHAT NOT TO DO:

* **Do NOT** light a cigarette or smoke in the area
* **Do NOT** start an engine or drive near the area of the leak
* **Do NOT** cause any friction that could cause a spark
* **Do NOT** attempt to operate valves on the pipeline
* **Do NOT** attempt to extinguish the burning natural gas

Responsibilities of the Pipeline Operator

Pipeline operations and maintenance activities are required to follow industry-wide policies and procedures and established best practices. Piedmont Natural Gas participates in the One-Call system and rigidly performs a broad range of safety precautions including aerial and ground leak patrols, natural gas sampling, preventative maintenance, the installation of pipeline markers, and the planning of emergency response procedures.

In accordance with federal regulations some areas near pipelines are designated as High Consequence Areas. For these areas, supplemental hazard assessment and prevention programs, known as Integrity Management Programs, have been developed. For more information about these plans contact the Customer Information Center at 1-800-752-7504.

ADDENDUM #1
ISSUED: August 22, 2019

Part V Gravity Sewer

1. Material

Suitable couplings complying with ASTM specifications shall be used for joining dissimilar materials which take into account the leakage limitations on these joints.

a. Ductile Iron Pipe

i. Pipe shall be manufactured as per AWWA C141 in 18 foot lengths. Pipe shall be Class 50, as manufactured by Griffin, U. S. Pipe, American, Tyler, or Clow.

ii. Pipe joints shall be of the push-on type as per AWWA C111. Pipe lining shall be cement mortar with a seal coat of bituminous material, all in accordance with AWWA C104.

iii. Ductile Iron Pipe shall be designed and manufactured in accordance with AWWA C150 and C151 for a laying condition Type 2 and pressure class rating as follows:

Minimum Pressure Class for DIP Sewer Mains

Pipe Diameter	Depth of Cover	Pressure Class
8-Inch	3 to 20 Feet	350 psi
10 to 12-Inch	3 to 14 Feet	350 psi
14 to 20-Inch	3 to 10 Feet	250 psi
24 to 64-Inch	3 to 8 Feet	200 psi

Note: For cases not specified, consult with Pluris for further guidance.

iv. All buried DIP and fittings shall have bituminous coating on the exterior surface in accordance with AWWA C151.

b. Polyethylene Sewer Pipe

i. Polyethylene sewer pipe shall be Spirolite as manufactured by Spiral Engineered Systems, or approved equal.

c. Polyvinyl Chloride (PVC) Pipe

i. PVC pipe shall be made of PVC plastic having a cell classification of 12454-B, 12454-C, or 13364-B (with minimum tensile modulus of 500,000 psi) as defined in ASTM Specification D1784.

ii. PVC pipe shall have integral wall bell and spigot joints for the conveyance of domestic sewage and shall be supplied in minimum 12.5 foot lengths. Fittings *(private sewer service fittings)* shall be made of PVC plastic having a cell classification of 12454-B 12454-C or 13343-C as defined in *ASTM* Specification D1784.

iii. All PVC gravity sewer pipe and PVC fittings shall be manufactured in accordance with the latest version of ASTM D3034. Fittings shall be manufactured by pipe supplier or approved equal, and have bell and/or spigot configurations compatible with that of the pipe. Fittings shall be ductile iron fittings for 6" and larger pipes.

iv. All PVC pipe up to and including 15 inches in diameter shall have a minimum Standard Dimension Ratio (SDR) of 26. Where laying conditions so warrant, and in accordance with the manufacturer's recommendations, lower SDR values (stronger pipe) may be required. Pluris reserves the right to require the installation of SDR 21 or SDR 19 pipe at the discretion of Pluris.

v. PVC pipe of any make, brand, or type shall not be used for installations larger than 15 inches in diameter, without first receiving written approval of Pluris.

vi. PVC pipe shall not be used for installations deeper than 20 feet.

d. Material Identification

i. Each length of pipe shall have plainly and permanently marked thereon the following information, as well as any additional information specifically noted in the sections below:

- Pipe class or strength designation
- Manufacturer's name or trademark
- Nominal pipe size

e. Bedding Materials

i. For PVC and PVC Composite sewer mains see Section L in the

Construction Requirements "Additional Requirements for Flexible and Semi-Rigid Pipe" and the Standard Details for bedding requirements.

f. Manholes

i. Concrete Manholes

a. Manholes shall be precast concrete
b. All manholes shall have eccentric cone sections
c. Precast manholes shall meet ASTM C478 as to design and manufacturing requirements
d. The standard joint shall be sealed with a plastic cement putty meeting Federal Specification SS-S-00210, such as Ram-Nek or a butyl rubber sealant
e. All lift holes must be plugged with non-shrinking grout after installation
f. All grade adjustment rings shall be sealed with non-shrink grout.
g. All grade adjustment rings will be of precast concrete. No block or brick risers will be accepted.
h. All manholes shall have 6 inch, 3,000 psi concrete bottoms resting on a minimum of 12 inches of #57 stone
i. Sewer mains shall enter and exit radially through the manhole
j. Inverts shall be constructed with a width and height equal to ½ that of the effluent pipe and shall be so finished that a minimum energy loss occurs in the manhole.
k. At each inlet and outlet of 8 inches or greater, compression connectors (flexible sleeves) shall be cast into the manhole section.
l. Flexible connectors are to be manufactured of high quality rubber or synthetic rubber and all strap clamps or draw bolts shall be stainless steel
m. Boots are to meet standards of ASTM C923.
n. Rings and clamps are to meet standards of ASTM A167 and/or ASTM C923
o. Watertight manhole covers are to be used wherever the manhole tops may be flooded by street runoff or high water. Locked manhole covers may be desirable in isolated easement locations or where vandalism may be a problem.

ii. Manhole Frame and Cover Materials

a. Manhole Frames and Covers shall be Class 35 gray iron with "Sanitary Sewer" forged into the cover as indicated in the details.
b. Rings and cover shall be stamped with the make and model
c. All manhole frames and covers shall be domestically made and manufactured in the USA from domestic iron.
d. For installation in roadways, use Type I ring and cover and place

sufficient depth concrete below the pavement around the ring to ensure contact with manhole.

e. For installation in unpaved areas, use Type 2 ring and cover
f. Use Type 3 ring and cover for installations necessitating watertight requirements.
g. Locking covers shall be required in all outfall locations
h. Castings shall be machined to give even and continuous bearing on the full length of the frame
i. Castings shall be free of porosity and blow holes
j. Manhole frames shall be bolted to the manhole, except in paved streets
k. All manhole rings in roadways shall be encased in a concrete collar of 3,000 psi concrete beneath the asphalt, with the cover flush with the top of pavement
l. Watertight manhole frames and covers shall have neoprene gasket and machined bearing surfaces
m. Bolts shall be standard hexagonal-head, countersunk such that when fully tightened the bolt head is flush with the top of cover
n. Only stainless steel tightening bolts shall be used.

iii. Manhole Steps

a. Manhole steps shall be furnished with the precast manhole sections

b. Steps shall be of polypropylene material reinforced with a ½ inch diameter reinforcing rod

c. Manhole steps shall be designed for a vertical load of 400 pounds and a horizontal pull out load of 1,000 pounds

d. Steps shall be set 12 inches on center

e. Holes for the installation of manhole steps shall not project through the manhole wall, but shall stop a minimum of one inch from the outside wall

f. Steps shall be at least 12 inches clear width and shall project at least 5 inches from the wall into which they are embedded

g. Steps shall be located along the effluent side of the manhole

h. The eccentric cone shall be oriented so that the steps are vertical over the downstream invert of the primary flow path to allow ease of access for maintenance, camera, or cleaning operations

i. The minimum diameter of manholes shall be 4 feet (48 inches). Larger diameters are preferable for large diameter sewers. A minimum access diameter of 22 inches shall be provided.

ii. Manholes for sewers less than 16 inches in diameter shall be a minimum of 4 feet in diameter. Manholes for sewers 16 inches in

diameter or greater shall be 5 feet in diameter. No inside drops shall be allowed.

iii. Any manholes without rubber boots will not be accepted. Boots shall be accompanied by stainless steel banded #316 connection

iv. Manholes located within 100 year flood plain or in areas of high ground water shall be waterproofed by wrapping all joints with a minimum 8" width band of inorganic asbestos felt saturated in waterproofing asphalt.

v. Waterproofing shall be installed by mopping asphalt over the joint area, then wrapping the felt around the joints, and finally mapping the felt with another coat of asphalt.

g. For Service Connections

i. Pipe Materials

a. Cast Iron Soil Pipe – Cast Iron Soil Pipe shall be heavy weight hub and spigot meeting Federal Specifications WW-401. The joints shall be rubber type elastomeric as per ASTM C425

b. PVC Pipe – PVC pipe shall be schedule 40 or greater supplied in minimum of 18 foot lengths. The pipe may be joined by solvent weld.

c. PVC Pipe shall meet the requirements of ASTM D3033 (SDR 35) as furnished by Johns-Manville, Gifford Hill, David, Olin, or approved equal. The pipe may be joined by elastomeric gaskets. Schedule 40 PVC pipe may also be used.

d. Ductile Iron Pipe – Ductile Iron Pipe shall be used for sanitary sewer with services with less than 3 feet of cover or in excess of 20 feet of cover. Pressure class and thickness class of all ductile iron lines with less than 3 feet of cover will be indicated on all plan and profile sheets. Ductile iron services shall also be used in all cases where a water supply well is located within 100 feet of the sewer service line.

ii. Service Saddle Materials

a. PVC service saddles shall be of the same material as the main and shall be solvent welded and fastened with double stainless steel bands. Service saddles are not allowed for use with newly constructed mains.

b. Ductile iron service saddles shall be "ROMAC CB" type consisting of a virgin SBR gasket compounded for sewer service, a ductile iron saddle casting, a 304 stainless steel adjustable strap for fastening the gasket and the saddle casting to the sewer main and a 304 stainless steel adjustable circle clamp for securing the service line into the SBR gasket

c. Service Saddles for PVC services shall be PVC with a cast iron plug at the right-of-way; a glued-on full circle wye with double stainless steel bands as shown on Pluris Standard Details. Cast iron saddles shall be sealed with a layer of mortar around the outside edge of the saddle as shown on Pluris Standard Details.

2. Design

a. Location

i. All public sanitary sewer mains shall be installed in dedicated street right-of-way or in dedicated utility easements. Mains located within NCDOT right-of-way shall be placed in accordance with NCDOT standards and the applicable encroachment permit.

ii. Minimum widths of public sanitary sewer easements shall be as follows:

50 feet Construction Easement
30 feet Permanent Easement

iii. The size of easements for sanitary sewer mains greater than 24" shall be determined by Pluris.

iv. Sewer mains shall be centered within their easements unless otherwise determined by Pluris.

v. Proposed sewers paralleling a creek shall be designed to a proper depth to allow lateral connections such that all creek crossing will be below stream bed elevation. The top of the sewer main shall have at least one foot of cover between it and the stream bed. Concrete encasement shall be required when the cover between the top of the pipe and the stream bed is less than three (3) feet. Sewers entering or crossing streams shall be constructed of ferrous material pipe with mechanical joints; otherwise they shall be constructed so they will remain watertight and free from changes in alignment or grade and tested to 150 psi. PVC pipe may be used where a minimum of three feet of cover can be maintained. Material used to backfill the trench shall be stone,

coarse aggregate, washed gravel, or other materials which will not readily erode, cause siltation, damage pipe during placement, or corrode the pipe.

vi. Sanitary sewer mains shall not be installed under any part of water impoundments.

vii. All private sewer collection mains inside Pluris service area that will connect or are planning to discharge into Pluris sewer system shall comply with all Pluris design, siting, and installation criteria outlined herein. The Owner of the private sewer collection system shall meet all State design requirements and obtain a State permit to construct and operate the private system.

viii. No developer, contractor, or property owner shall place any part of a structure, any permanent equipment, permanent retaining wall or impoundment within sanitary sewer easements or utility easements dedicated to Pluris.

ix. Fences may be allowed across easements provided that appropriate access gates have been installed to allow utility maintenance personnel access.

x. Fill or cut slopes are not allowed to extend into easements except by specific approval of Pluris.

xi. Sewer line easements shall be graded smooth, free from rocks, boulders, roots, stumps, and other debris, and seeded and mulched upon the completion of construction. Easements across sloped areas shall be graded uniformly across the slope to no steeper than a 5 to 1 ratio.

xii. Mains shall be deep enough to serve the adjoining property and allow for sufficient slope in lateral lines, and shall have the following minimum covers. These requirements may be waived at the direction of Pluris, in which case ductile iron pipe shall be installed.

a. 4 feet from the top of the pipe to finished subgrade in roadways
b. 3 feet from the top of pipe to finished grade outside roadways

xiii. Mains over 20 feet deep require ductile iron for the entire run between manholes and shall be specifically approved by Pluris.

xiv. Mains shall have a minimum vertical separation of 24 inches between storm pipe when the horizontal separation is 3 feet or less unless structural bridging is provided.

xv. There shall be a minimum of 5 feet horizontal separation between parallel

gravity and/or force mains.

xvi. Sewer mains shall have a minimum horizontal separation of 10 feet from water lines, unless the top of the sewer main is at least 18 inches below the bottom of the water main and there is a horizontal separation of at least 3 feet from the closest edge of pipes.

xvii. Where sewer mains cross beneath water mains with a vertical separation of 18 inches or less, or where water mains cross under sewer mains, the entire leg of sewer main shall be ductile iron pipe and the void space between the pipe crossing shall be backfilled with suitable fill that meets or exceeds NCDOT specifications. The water main shall be centered at the point of crossing, which shall be at an approximate 90 degree angle.

xviii. Structures - The sewer outfalls, headwalls, manholes, gate valve boxes, or other structures shall be located so they do not interfere with the free discharge of flood flows of the stream.

ixx. Alignment - Sewers crossing streams shall be designed to cross the stream as nearly perpendicular to the stream flow as possible and shall be free from change in grade. Sewer systems shall be designed to minimize the number of stream crossings.

xx. Aerial Crossings - **Aerial crossings shall be prohibited unless specifically allowed by Pluris and only under extreme circumstances.**

a. Proper joint technology, such as flanged or restrained, adequate supports to prevent excessive flexion, or a combination of both shall be provided for all aerial pipe crossings. Supports shall be designed to prevent frost heave, overturning, and settlement.

b. Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above ground and below ground sewers. Where buried sewers change to aerial sewers, special construction techniques shall be used to minimize heaving.

c. For aerial stream crossings, the impact of flood waters and debris shall be considered. The bottom of the pipe should be placed no lower than the elevation of the 25 year flood. Ductile iron pipe with mechanical joints shall be required.

d. In the event that the 25 year flood elevation can not be determined or the proposed gravity sewer must be placed below the 25 year flood

elevation, a letter shall be provided by the applicant upon certification stating: "Regular and proper inspection and maintenance of the aerial crossing shall be provided to insure that the creek/stream flow is not impeded and that no damage will be caused to upstream or adjacent properties.

xxi. Anti-Seepage Collars - In areas where the sewer trench has the potential to drain wetlands, anti-seepage collars shall be installed. Please be advised, in these areas, a 401/404 permit may be required. All areas directional bored under wetlands require anti-seep collars.

b. Protection of Potable Water Supplies and Storm Sewers

i. Cross Connections Prohibited - There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenance thereto which would permit the passage of any wastewater or polluted water into the potable supply. No water pipe shall pass through or come into contact with any part of a sewer manhole.

c. Size

i. The minimum diameter size for gravity sewer mains conveying wastewater shall be eight (8) inches for public sewers and six (6) for private sewers.

ii. New sewer systems shall be designed based on NC Regulation Design Criteria and NCDENR requirements for flow as found in 15A NCAC 02T .0114.

iii. The ratio of peak to average daily flow shall be as follows:

$Q_{max}/Q_{avg.}$	Q_{avg} Flow (GPD)
4.0	3,000 or less
3.5	3,000 – 6,000
3.0	6,000 – 10,000
2.5	Greater than 10,000

iv. Sewers shall be designed flowing half full at the average daily flow.

v. Sanitary sewers shall be designed to carry the projected peak flow at no more than 3/4 full.

vi. All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second, based on Manning's formula using an "n" value of 0.013. The following are the minimum slopes which shall be provided; however, slopes greater than these are recommended.
The minimum grades for public sanitary sewers shall be as follows:

Main Size (in.)	Minimum Slope (ft/100 ft)
6	0.60
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06

vii. The minimum slope for the uppermost reach of a sanitary sewer line shall be 1.00% regardless of sewer line size.

viii. The maximum grade for sanitary sewers is 10%. The maximum velocity in sanitary sewers is 15 ft./sec.

ix. Sewer extensions should be designed for projected flows even when the diameter of the receiving sewer is less than the diameter of the proposed extension at a manhole, with special consideration of an appropriate flow channel to minimize turbulence when there is a change in sewer size.

x. A downstream analysis of the receiving sewer is required prior to submitting for applicable permits associated with the proposed project.

xi. Pipe diameter changes shall occur in a manhole with the invert of the larger pipe lowered sufficiently to maintain the same energy gradient. An approximate method of securing these results is to place the 0.8 depth point of both sewers at the same elevation.

xii. Manning's Equation for Gravity Flow

$$V = [1.486/n] \times R^{.66} \times S^{.5}$$

Where:

V = Velocity in feet per second
n = Coefficient of Roughness (0.013)
S = Slope in foot per foot
R = Hydraulic Radius in feet(cross sectional area divided by the wetted perimeter)

xiii. The pipe diameter and slope shall be selected to obtain the greatest practical velocities to minimize settling problems. Designs must include a minimum scouring velocity of 2 feet per second. Sewers shall not be oversized to justify using flatter slopes. If the minimum scouring velocity can not be maintained during initial operation prior to the design flow capacities being reached, the ability to periodically flush the system shall be required.

d. Manholes

i. Manholes shall be spaced at a maximum distance of 400 feet apart for all sewer lines.

ii. Manholes for sewers less than 16 inches in diameter shall be a minimum of 4 feet in diameter. Manholes for sewers 16 inches in diameter or greater shall be 5 feet in diameter. A minimum access diameter of 22 inches shall be provided.

iii. Manholes shall be installed at each deflection of line and/or grade. The flow channel through manholes should be made to conform in shape and slope to that of the entering sewer line. Therefore, no elevation drop shall occur at the manhole and centerline inverts shall be used.

iv. Inside drop manholes shall not be used. Moor base shall not be used. Outside drops shall be used when free drops exceed 24 inches above the manhole invert.

v. Where the difference in elevation between the incoming sewer and the manhole invert is less than 2 feet (24 inches), the invert shall be filleted to prevent solids deposition.

vi. Due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole, the entire outside drop connection shall be encased in concrete or ferrous pipe specified with necessary blocking for drop connection.

vii. A bench shall be provided on each side of any manhole channel when the pipe diameter(s) are less than the manhole diameter. The bench shall be sloped no less than 1/2 inch per foot (4 percent). The invert elevation of any lateral sewer, service connection, or drop manhole pipe shall be above the bench surface elevation. No invert shall be located directly on the surface of the bench.

viii. Inlet and outlet pipes shall be joined to the manhole with a gasketed flexible watertight connection or any watertight connection arrangement that allows minor differential settlement of the pipe and manhole wall to take place.

ix. Flow Channel

a. The flow channel straight through a manhole shall be made to conform as closely as possible in shape, and slope to that of the connecting sewers. The channel walls shall be formed or shaped to three quarters (3/4) of the height of the crown of the outlet sewer in such a manner to not obstruct maintenance, inspection or flow in the sewers.
b. When curved flow channels are specified in manholes, including branch inlets, minimum slopes should be increased to maintain acceptable velocities.

x. Sewers shall be laid with uniform slope between manholes.

xi. All sewers shall have straight alignment between manholes. Straight alignment shall be checked by either using a laser or lamping.

xii. Location

a. Manholes shall be installed: at the end of each line, at all changes in grade, size, or alignment, at all intersections, and at distances not greater than 400 feet for all sewers.

b. Cleanouts may be used in lieu of manholes for 6 inch private sewer lines with distances between cleanouts not to exceed 100 feet.

xiii. Watertightness

a. Manholes shall be designed for protection from the 100-year flood by either:

i. Manhole rims shall be 24 inches (2 feet) above the 100-year flood elevation or,
ii. Manholes shall be watertight and vented 24 inches (2 feet) above the 100-year flood elevation. Manholes shall be vented every 1,000 feet or every other manhole, whichever is greater.

xiv. Buoyancy - Buoyancy shall be considered and flotation of the manholes shall be prevented with appropriate construction in every design where high groundwater conditions are anticipated. All manholes shall have a minimum 6" extended base.

xv. Inspection and Testing - The specifications shall include a requirement for inspection and testing for watertightness or damage prior to placing into service.

xvi. Corrosion Protection For Manholes

a. Where corrosive conditions due to septicity or other causes are anticipated, consideration shall be given to providing corrosion protection on the interior of the manholes.
b. Where high flow velocities are anticipated, the manholes shall be protected against displacement by erosion and impact.

e. Pipes

i. The pipe material selected shall be adapted to local conditions, such as: character of industrial wastes, possibility of septicity, soil characteristics, exceptionally heavy external loadings, abrasion, corrosion, and similar problems. Consideration shall also be given to pipes and compression joint materials subjected to corrosive or solvent wastes.

ii. The specifications shall stipulate: the pipe interior, sealing surfaces, fittings and other accessories shall be kept clean; pipe bundles be stored on flat surfaces with uniform support; stored pipe shall be protected from prolonged exposure (six months or more) to sunlight with a suitable covering (canvas or other opaque material); air circulation shall be provided under any covering; gaskets shall not be exposed to oil, grease, ozone (produced by electric motors), excessive heat and direct sunlight; consultation with the manufacturers shall be undertaken for specific storage and handling recommendations.

iii. All sewers shall be designed to prevent damage from superimposed live, dead, and frost induced loads. Proper allowance for loads on the sewer shall be made because of soil and potential groundwater conditions, as well as the width and depth of trench. Where necessary, special bedding, haunching and initial backfill, concrete cradle, or other special construction shall be used to withstand anticipated potential superimposed loading or loss of trench wall stability. See ASTM D 2321 OR ASTM C 12 when appropriate.

iv. For new pipe materials for which ASTM standards have not been established, the design engineer shall provide complete pipe specifications and installation specifications developed on the basis of criteria adequately documented and certified in writing by the pipe manufacturer to be satisfactory for the specific detailed plans.

f. Joints

i. The installation of joints and the materials used shall be included in the specifications. Sewer joints shall be designed to minimize infiltration and to inhibit the entrance of roots throughout the life of the system.

ii. Relation to Water Supply Sources

a. A distance of 100 feet shall be maintained between any private or public water supply source, including any WS-I waters or Class I or Class II impounded reservoirs used as a source of drinking water. If this minimum separation can not be maintained, ferrous sewer pipe with joints equivalent to public water supply design standards and pressure tested to 150 psi to assure watertightness, shall be used. The minimum separation shall, however, not be less than 25 feet from a private well or 50 feet from a public water supply well.
b. All existing waterworks units, such as basins, wells, or other treatment units, within 200 feet of the proposed sewer shall be shown on the engineering plans.

iii. Relation to Water Mains and Storm Sewers

a. Horizontal and Vertical Separation

i. Sewers shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the appropriate reviewing agency (NCDENR) may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so the bottom of the water
main is at least 18 inches above the top of the sewer.
ii. If it is impossible to obtain proper horizontal and vertical separation as described above or anytime the sewer is over the water main, both the water main and sewer must be constructed of ferrous pipe complying with public water supply design standards and be pressure tested to 150 psi to assure watertightness before backfilling.
iii. A 24 inch vertical separation shall be provided between storm sewer and sanitary sewer lines or ferrous pipe specified.

b. Crossings

i. Sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

ii. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, one of the following methods must be specified:

(1) The sewer shall be designed and constructed of ferrous pipe and shall be pressure tested at 150 psi to assure water tightness prior to backfilling, or
(2) Either the water main or the sewer line may be encased in a watertight carrier pipe which extends 10 feet on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be of materials approved by the regulatory agency for use in water main construction.

g. Buoyancy - Buoyancy of sewers shall be considered and flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.

h. Depth - Three (3) feet minimum cover shall be provided for all sewers unless ferrous material pipe is specified. Ferrous material pipe, or other pipe with proper bedding to develop design supporting strength, shall be provided where sewers are subject to traffic bearing loads. Additional protection shall be provided for sewers that cannot be placed at a depth sufficient to prevent damage.

i. Design Capacity and Design Flow - Sewer capabilities shall be designed for the estimated ultimate tributary population including consideration given to the maximum anticipated capacity of institutions, industrial parks, etc. The capability of downstream sewers to accept future flow made tributary to the collection system shall be evaluated by the engineer. Where future relief sewers are planned, analysis of alternatives should accompany initial permit applications.

j. Standards - Installation specifications shall contain appropriate requirements based on the criteria, standards, and requirements established by the construction industry in its technical publications. Requirements shall be set forth in the construction specifications for the pipe and methods of bedding and backfilling thereof so as not to damage the pipe or its joints, impede cleaning operations and future tapping, nor create excessive side fill pressures and ovalation of the pipe, nor seriously impair flow capacity.

k. Service Connections

i. General Requirements

a. All residential subdivision lots shall be served by gravity unless otherwise approved by Pluris. If a pump is approved, it shall be privately maintained, must pump into a service connection placed on the lot, and must have a note on the recorded plat indicating that a private pump is required to serve the lot.
b. Service connections to the main lines shall be perpendicular to the main line and shall extend to the edge of the right of way or easement line.
c. Cleanouts are required on all services with a maximum spacing of 75 feet on 4 inch services and 100 feet on 6 inch services, and at the right of way line or edge of easement. All cleanouts shall extend a minimum of 6 inches above finished grade with brass caps or meet the optional cleanout method requirements in accordance with the Standard Details.
d. Sewer cleanouts located in paved areas, which bear vehicle loading, must have ductile iron risers, ductile iron fittings and brass caps or meet optional cleanout method requirements in accordance with Standard Details.

3. Construction

a. Siltation and Erosion

Construction methods that will minimize siltation and erosion shall be employed. The design engineer shall include in the project specifications the method(s) to be employed in the construction of sewers. Such methods shall provide adequate control of siltation and erosion by limiting unnecessary excavation, disturbing or uprooting trees and vegetation, dumping of soil or debris, or pumping silt-laden water into streams. Specifications shall require that cleanup, grading, seeding, and planting or restoration of all work areas shall begin immediately. Exposed areas shall not remain unprotected for more than seven days unless a sedimentation and erosion control plan is submitted to, and approved by, the NCDENR Division of Land Resources.

b. Bedding, Haunching, and Initial Backfill

i. Bedding Classes A, B, C or crushed stone as described in ASTM C 12 shall be used and carefully compacted for all rigid pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load, based on the type soil encountered and potential ground water conditions.

ii. Embedment materials, Classes I, II, or III, as described in ASTM D 2321, for bedding, haunching and initial backfill, shall be used and carefully compacted for all flexible pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load, based on the type soil encountered and potential groundwater conditions. (See Class definitions in section L.2.f.)

ii. All water entering the excavations or other parts of the work shall be removed until

all the work has been completed. No sanitary sewer shall be used for the disposal of trench water.

c. Sanitary sewer mains shall be deep enough to serve the adjoining property and allow for sufficient slope in lateral lines. All sanitary sewer mains shall have the following minimum covers:

   1. 4 feet from the top of pipe to finished subgrade when under a roadway or parking lot.
   2. 3 feet from the top of pipe to finished grade when outside a roadway.

   The above requirements may be waived at the direction of Pluris, in which case ductile iron pipe shall be installed of appropriate thickness and pressure class.

d. Sewer mains from 14 to 20 feet deep shall require special bedding in accordance with the Standard Details.

e. Sewers over 20 feet deep shall require ductile iron or reinforced concrete pipe for the entire run between manholes.

f. Pipe trench excavation and backfilling shall be performed in accordance with Part II of these specifications.

   i. The width of the trench shall be ample to allow the pipe to be laid and jointed properly and to allow the bedding and haunching to be placed and compacted to adequately support the pipe. The trench sides shall be kept as nearly vertical as possible. When wider trenches are specified, appropriate bedding class and pipe strength shall be used.

   ii. In unsupported, unstable soil the size and stiffness of the pipe, stiffness of the embedment and in-situ soil and depth of cover shall be considered in determining the minimum trench width necessary to adequately support the pipe.

   iii. Ledge rock, boulders, and large stones shall be removed to provide a minimum clearance of 4 inches below and on each side of all pipe(s).

g. Transitions of pipe material shall occur only at manholes.

h. Where sanitary sewers cross beneath water mains with a vertical separation of 18 inches or less or where water mains cross under sewer mains, both lines shall be ductile iron pipe for a distance of 10 feet on either side of the point of crossing. The waterline pipe shall be centered at the point of crossing.

i. Sanitary sewers shall have the top of pipe at least 24 inches below the bottom of storm

sewer pipe when the horizontal separation between the closest edges of the two pipes is 3 feet or less. Where sanitary and storm sewers cross with a vertical separation of less than 24 inches the sanitary sewer shall be of water main standard ductile iron pipe for a distance of 10 feet on either side of the point of crossing with the sanitary sewer pipe section centered at the crossing.

j. There shall be a 5 foot horizontal separation between parallel gravity and/or force mains.

k. Additional Requirements for Flexible, and Semi-Rigid Pipe (Polyethylene and PVC)

i. For Polyethylene and PVC pipe, the pipe shall be produced with bell and spigot end construction. Joining will be accomplished by rubber gasket in accordance with manufacturer's recommendation, unless otherwise directed or approved by Pluris. Each pipe length shall be clearly marked with information including pipe size, profile number and class number.

ii. The installation shall satisfy the requirements of the manufacturer, and/or the following, whichever is more stringent:

a. Installation of polyethylene and PVC pipe shall follow the recommendations of ASTM D-2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe".

For flexible pipe bedding and embedment material shall be either Class I or Class II. For semi-rigid pipe, Class III materials may also be used. In any area where the pipe will be installed below existing or future ground water levels or where the trench could be subject to inundation, only Class I material shall be used for bedding and embedment.

b. The manufacturer's specifications or otherwise approved method shall be used in determining the stiffness class of the pipe to be installed so as to attain the required deflection control. The class of the pipe must be approved by Pluris prior to installation.

c. The bedding (4" minimum) and embedment materials shall be per ASTM D2321. The embedment materials shall be installed from trench wall to trench wall and from the invert to a minimum of 6" above the crown of the pipe.

d. The bedding and embedment material shall be compacted to a minimum of 90% Standard Proctor density for Class I and II materials, and a minimum of 95 % Standard Proctor density for Class III materials.

e. If hydraulic jack shoring is utilized for trench walls, where shoring is used, it shall be kept to the area just above the top of the pipe. This will ensure the embedment materials and pipe will not be disturbed when removal is made.

f. Bedding and embedment material classifications shall be defined as follows:

CLASS I - Angular, (1/4 to 1-1/2 inch) graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, crushed gravel, and crushed shells.

CLASS II - Coarse sands and gravels with maximum particle size of 1- 1/2 inch, including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class.

CLASS III - Fine sand and clayey gravels, including fine sands, sand- clay mixtures, and gravel-clay mixtures, Soil Types GM, GC, SM and SC are included in this class.

CLASS IV - Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this class. These materials are not recommended for embedment.

iii. Pipe shall be laid going uphill.

l. For Service Connections

i. General Requirements

a. See design criteria contained herein for additional installation requirements.
b. Sewer laterals shall not be located in easements when gravity service can be provided to the property frontage at the street.
c. Direct sewer service taps shall not be allowed on sewer interceptor or outfall mains 18-inches in diameter or larger, except by manhole connection.
d. Each separately owned structure requires a separate tap to a public sewer.
e. All service connections to existing sanitary sewer mains shall be made by Pluris. Service connections to new mains may be made by the Contractor, but must include the use of wye (not tee) connections. Taps onto new lines may only be approved by Pluris.
f. All service lines with less than 3-ft of cover or deeper than 20-ft shall be made of ductile iron pipe.
g. Service lines between 3 and 8 feet in depth do not require special bedding. PVC service lines between 8 and 20 feet in depth shall require Class I bedding from 4 inches below the service line to 4 inches above the service line.
h. Service connections made using a "ROMAC CB" sewer saddle shall be made only when the service line is iron pipe and only when the sewer main is 8", 10", or 12" diameter concrete, ductile iron, or PVC sewer pipe. This service connection shall not be used when the sewer main material is truss sewer

pipe. The opening in the sewer main for the "ROMAC CB" sewer saddle shall be cut with a hydraulically or pneumatically driven circular tapping saw of the same nominal diameter as the sewer service line.

ii. Individually owned structures shall require at least one sewer tap.

iii. Service taps into mains shall be made on the top quarter of the main at a 45° angle to vertical with the wye saddle angled with the direction of flow in the main.

iv. Services are to be done by auger unless otherwise approved by Pluris.

v. Service connections to the main lines shall be perpendicular to the main line and shall extend to the edge of the right-of-way or easement line. 4 inch lines shall have a minimum slope of 0.60 ft./100 feet. Cleanouts shall be required on all sewer services with a maximum spacing of 50 feet on 4 inch services and 100 feet on 6 inch services. A cleanout shall be placed on all service lines at the right-of-way line or at the edge of the easement. All cleanouts shall extend a minimum of 6 inches above finished grade as in accordance with the Standard Details.

vi. Service lines shall not be installed into manholes.

m. Final Backfill

i. Final backfill shall be of a suitable material removed from excavation except where other material is specified. Debris, frozen material, large clods or stones, organic matter, or other unstable materials shall not be used for final backfill within 2 feet of the top of the pipe. Stones used in backfills shall not be greater than 6 inches along any axis.

ii. Final backfill shall be placed in such a manner as not to disturb the alignment of the pipe.

4. Testing

The Contractor/Applicant shall furnish all materials, labor, and equipment to perform all testing.

a. The maximum allowable deflection after installation shall BE LESS THAN 5% of the pipe diameter. The mandrel (go/no-go) deflection test must be performed on each line prior to acceptance, and no less than 30 days after installation. The Contractor shall supply the mandrel used for this performance test. The mandrel device shall be cylindrical in shape having 9 possible contact points with the pipe. The mandrel's diameter (ID of

proving right) shall equal the dimensions in the following table, and shall be subject to the Engineer's approval.

For Polyethylene and PVC Pipe the following shall apply:

Nominal Diameter (inches)	(Proving Ring) Dia. Mandrel (inches)
6"	5.65"
8"	7.76"
10"	9.08"
12"	10.79"
15"	14.09"
18"	16.53"
21"	19.30"
24"	22.08"
27"	24.84"
30"	27.62"
33"	30.38"
36"	33.15"
42"	38.68"
48"	44.21"
54"	49.74"
60"	55.27"

i. For flexible pipes such as PVC, the following shall apply: Mandrel Test criteria for PVC Pipe

Nominal Diameter (inches)	Proving Ring Minimum Length (inches)	Mandrel (diameter) (inches)
6	6	5.65
8	8	7.40
10	10	9.31
12	10	11.22
15	12	14.09

ii. For semi-rigid pipes, such as PVC Composite (Truss) Pipe, the following shall apply:

Nominal Diameter	Proving Ring	Mandrel

(inches)	Minimum Length (inches)	(diameter) (inches)
8	8	7.52
10	10	9.46
12	10	11.40
15	12	14.31

b. Deflection Test

i. Deflection tests shall be performed on all pipe installations. The test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. As an alternative to waiting 30 days to permit stabilization of the soil-pipe system, Pluris will accept certification from a soil testing firm verifying that the backfill of the trench has been compacted to at least 95% maximum density.

ii. No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent, replacement or correction shall be accomplished in accordance with requirements in the approved specifications.

iii. The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, to which the pipe is manufactured. The pipe shall be measured in compliance with ASTM D2122 Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The test shall be performed without mechanical pulling devices.

c. Leakage Tests

i. Leakage tests shall be specified. This may include appropriate water or low pressure air testing. The testing methods selected should take into consideration the range in groundwater elevations during the test and anticipated during the design life of the sewer.

ii. Water (Hydrostatic) Test - The leakage exfiltration or infiltration shall not exceed 100 gallons per inch of pipe diameter per mile per day for any section of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of 2 feet.

iii. Air Test

a. The air test shall, as a minimum, conform to the test procedure described in ASTM C-828-86 for clay pipe, ASTM C 924 for concrete pipe, and for other materials, test procedures approved by NCDENR and Pluris.

b. Low-pressure air testing shall be performed on all sewer mains before the laterals or stubs are installed on the line, and after the trench has been backfilled to finished grade. Plugs shall be installed at each manhole to seal off the test section. The line will be pressurized with a single hose and monitored by a separate hose connection from the plug. Air then shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0 psig. The air pressure shall then be allowed to stabilize for a minimum of 2 minutes at no less than 3.5 psig (plus groundwater pressure, if any). When the pressure reaches 3.5, the time required for the pressure to drop 1.0 psi will be observed and recorded. The line shall be "acceptable" if the pressure does not drop more than 1.0 psi in the time prescribed for the test in the Sanitary Sewer Air Test table found in the Standard Details.

c. If the section fails to meet these requirements, the source of leakage shall be repaired and the pipe section re-inspected.

d. Pluris may require that an infiltration test be performed that shall not exceed 100 GPD/inch/mile.

d. Visual Testing and Observation

i. All materials used must be approved by Pluris prior to installation. Rejected materials shall be immediately removed from the job.

ii. Gravity sanitary sewer lines shall be clean and free from obstructions, and shall be visually inspected from every manhole. Lines which do not exhibit a true line and grade or which have structural defects shall be corrected. Sanitary sewer service connections shall be visually inspected prior to backfilling.

e. Video Assessment and Cleaning

i. As a final measure required for acceptance, the Contractor shall clean and televise all newly installed sewer mains prior to acceptance by Pluris. The Contractor shall televise the sewer main and all lateral connections installed from the upstream to downstream manhole with no reverse setups or cutaways. Throughout shooting, the camera shall be panned and tilted for a complete view of the main. Lighting shall be adequate to view the entire sewer main and service connections from beginning to end. The video inspection shall be submitted to Pluris on DVD and formatted with software compatible and readable by Pluris. Pluris shall not be responsible for purchasing additional software necessary to view the videos.

ii. The camera shall be advanced at a uniform rate that allows a full and thorough inspection of the new sewer main. The camera shall be a color, pan, and tilt camera. The picture quality and resolution shall be acceptable and sufficient to allow a

complete inspection with no lapses in coverage. The length of the sewer main shall be measured and recorded on the video screen. The distance counter shall be calibrated before shooting the inspection video.

iii. The Contractor shall clean the sewer mains ahead of video inspection with a high-velocity water jet. The video inspection shall take place within 2-hours of cleaning operations as witnessed by Pluris. All construction debris shall be collected and removed in the downstream manhole and shall not be released into the sewer system.

iv. A Pluris representative shall be present throughout the cleaning and televising of the sewer mains to verify that the video work complies with the specifications.

v. Prior to submitting the DVD to Pluris, the Contractor shall label the DVD with the following information:

- Name of the Project/Development.
- Name and contact information of responsible party.
- Date of televising.
- Manhole identification as shown on the design plans.

f. Manholes

i. Vacuum Testing

a. All newly installed manholes shall pass a vacuum test in accordance with ASTM C 1244-93. The Contractor shall supply all equipment and materials necessary to vacuum test the manholes.

b. Vacuum Testing shall not be initiated until the manholes and all specified coatings and lining materials have been cured in accordance with manufacturer recommendations.

c. A Pluris representative shall be present and witness all vacuum testing.
d. The following vacuum testing criteria shall apply for compliance with the testing procedure.

- A vacuum of 10-inches of mercury shall be drawn with an approved vacuum testing unit.

- The testing time shall not be measured until after the vacuum pump has been shut off.

- The time required for the vacuum to drop from 10-inches to 9-inches of

mercury shall meet or exceed the values listed in the following table:

Manhole Vacuum Testing Time

Depth (feet)	Manhole Diameter (inches)		
	48	60	72
	Time (seconds)		
8	20	26	33
10	25	33	41
12	30	39	49
14	35	48	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

Note: If depth falls below 8 feet or between two depths, the next deepest increment of depth shall be used.

5. Repairs

a. Sewer Main Repairs

i. PVC Pipe – replace damaged section with PVC Pipe and install a Fernco coupling at each end encased in concrete.

ii. ABS/PVC Truss Pipe – replace damaged section with D.I.P. and install a Fernco coupling at each end encased in concrete.

iii. A.C. Pipe – use a full circle repair clamp for the damaged section or replace damaged section with DIP and couplings encased in concrete.

iv. HDPE Pipe – replace damaged section with new HDPE pipeline section and install electrofusion couplings at both ends; minor breaches may be repaired with an electrofusion repair coupling as deemed appropriate by manufacturer's representative.

b. Installation

i. All repairs to damaged sanitary sewer lines in paved areas shall be backfilled with ABC stone (crusher run) to a density of 95 percent Standard Proctor.

ii. All repairs to damaged sanitary sewer lines shall be bedded with 6-inches of washed stone and compacted to a minimum of 95% Standard Proctor density before installing the new joint of ductile iron.

Part VI Sewer Force Main

1. Material

a. General

i. Force mains smaller than 4 inches in diameter shall be PVC or HDPE, while force mains 4 inches or larger shall be DIP, PVC, or HDPE.

ii. Force mains shall be of a size greater than the diameter of solid capable of being passed by the sewage pumps.

a. PVC and HDPE pipe requires the installation of 3 inch wide detector tape a maximum of 2 feet below the finished grade

iii. All fittings shall be as manufactured by Russco, Clow, Tyler, American, Union, or Griffin.

iv. Force main shall be installed with a minimum cover of three feet measured from the top of the pipe to the finished subgrade.

b. Ductile Iron Pipe

i. Pipe shall be manufactured as per AWWA C141 in minimum 18 foot lengths. Pipe shall be Class 51, as manufactured by Griffin, U. S. Pipe, American, or Clow.

ii. Ductile Iron Pipe shall be designed and manufactured in accordance with AWWA C150 and C151 for a laying condition Type 2. Pipe joints shall be of the push-on type per AWWA C111. Pipe lining shall be cement mortar with a seal coat of bituminous material, all in accordance with AWWA C104. Ductile Iron Pipe Joints shall be mechanical or gasketed joint as per AWWA C151.

Working pressure shall be as follows:

4" – 12"	350 psi
14" – 20"	250 psi
24"	200 psi
30" – 54"	150 psi

iii. DI pipe shall conform to ANSI/AWWA C151/A21.51 "Ductile Iron Pipe, Centrifugally Cast in Metal Molds for Water or Other Liquids."

iv. The thickness and pressure class of DI pipe required for the installation and operating conditions during the expected service life of the force main shall be determined in accordance with ANSI/AWWA C150/A21.50 "Thickness Design of Ductile Iron Pipe."

v. Fittings for DI pipe shall conform to ANSI/AWWA C110/A21.10 "Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In. for Water and Other Liquids" or ANSI/AWWA C153/A21.53 "Ductile Iron Compact Fittings, 3 In. through 24 In. and 54 In. through 66 In., for Water Service."

vi. Force mains of DI pipe shall have mechanical or gasketed push-on type joints. If exposed, force mains of DI pipe shall have flanged joints. Restrained joint DI pipe may be used for anchoring purposes as described in Section 4.03C.

   a. Gaskets shall be manufactured of vulcanized natural or synthetic rubber in accordance with ANSI/AWWA C111/A21.11 "Rubber Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings."
   b. Flanged DI pipe shall conform to ANSI/AWWA C115/A21.15 "Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.

vii. Consideration shall be given to the existence of or the potential for development of corrosive environments within and outside the force main shall be performed. Sources of corrosion may include: acidic soils, septic wastewater, and air entrainment within the force main. Where corrosion is deemed to be a serious problem, DI pipe shall be provided with cathodic protection or an internal/external encasement, lining, or coating appropriate for the pipe material and situation. Such encasements, linings, and coatings shall be manufactured or applied in accordance with the appropriate ANSI and AWWA standards.

c. PVC Pipe

i. PVC Pipe shall meet the requirements of AWWA C900.

ii. Pipe shall be pressure rated 160 psi, SDR-26, integral bell with strength equal to the pipe wall, cast iron O.C., 18 foot lengths, with a solid elastomeric ring as furnished by Johns-Manville, Clow, North Star, or Robin-Tech.

iii. PVC pipe will require the installation of a detector tape and wire placed a maximum of 2 feet below the covering surface. The detector tape shall be a wide wire as manufactured by Allen or approved by Pluris.

iv. All fittings shall be as manufactured by Russco, Clow, Tyler, American, Union, or Griffin or approved by Pluris.

v. PVC Pipe shall be SDR 21 or schedule 40 PVC pipe with push joints. Pipe and joints shall meet all applicable requirements of ASTM D-2241 and D-1785. PVC pipe requires the installation of detector tape and wire a maximum of 2 feet below the finished grade.

vi. PVC material used in the manufacture of PVC pipe shall conform to ASTM D1784 "Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds."

vii. PVC pipe shall conform to ASTM D1785 "Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, 120" or to ASTM D2241 "Poly(Vinyl Chloride) (PVC) (SDR-PR)."

viii. The thickness and pressure class of PVC pipe required for the installation and operating conditions during the expected service life of the force main shall be determined in accordance with AWWA C900 "Poly(Vinyl Chloride) (PVC) Pressure Pipe, 4 In. through 12 In., for Water" or AWWA C905 "Poly(Vinyl Chloride) (PVC) Water Transmission Pipe, Nominal Diameters 14 In. through 36 In."

ix. Force mains of PVC pipe shall have gasketed push-on type joints. Gaskets shall be manufactured of elastomeric material in accordance with ASTM F477 "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe."

x. Mechanical joint DI pipe fittings conforming to ANSI/AWWA C110/A21.10 or gasketed PVC fittings shall be used for force mains four inches in diameter and larger. Solvent-welded or gasketed fittings may be used for smaller diameter force mains.

d. High-Density Polyethylene Pipe (HDPE)

i. HDPE pipe shall be produced from a high molecular weight, high density, polyethylene resin, meeting the requirements of ASTM D3350 "Standard Specification for Polyethylene (PE) Plastic Pipe and Fitting Materials." Resin material shall be listed by PPI in the name of the manufacturer and shall be based on testing in accordance with ASTM D2837 "Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe."

ii. HDPE pipe shall conform to ASTM D3035 "Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter" or ASTM F714 "D3035 "Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on

Outside Diameter."

iii. The thickness and pressure class of HDPE pipe required for the installation and operating conditions during the expected service life of the force main shall be determined in accordance with AWWA C906 "Polyethylene (PE) Pressure Pipe and Fittings, 4 In. through 63 In., for Water Distribution."

iv. Fittings for HDPE pipe shall conform to ASTM D3261 "Standard Specification for Butt Fusion of Polyethylene (PE) Plastic Fittings for PE Plastic Pipe and Tubing" and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe material.

v. Force mains of HDPE pipe shall be joined by the thermal butt fusion process and shall be performed in accordance with ASTM A2657 "Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings" and the manufacturer's recommendations during installation.

e. Pipe Fitting Materials

i. Pipe fittings shall be cast or ductile iron designed and manufactured per AWWA C110. Fittings up to and including 12 inches shall be designed for an internal pressure of 250 psi. Fittings larger than 12 inches shall be designed for an internal pressure of 150 psi. Joints for fittings shall be mechanical joint and shall be cement mortar lined with a seal coat of bituminous material, in accordance with AWWA C104.

ii. All buried DIP and fittings shall have bituminous coating on the exterior surface in accordance with AWWA C151.

iii. Except for HDPE, pipe shall be supplied in minimum of 18-foot lengths unless approved otherwise by Pluris.

f. Material Identification

i. Force mains shall be appropriately identified upon installation so they will not be confused with potable water lines. Green detector tape and wire 3 inches in width and clearly labeled sanitary sewer shall be laid a maximum of 2 feet below the finished grade.

ii. Force main valves shall have valve box covers marked "Sewer".

g. Manhole Materials - All manholes installed along a force main and the discharge manhole shall be installed according to Section 7.2.1(F) of Pluris Standard Specifications and coated with an approved epoxy coating.

2. Design

a. General

i. Sizes of fittings up to and including 16 inch shall be designed for an internal pressure of 250 psi.

ii. Reaction blocking for all fittings or components subject to hydrostatic thrust shall be securely anchored by the use of concrete thrust blocks poured in place. The reaction areas are shown in Standard Detail 6.11. No concrete shall interfere with the removal of fittings. Materials for reaction blocking shall be 3,000 psi concrete.

iii. Air release valves shall be designed at the high points of all force mains and in the valve vault of all lift stations. The air release valves shall be constructed from stainless steel and utilize a ball valve.

iv. Force sewer mains shall be installed in dedicated public right-of-way or in dedicated utility easements having the following dimensions:

50 feet	Construction Easement
30 feet	Permanent Easement

b. Material

i. Pipe material and specifications shall be selected based on the installation and operating conditions of the force main following installation. Such factors shall include, but shall not be limited to:

a. Installation depth and overburden pressure.
b. Soil conditions and groundwater presence
c. Corrosion resistance from both external and internal sources.
d. Strength required to withstand internal pressures expected during normal operation as well as those resulting from hydraulic surges and water hammer.

ii. Force mains shall be constructed of one of the following types of pipe:

a. Ductile iron (DI)
b. Polyvinyl chloride (PVC)
c. High-Density Polyethylene Pipe (HDPE)
d. All pipe used for force main construction shall be labeled or otherwise identified as conveying wastewater.

c. Diameter

i. The pipe diameter of the force main shall be larger than the diameter of the maximum solid size that is passed by pumps present in the pump station.

a. A minimum four-inch force main shall be used unless the force main is served by pumps capable of grinding, chopping, or cutting solids or a mechanical means of reducing the size of a three-inch solid and any trash or stringy material that can pass through a four-inch hose is installed in the pump station. Acceptable mechanical means of solids reduction shall be as defined in 15A NCAC 02T regulations.

d. Velocity

i. Wastewater velocity occurring in a force main shall be calculated using the continuity equation:

$V = 0.409Q/D^2$

V = velocity(feet per second)
Q = pumping rate of a single pump(gpm)
D = diameter of the pipe segment(inches)

ii. A self-cleansing velocity of at least two feet per second shall be provided throughout the length of the force main in accordance with 15A NCAC 2H .0219(i)(2)(B).

a. Consideration shall be given to preventing or alleviating the accumulation of solids in the force main by providing one or more of the following:

i. The ability to provide velocities of between two and five feet per second during a cleaning event that are suitable to resuspend any solids that may have settled out.
ii. Drain or blow-off valves provided at all low points in the force main. Such valves shall either be connected to an available entry point into the wastewater collection system, provided with a connection for a vacuum pumper truck, and designed with some other method to prevent an intentional discharge of wastewater during their operation.

iii. Flushing ports along the length of the force main as well as a water supply of sufficient quantity and pressure. Such ports shall either be connected to an available entry point into the wastewater collection system, provided with a connection for a vacuum pumper truck, and designed with some other method to prevent an intentional discharge of wastewater during their operation.

iv. Pigging device launching and retrieval stations of a size sufficient to clean the inside diameter of the force main.

b. Compliance with NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section4.03 B.1shall also be required when engineering calculations determine that depressed sections of the force main will not be completely flushed in a single pumping cycle.

iii. Anchorage

a. Force mains shall be adequately anchored to resist thrusts that may develop at bends, tees, valves, fittings, plugs, and at any other location where a change in flow direction occurs.

i. Such anchoring shall be provided through the use of concrete thrust blocking and/or restrained joint pipe.

(1) Concrete thrust blocks shall be located between the fitting to be anchored and undisturbed soil material. Appropriate thrust reaction block bearing areas shall be calculated based not only on the maximum expected force, but also on the soil material. Concrete thrust blocks shall have a minimum compressive strength of 3,000 pounds per square inch.
(2) Self-restrained joints or joints restrained with tie rods and clamps shall both be acceptable. In both cases, component parts shall either be manufactured of corrosion-resistant materials or coated liberally with a corrosion-retarding product.

ii. Anchoring devices shall be designed to withstand force main pressures of at least 25 percent greater than the maximum pump shut-off head plus an allowance for water hammer and an appropriate factor of safety.

e. Surge and Water Hammer

i. Consideration shall be given to analyzing force mains in conjunction with their associated pump stations with respect to the development of hydraulic transients.

ii. Force main design shall be such that active devices for control of transient hydraulic conditions are minimized to the greatest extent possible; however, if this is not feasible, the following shall be acceptable control strategies:

a. Variable-speed pumps or constant-speed pumps in combination with control

valves that open and close slowly.
b. Providing air scouring velocities in the force main.
c. Construction of the force main using a higher-strength pipe.
d. Vacuum relief valves in accordance with NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 4.05.
e. Specialized control and/or release valves and other devices designed to prevent transient pressures from reaching levels that could damage the pump station and force main systems.

f. Appurtenances

i. Air Release and Vacuum Relief Valves

a. The route of the force main shall be such that the number of air release and vacuum relief valves are minimized to the greatest extent possible.

b. In accordance with 15A NCAC 02T .0305(h)(5), an air release valve shall be provided at all high points to prevent air locking of the force main. NC DENR has interpreted this regulation as requiring an air release valve at locations where the distance between the low point and high point in the force main exceeds 10 vertical feet.

i. Automatic or manual air release valves shall be acceptable.
ii. Consideration shall be given to using manual air release valves in lieu of automatic air release valves or providing automatic air release valves with flood protection in areas within the 100-year floodplain or any where flooding is anticipated to occur.
iii. Automatic air valves shall be of the quick-opening, slow-closing type to prevent the development of hydraulic surge conditions.

c. Consideration shall be given to locating vacuum relief valves at locations along the force main where sub-atmospheric pressures or column separation may occur.

g. Force mains shall be installed with a minimum cover of three (3) feet measured from the top of the pipe to the finished subgrade.

h. Dedicated easements for force mains and appurtenances shall be recorded as "Pluris Utility and Pipeline Easement" or "Pluris Sanitary Sewer Easement". Pluris sewer easements shall not contain any other utilities.

i. Force mains shall discharge at the invert of the receiving manhole and shall be as close as possible to 180 degrees from the outlet pipe.

j. Sewage Combination Air Valves shall be installed at all the high points or runs exceeding 3,000-ft on all force mains in accordance with the Standard Details.

k. A plug valve shall be installed every 3,000 feet of force main length, unless otherwise directed by Pluris.

l. All air release valves, plug valves, or other fittings or appurtenances that have moving or operating parts and require maintenance and routine access shall have a manhole placed over them or over the operating portion of the device. Manholes shall be designed and installed as described in Section 7.0 of Pluris Standard Specifications.

m. Refer to Part I and Part II of Pluris Standard Specifications for more details on easements, separation distances, bedding requirements, installation requirements, etc.

3. Construction

a. Ductile Iron Pipe force main may be cored if necessary.

b. PVC pipe will require the installation of a detector tape placed a maximum of 2 feet below the surface. #12 gage copper tracer wire with green plastic coating will be laid with all force mains and made accessible at all valve boxes.
Force mains shall be appropriately identified upon installation so they will not be confused with potable waterlines or other utilities.

c. Reaction blocking for all fittings or components subject to hydrostatic thrust shall be securely anchored by the use of concrete thrust blocks poured in place.

d. Force mains shall be installed with a minimum cover of three feet measured from the top of the pipe to the finished subgrade.

e. Force main valves shall be spaced at appropriate intervals as determined by Pluris, and shall have valve box caps marked "Sewer".

f. The receiving manhole for a force main shall receive an interior coating of Koppers "Super Service Black" with a total dry film thickness of 10 mils. All nicks and scratches shall be touched up prior to acceptance of the manhole. The force main shall discharge at the invert of the receiving manhole and shall be as close as possible to 180° from the outlet pipe.

g. Installation

i. Joints and Bedding

a. Force mains shall be installed such that pipe and joint deflection is minimized.

i. Force mains of DI pipe shall be installed in accordance with AWWA C600 "Installation of Ductile Iron Water Mains and Their Appurtenances."
ii. Force mains of PVC pipe shall be installed in accordance with AWWA C605 "Installation of Underground Installation of Polyvinyl Chloride (PVC) Pipe and Fittings for Water."
iii. Force mains of HDPE pipe shall be installed as described in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 4.01B.3.e. Contractors shall be fully-trained and qualified by the manufacturer to install HDPE pipe.

b. Continuous and uniform bedding, haunching, and backfill that is appropriate for the soil type and pipe material shall be provided in the force main trench.

ii. Burial

a. A minimum burial depth of three feet as measured from the crown of the pipe to the ground surface shall be provided throughout the length of the force main in accordance with 15A NCAC 02T .0305(g)(4). Consideration shall be given to utilizing a greater burial depth in locations where the frost depth exceeds three feet.

b. In the event that the appropriate installation depth cannot be met by the design, the force main shall be constructed of ferrous pipe or provided with a ferrous pipe encasement in accordance with State requirements.

iii. Separations

a. Minimum separations between pump stations/force mains and natural features, other utilities, etc. shall be maintained in accordance with 15A NCAC 02T .0305(f).

b. Stream Crossings

i. Force mains shall be routed such that the number of stream crossings is minimized. When a stream crossing is required by the design, the crossings shall be as nearly perpendicular to the stream flow as possible.
ii. DI pipe with joints equivalent to water main standards or a watertight ferrous encasement pipe shall be used to construct force mains that cross streams. The DI or encasement pipe shall be extended horizontally for a length equal to that required by 15A NCAC 02T .0305 on either side of the stream.
iii. Force main bedding, haunching, and backfill shall be appropriate for the installation location and pipe material. However, the ability of the bedding

and backfill material to readily erode, cause siltation, damage the force main during installation, and corrode the force main after installation shall also be considered.

iv. No aerial stream crossing of force mains will be permitted. All stream crossings will be by directional bore.

c. In the event that the appropriate separation cannot be met by the design, the force main shall be constructed of ferrous pipe material with joints equivalent to water main standards or provided with a watertight, ferrous pipe encasement. However, force mains shall not be closer than 25 feet from a private water supply well or 50 feet from a public water supply well, even if ferrous pipe material with joints equivalent to water main standards is used.

4. Testing

a. Hydrostatic Testing of Force Main

The force main shall be completely filled with water, all air shall be expelled from the pipe and the discharge end of the pipeline shall be plugged and adequately blocked before the hydrostatic test begins.

The force main shall be tested to a pressure of 150 psi or three times the rated TDH of the pumps in psi, whichever is larger, as measured at the lowest elevation of the pipeline, for a duration of 2 hours. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 10 psi or less. At the end of the test period, the leakage shall be measured with an accurate water meter.

Once full of water, the force main segment shall be pressurized and allowed to stabilize at a minimum test pressure of 1.5 times the maximum design pressure of the force main pipe material.

Pipe Size Allowable Leakage

Pipe Size	(Gal. per 1000 ft. of pipe)
4	0.85
6	1.28
8	1.70
12	2.56

All leaks shall be located and repaired regardless of the amount of leakage. If the force main does not pass the leakage test requirements, the cause of the failure shall be identified and repaired. Testing shall be repeated until the force main passes.

b. Force Main Testing

i. General

a. Prior to testing any segment of force main, care shall be taken to prevent the pipe from moving while under pressure.
b. Temporary taps and air releases shall be permissible to facilitate testing.
c. Water used for testing force main installations shall either be disposed in a nearby sanitary sewer, as authorized by the local sewer authority, or in another location in accordance with state and federal laws and regulations.
d. All testing shall be performed in the presence of the applicant, the Engineer of Record or his representative, and an authorized representative from Pluris.
e. The results of all testing shall be maintained by the applicant as part of the construction record documentation as stipulated in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 1.03B.

ii. Force mains shall be installed in a manner such that pipe deflection is minimized.

iii. Pressure Testing

a. A hydrostatic pressure test shall be performed on each segment of installed force main.
b. The test shall be performed after the force main has been backfilled and at least seven days following the pouring of the last thrust block.
c. The following procedures shall be followed in performing hydrostatic pressure tests on force mains:

i. The force main segment shall be carefully filled with water at a velocity of approximately one foot per second. Water may be introduced from either the pump station or a temporary connection made in the force main. Appropriate measures necessary to eliminate all air from the force main shall be
taken during this process.
ii. Once full of water, the force main segment shall be pressurized and allowed to stabilize at a minimum test pressure of 1.5 times the maximum design pressure of the force main pipe material.
iii. This pressure shall be maintained for at least two consecutive hours.
iv. If the stated pressure cannot be maintained, the applicant is responsible for assuring that the cause of test failure is determined, all necessary repairs are made, and repeating the hydrostatic pressure test until the force main segment passes.

d. The pressure test may be performed concurrently or separately with the leakage

test as required in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 6.04D.

iv. Leakage Testing

a. A leakage test shall be performed on each segment of installed force main at the hydrostatic pressure test stipulated in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 6.04C.
b. Leakage shall be defined as the quantity of water required to maintain a pressure within five pounds per square inch of the specified test pressure after the pipe has been filled with water and all air has been expelled.
c. Leakage shall be measured with a calibrated test meter and shall not exceed the amount given by the following formula:

$$L = (N \times D \times \sqrt{P})/ 7400$$

L = Allowable leakage (gallons per hour)
N = Number of joints in length of pipe segment tested
D = Nominal diameter of pipe segment tested (inches)
P = Test pressure (pounds per square inch)

All visible leaks shall be repaired regardless of the amount of leakage. If leakage exceeds this rate, the applicant is responsible for assuring that the cause of test failure is determined, all necessary repairs are made, and repeating the test until the force main segment passes.

d. The leakage test may be performed concurrently or separately with the leakage test stipulated in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 6.04D.

v. Each layer of fill or backfill over the force main shall be compacted to a density needed to accommodate the use of the force main installation area or otherwise may be required (e.g., encroachment agreement with the North Carolina Department of Transportation, etc.)

c. Inspections

i. All materials and equipment used in the construction of the wastewater pumping system must be verified for compliance with the specifications (or other approval granted by Pluris) by the Engineer prior to installation. Non-conforming materials or equipment shall be immediately removed from the job site.

ii. Compliance with plans and specifications shall be verified on a regular basis by the Engineer of Record.

d. General

i. The Contractor shall furnish all materials, labor, and equipment to perform all testing.

ii. All water or wastewater used during testing of the pump station, force main, or any of the systems described in this section, must be disposed of with regard to all NCDENR regulations.

iii. Before the operational tests are conducted, the required copies of the Operation and Maintenance Manuals shall be delivered to Pluris.

iv. Pluris reserves the right to require further testing, as necessary, to assure that all components and infrastructure are performing in accordance with the manufacturer recommendations and Pluris specifications. All testing, repairs and/or readjustments, and necessary re-testing, shall be at no additional cost to Pluris.

v. All on-site testing and/or installation verification shall be performed in the presence of the Inspector or other representative authorized by Pluris.

vi. All testing, installation verification, and training, shall be performed in the presence of, or by, an experienced, competent, and authorized manufacturers' representative.

vii. Factory testing shall consist of testing all operating functions of the equipment under varying operating conditions to assure that it will perform as specified. Any specific testing that may be required is discussed under the individual equipment items below. Results of factory testing shall be presented to Pluris prior to delivery of the equipment.

viii. Installation Verification shall consist of a visit to the site by a manufacturer's representative to inspect, check, adjust if necessary, and approve the equipment installation. The manufacturer's representative shall certify that the equipment has been properly installed and lubricated, is in accurate alignment, and is free from any undue stress imposed by connecting piping or anchor bolts. Any specific verification requirements are discussed under the individual equipment items below. Results of the installation verification shall be presented to Pluris prior to start-up of the equipment.

ix. On-Site Testing shall consist of all manual and automatic operating functions under various operating conditions, including full load conditions. The equipment shall also be tested under adverse or emergency conditions. All alarms and remote signals shall also be tested. Any specific testing that may be required is discussed under the individual equipment items below. Results of the on-site testing shall be presented to Pluris prior to final acceptance of the project.

x. All functions and systems of the pump station, even those not specifically listed below, shall be tested to ensure proper operation under normal and emergency situations.

xi. All defective equipment or malfunctioning systems shall be replaced or corrected, and the full system placed in a fully operational condition to the satisfaction of Pluris, at no cost to Pluris.

xii. Results of all factory testing, installation certifications, and on-site operational testing shall be provided to Pluris in the final construction documents as described in the Submittals portion of this specification section.

5. Valves and Appurtenances

a. Check Valve: Check valves shall be iron bodied, fully bronze mounted with bronze clapper disc and bronze seat ring, and shall have a spring loaded lever arm capable of being mounted on either side of the valve.

b. Plug Valve: Plug valves shall be eccentric action and resilient plug facing with heavy duty stainless steel bearings and welded-in corrosion resistant nickel seal. Force main plug valves shall provide clean passage for a solid sphere of at least 67% of the adjoining pipe diameter to facilitate pigging of the force main. Force main plug valves shall be "full-port" cross-sectional area perpendicular to the flow of at least 100% of the adjoining pipe.

c. Air Release Valve:

i. The valve shall be sized by a North Carolina licensed Engineer, and approved by Pluris. Information on the manufacturer's recommended sizing, along with the Project Engineer's recommendation, shall be submitted to Pluris for review when applying for approval of the sizing.

ii. Combination air valves shall be of the single housing style that combines the operation of both an air/vacuum and air release valve. The valve shall have a minimum two (2) inch NPT inlet and 150-psig working pressure. The valve must meet the requirements of AWWA C512.

Part VII Sewer Pump Stations

1. Material

a. Site Work - There shall be provided a high pressure sodium vapor luminary light of 600 watt (min) capacity to illuminate the pump station area. The light shall be mounted on a Class V utility pole at a height of 30 feet and controlled by means of a photo cell and manual switch to bypass photo cell.

b. Piping and Valves - Suction and discharge piping shall be Class 50 ductile iron flanged pipe as manufactured under AWWA Specification C 141. A check valve and a gate valve shall be provided in a valve vault outside the station for the discharge pipe of each pump. A tee shall be installed in the valve vault to join each discharge pipe into the common force main line. An air release valve shall be located in the valve vault downstream of the gate and check valves. In addition a 3" stub with valve and quick connect coupling shall be installed after the tee to provide an emergency bypass in case of both pumps failing.

c. Electrical - The electrical power entrance shall be through a meter base, followed by a NEMA 4X heavy duty, single throw, fusible safety switch with a solid neutral; followed by a NEMA 4X heavy duty, double throw, three pole safety switch which feeds the control panel from one side and heavy duty, circuit breaking 4 wire, 4 pole receptacle assembly as manufactured by Crouse-Hinds or other approved equal from the other side.

d. Control Equipment Enclosure - Liquid Level Controls – The cord connection for the control shall be numbered 16-2, rated for 13 amps, and shall be type SJTO. To ensure optimum longevity contacts shall be rated for 20 amps at 115 V AC and shall be sealed in a heavy duty glass enclosure.

e. Pump Station – Submersible Pump Type

   i. Sewage Pumps and Motors

      a. Pumps shall be Myers or other approved manufacturer submersible, large grinder or non-clog sewage pumps.

      b. The common pump shaft shall be of 416 stainless steel.

      c. Power cables to pumps shall be AWG (min) hypalon jacketed type SPC cable of thirty (30) feet in length as a minimum.

   ii. Discharge Piping and Valves

a. Discharge piping shall be flanged ductile iron pipe pipe (Class 50 min) sized to produce a minimum head loss while maintaining a minimum velocity of 2.5 feet per second, as here in before specified.

b. All hardware used shall be 316 stainless steel.

iii. Lift Out Rail System - Guide Rails shall be stainless steel pipe.

iv. Telemetry – Mission Control Model M-110 Series wireless monitoring and alarm system.

2. Design

a. General Requirements

i. Sewage pumping stations shall meet the requirements as stated below and as described in each section for the type of station selected. Pump stations may be submersible grinder pumps only.

ii. All stations shall have a minimum of 2 pumps of equal capacity. The pumps shall be solids handling, grinder or non-clog pumps capable of handling flows in excess of the expected peak flow. Where three or more pumps are required, they should be of such capacity that with any one unit out of service, the remaining units will have capacity to handle peak sewage flows. Pumps and the sewage force main shall be sized to provide a minimum velocity in the force main of 2.5 fps.

iii. Sewage pumping stations, all related structures and controls, shall be protected from physical damage by the 100 year flood. Stations shall be designed to remain fully operational and accessible during the 25 year flood. The 100 year flood elevation shall be shown on all site plans. All sewage pump stations which are adjacent to stream classified as WS-I, WS-II, or B waters shall be equipped with an alternate power source. All lift station with a tributary flow of 15,000 gallons per day must be equipped with an emergency self-priming by-pass pump with diesel engine and controlled by independent floats. All pump stations with less than 15,000 gallons per day tributary flow must be plumbed with ports for a mobile by-pass pump. Plumbing connections shall be specified by Pluris.

b. Site Work

i. The site shall be graded generally to drain away from the pump station and to remove stormwater runoff from site in a non-erosive manner.

ii. The site shall be stabilized by crushed stone, low maintenance vegetative ground

cover or other suitable materials. A shrubbery screen shall be provided on three sides of all pump stations, outside the security fence.

iii. The site area shall be secured by a six (6) foot high chain link fence. Fence products shall be only new materials using hot dipped galvanized iron or steel components and aluminum coated fabric. Line posts, top and bottom rails, gate and fabric shall be as specified on the Standard Detail Drawings. Gates shall permit 180 degree opening and shall be located so as to provide vehicle accessibility for lifting the pumping units. There shall be a minimum gate opening of twelve (14) feet to facilitate truck access.

iv. The site shall feature adequate turn around areas for a WB-20 service vehicle and provide a 12 foot (minimum) wide access road to the site with grades not to exceed 10 feet in one hundred feet (10%).

v. There shall be provided a high pressure sodium vapor luminary light of 600 watt (min) capacity to illuminate the pump station area. The light shall be mounted on a Class V utility pole at a height of 30 feet and controlled by means of a photo cell and manual switch.

c. Piping Valves - Check valves shall be iron bodied, fully bronze mounted with bronze clapper disc and replaceable bronze seat ring, and shall have a spring loaded lever arm capable of being mounted on either side of the valve and rated for 175 psi working pressure.

d. Wetwell

i. The wet well shall be precast concrete manhole sections conforming to ASTM C-478, latest revision, with a six (6) foot minimum diameter. The base of the wet well shall be pre-cast, steel reinforced concrete and have a minimum extended base of 6 inches greater than the outside diameter of the wet well. The concrete shall have a minimum 28 day compressive strength of 3,000 psi.

ii. The manhole sections shall have joints of a durable mastic sealing material and the joints shall be further waterproofed on the outside of the wet well by the application of asphalt, overlapped by a 12 inch wide band of inorganic asbestos felt, and a finish mopping of asphalt. The interior side of the joints shall be plastered smooth with 3 coats of portland cement grout. The interior and the exterior of the wet well shall then receive two successive coats of Koppers 'Super Service Black, or a suitable coal tar epoxy, With a total dry film thickness of ten (10) mils, All nicks and scratches shall be touched up in the field before backfilling occurs. The access hatch to the wet well shall be a square hatch of 1/4" aluminum, 6063 alloy, diamond pattern plate with steel hinges on an aluminum frame cast in place in the cover slab.

ii. The wet well shall have a vent made from ductile iron, flanged joint, pipe fittings, as shown on the plans. An insect screen shall be included at the exposed end of the

vent pipe. The insect screen shall be bronze insect screening or aluminum insect screening.

d. Electrical

i. Electrical service to all pump stations shall be three phase, 240 or 480 V AC with a wye connection. The electrical power entrance shall be through a meter base, followed by a NEMA 4X heavy duty, single throw, fusible safety switch which feeds the control panel from one side and heavy duty, circuit breaking 4 wire, 4 pole receptacle assembly as manufactured by the Crouse-Hinds or other approved equal from the other side. All of these electrical components shall be suitably sized to be capable of service with all sewage pumps running.

ii. All electrical components, including panel shall be sealed off with Ductiseal type sealant in accordance with the N. C. Electrical Code requirements for electrical service to gas pumps.

e. Pump Motor Controls - Pump motor controls equipment shall be located within a NEMA 4X stainless steel above ground housing.

f. Control Equipment Enclosure

i. NEMA4X_Enclosure - Enclosure shall be a NEMA type 4X and be of suitable size to house all components. A locking hasp shall be provided in addition to screw clamp type latches. Enclosure shall be fabricated from 14 gauge stainless steel. The top of the enclosure shall serve as a drip shield and the seam free sides shall prevent rain and sleet from entering. Inner panel shall be made of 12 gauge steel and shall be painted white. The enclosure and interior panel shall be painted with heat fused modified polyester powder, electrostatically applied over a phosphatized base. Enclosure shall be ANSI/ASI 61 grey.

ii. Hinged Inner Door – An inner door shall be furnished. Overload reset push buttons, circuit breakers, switches and pilot lights shall be the only components accessible with door closed. Door shall be hinged and may be opened when service is required.

iii. Line Terminal Block – A terminal block shall be furnished with properly sized line lugs to accept the main power source entering the control panel. Load lugs shall be adequate to accept all required load side wiring requirements. All live parts shall be fully shielded.

iv. Motor Circuit Breakers (240 or 460 V AC) - A properly sized, molded case, thermal magnetic circuit breaker shall be provided for each pump motor. Line and load sides shall be equipped with lugs properly sized for the horsepower and current rating of the motor(s). They shall be attached to mounting brackets which are specifically

manufactured for use with the particular circuit breaker. The interrupting rating shall be 10,000 RMS symmetrical amps.

v. Transformer Primary Circuit Breaker (When Transformer Is Required) – A properly sized, two pole, molded case circuit breaker shall be furnished ahead of the control power 120 V AC power transformer for short circuit protection and disconnecting power to the transformer. The circuit breaker shall conform to the specifications for the motor circuit breaker(s).

vi. Control Power Transformer (When Neutral Is Not Available at Jobsite – Std. on 460 V AC) - An industrial quality control transformer shall be furnished to provide control voltage. The transformer shall be sized with an adequate KVA rating to provide 120 V AC power for all items required in the control and alarm circuits. - Transformer shall be protected in its secondary by properly sized fuses and/or circuit breaker(s).

vii. Magnetic Contactors and Overload Relays- A magnetic contactor shall be furnished for each motor. A separate, panel mounted, 3 leg (three phase) or 1 leg (single phase) overload relay shall be supplied for each motor. Each leg of the overload relay shall be equipped with a properly sized overload heater. Contactor and overload relay shall be properly sized for the required horsepower, voltage and phase.

viii. Elapsed Time Meters – Six digit, non-resetable elapsed time meters shall be mounted in the control panel enclosure t o record the running time of each pump.

ix. Phase and Voltage Monitor- A phase failure, reversal and under voltage monitor shall be supplied to prevent the motors from running under low voltage, phase loss, or phase reversal conditions. The monitor will lock out the control circuit until the problem is corrected and automatically reset.

x. Lightning Arrestor- Suitable lightning arrestors shall be provided to protect motors and control equipment from lightning induced line surges.

xi. Thru-Door Overload Reset Push Buttons - Overload reset push buttons shall be provided for each overload relay. Push buttons shall be mounted so that with inner door closed, overload relays may be reset without entering high voltage compartment.

xii. Switches - Heavy duty industrial grade oiltight switches shall be provided for each pump for "Hands-Off-Automatic' operation selection. All switch components shall be made of corrosion resistant metals and polyesters. Contact blocks shall be made of see-through polycarbonate for simplified inspection of contacts, Cams and strokes shall be Teflon impregnated for abrasion free service without lubrication. The switches required shall be as follows:

Switch Function (Name Plate)	Voltage
Manual-off-Automatic	120 V AC

xiii. Pilot Lights – Full voltage heavy duty industrial grade oiltight pilot lights shall be provided. All pilot light components shall be made of corrosion resistant metals and polyesters. An insulated socket shall be furnished to eliminate the possibility of shock during bulb change. Lens shall be made of lexan. The pilot lights required shall be as follows:

Pilot Light Function (Name Plate)	Voltage	Lens Color
PUMP 1	120 V AC	GREEN
PUMP 2	120 V AC	GREEN

xiv. Seal Failure Circuit Test Push Button (illuminated) - Heavy duty industrial grade oiltight push buttons shall be provided for each submersible pump motor. All push button components shall be made of corrosion resistant metals and polyesters. Contact blocks shall be made of see-through polycarbonate for simplified inspection of contacts. An insulated socket shall be furnished to eliminate the possibility of shock during bulb change. Lens shall be made of lexan. The push buttons required shall be as follows:

Pilot Light Function (Name Plate)	Voltage	Lens Color
P1 SEAL FAIL	120 V AC	AMBER
P2 SEAL FAIL	120 V AC	AMBER

xv. Pump Alternator Circuit (For Duplex Pump Operation) - The electromechanical alternator relay shall be of industrial design specifically for use in pump applications. It shall have single pole double throw heavy duty 10 amp silver cadmium oxide contacts enclosed in a transparent cover. The contacts shall transfer when the unit is

deenergized. The circuit shall never be closed or opened while current is being conducted. The alternator circuit shall alternate the lead pump position between the pumps and shall allow the lag pump to start in response to a rising water level in the wet well. Needs to be switchable I.E. PI or P2 lead. (P1 alt. P2).

xvi. Power Failure - Once power is restored after a failure and the pump has pumped the water from alarm level down to pump off, the alarm should automatically reset itself.

xvii. Control Relay(s) - Plug-in control relays with 120 V AC coils shall be provided as required. Contact rating shall be 5 amps (minimum). Sockets shall be of the same manufacture as the relays and hold-down clips shall be furnished to prevent relay from sliding out of the socket.

xviii. High Wet Well Level Alarm - The control panel shall be provided with a suitable alarm circuit, activated by a separate level control. This alarm shall signal a high water condition in the sump. Terminals shall be furnished in the control panel for connection of an externally mounted alarm device. A red flashing light shall be provided as a visual alarm and a horn provided as an audible alarm of the high water condition in the wet well. The pump station shall also be equipped with buttons to both test and silence the horn and light.

xix. Liquid Level Controls - Mercury level control switches shall be provided for pumps on, lead pump on, lag pump on; and high level alarm functions. The mercury switch shall be encapsulated in polyurethane foam for corrosion and shock resistance. Level switches shall be weighted to hold desired position in the sump. The cord connection for the control shall be numbered 16-2, rated for 13 amps, and shall be type SJTO. To ensure optimum longevity contacts shall be rated for 20 amps at 115 V AC and shall be sealed in a heavy duty glass enclosure. No junction boxes or cable splices of any kind will be allowed in the wet well. Float leads shall not be in the same conduit as the motor leads.

xx. High Temperature Shutdown Circuit(s) - The high pump motor temperature circuit shall provide terminals for connection of the leads from the temperature sensor provided in the pump motor windings. Upon a high temperature condition in the pump windings, the control power to the pump motor contactor shall be disconnected, thus stopping the pump motor and an-overheating light shall come on. The pump shall automatically restart when the pump motor temperature returns to an acceptable level.

xxi. Ground Lug(s) - Equipment ground lug(s) shall be provided for grounding the enclosure. The ground lug(s) shall be suitable for the service provided to the enclosure and shall be sized per table 250-95 of the N.E.C. In all cases the enclosure must be adequately grounded per article 250 of the N.E.C.

xxii. Terminals - Terminals shall be provided for connecting mercury float switch leads, temperature sensor and seal fail sensor leads. Terminal blocks shall be rated for 600 volt use and accept a wire range of #22-8. All live parts shall be fully shielded. Block shall be constructed of nylon and have insulating walls on all sides of the lug. Blocks must be U. L. recognized.

xxiii. Construction Standards - Subpanel shall be drilled and tapped to accept machine thread bolts (self tapping screws are not acceptable). All control wiring shall be 16 AWG machine tool wire, Carol type 76512 or equal. All control wire shall be color coded or numbered in accordance with JIC standards. Power (motor) wiring shall be in accordance with the 1984 National Electrical Code. Major groups of wires shall be contained in a plastic wiring trough such as Panduit Type E or other approved equal.

xxiv. Guarantee- The manufacturer of the control panel shall furnish a warranty for one year from the date of start-up stipulating that all equipment shall be free from defects in design, materials and workmanship. The control panel manufacturer shall furnish replacement parts for any component proven defective, whether of his or other manufacturer during the guarantee period, excepting only those items which are normally consumed in service, such as light bulbs.

g. Pump Station – Submersible Pump Type

i. General - The submersible pump station structure shall consist of the wet well, duplex pumps and rails, pump controls and related appurtenances, discharge piping, valves, and valve vault, cover slabs and access hatches.

The wet well shall have as a minimum a diameter of five (6) feet, and shall be large enough to easily accommodate the location and removal of each pump so that no pump will have more than 5 stalls per hour when the other pump is out.

ii. Sewage Pumps and Motors - Pumps shall be Myers or other approved manufacturer, submersible, large grinder or non-clog sewage pumps, or a pump approved by Pluris's engineer. Submersible pumps shall be provided each capable of handling raw, unscreened sewage at peak design flow. Major pump components shall be of gray cast iron devoid of burr, pits or other irregularities: The pump motors shall be sealed submersible type, and shall be three phase, 60 Hertz, 240 or 460 volt motors with a wye connection. The motors shall meet the U. S. requirements of Class I, Division I, Group D for hazardous locations, and shall be sized to non-overloading throughout the entire operating range of the pump.

Stator winding shall be of the open type with insulation good for 1,800 Centigrade maximum temperature. Winding housing shall be filled with a clean high dielectric oil that lubricates bearings and seals and transfer heat from windings and rotor to outer shell.

Motor shall have two heavy duty ball bearings to support pump shaft and take radial and thrust loads and a sleeve guide bushing directly above the lower seal to take radial load and act as flame path for seal chamber. Ball bearings shall be designed for 30,000 hours B-10 life. Stator shall be heat shrunk into motor housing.

A heating sensor thermostat shall be attached to and embedded in the winding and be connected in series with the motor starter contactor coil to stop motor if temperature of winding is more than 220° F. Thermostat shall reset automatically when motor cools to safe operating temperature. The common pump shaft shall be of 416 stainless steel.

The pump motor shall be protected by two mechanical seals mounted in tandem with a seal chamber between the seals. Seal chamber shall be oil filled to lubricate seal face and to transmit heat from shaft to outer shell. Seal face shall be carbon and ceramic and lapped to a flatness of one light band. Lower seal faces shall be tungsten carbide.

A double electrode shall be mounted in the seal chamber to detect any water entering the chamber through the lower seal. Water in the chamber shall cause a red light to turn on at the control panel. This signal shall not stop the motor but shall act as a warning only.

Power cables to pumps shall be AWS (mm) hypalon jacketed type SPC cable of thirty (30) feet in length as a minimum.

iii. Discharge Piping and Valves - Discharge piping shall be flanged ductile iron pipe (Class 50 mm) sized to produce a minimum head loss while maintaining a minimum velocity of 2.5 feet per second, as herein before specified. All exposed piping shall have adequately sized and located thrust rods.

The discharge connection elbow shall be a straight through fitting with no flap valve and shall be permanently installed in the wet well along with the discharge piping. The pumps shall be automatically connected to the discharge connection elbow when lowered into place. A sliding guide bracket shall be guided no less than two guide bars. The entire weight of the pump shall bear upon the guides and base support with no part of the pump bearing directly on the floor of the sump. A stainless steel chain shall be provided for lifting each pump from the wet well and shall be in a single length and extend a minimum of 15 feet past the hatch. All hardware used shall be 316 stainless steel.

Gate valves and check valves on the discharge side of each pump shall be located in a valve vault separate from and adjacent to the wet well. A Dresser coupling shall be installed one each discharge main between the wet well and the valve vault. The

valve vault shall consist of a precast rectangular structure at least 6 feet square, all complete with a drain that goes to the wet well and that has a back water valve on the drain line, access ladder or rungs, and access cover cast in the top slab.

The access cover for the valve vault shall be a square hatch of 1/4 inch aluminum diamond pattern plate with steel hinges on an aluminum frame cast in place in the cover slab.

iv. Lift Out Rail System - The lift out systems shall consist of a straight elbow that bolts to bottom of basin, a combination disconnect assembly with a seal flange that mounts to pump, rail support guides that fasten to wall of basin and guide and support brackets that mount to pump.

Guide rails shall be Stainless steel pipe.

The discharge quick disconnect shall be tapered and have a holding groove machined into the face to hold a-sealing--O-ring. The tapered seat shall allow the pump to be nearly sealed to the discharge elbow before the sealing faces make contact. A guide plate and adjustable guide bar shall be fastened to top of the pump to insure good alignment and for support of the pump.

The rail support and mounting bushing shall be securely mounted to the basin wall and shall not be attached to the basin cover or cover frame.

The guide rail support shall be adjustable so that a perfect vertical alignment of the rails can be obtained.

h. Warranties and Documentation

i. Warranties - The pump manufacturer shall warrant to the Developer and subsequently Pluris, that the pumps, motors, and controls supplied to be free of defects in workmanship and material for a period of one (1) year. The warranty shall be in printed form and made applicable to Pluris (as Warrantee) at the time of acceptance for maintenance by Pluris. Digital and hardcopy drawings of the as-builts shall be provided to Pluris. The drawings shall contain all adjacent utility information including, but not limited to, forcemains, valves, and gravity sewer manholes.

ii. Documentation – Documentation to be supplied to Pluris shall be three copies of the complete Operation and Maintenance manuals which include the following:

a. Cover Sheet Listing: Pump manufacturer; source of repair parts, complete with address and phone number; operating conditions – rated capacity and TDH of each pump; model number, serial number, impeller diameter of each pump; all data plate information from each pump motor; data on other equipment

included as components in the pump station.

b. Pump Performance Curve with operating conditions indicated on it.

c. Detailed dimensional drawings of the pump and pump base elbow.

d. Detailed dimensional drawings of the pump motor.

e. A control panel wiring diagram.

f. Pump and motor installation and service manual.

g. Detailed information related to other components of the pump station.

i. Pump Design

i. General Requirements

a. Only pumps designed and manufactured for use in conveying raw, unscreened wastewater shall be acceptable

b. Pump selection shall consider the duty requirements as well as the physical and chemical characteristics of the wastewater being conveyed. Materials used in pump construction shall also be suitable for the physical and chemical characteristics of the wastewater being conveyed.

c. Pump stations conveying residential, commercial, institutional, or industrial domestic wastewater shall be provided with pumps that are suitable for continuous duty in conveying raw, unscreened wastewater.

i. Pumps shall be capable of handling a three-inch solid and any trash or stringy material that can pass through a four-inch hose unless a mechanical means of solids reduction is installed at the pump station.

(1) Pumps shall be made non-clog either by passing solids, trash, stringy material through a non-clog- or vortex-type impeller or by grinding, chopping, or cutting them prior to passing them through the impeller. Impellers shall have blades that are generally forward rounded or otherwise configured to avoid catching solids, trash, and stringy material.

(2) Mechanical bar screens, communicators, diminutors, or other similar devices may be required at regional pump stations.

ii. Pump suction and discharge openings shall be no less than four inches in

diameter unless the pump is capable of grinding, chopping, or cutting solids or a mechanical means of reducing the size of a three-inch solid and any trash or stringy material that can pass through a four-inch hose is installed at the pump station.

iii. Pumps shall be designed for continuous duty pumping of raw, unscreened wastewater. Pumps shall be adequately protected from damage due to failure conditions specific to the selected pump type and pump station configuration.

ii. Number and Capacity

a. Pump stations shall be provided with the number and capacity of pumps that is stipulated in 15A NCAC 02T .0305(h)(1).

i. Multiple pumps shall be used such that the pump station is capable of conveying the peak hourly wastewater flow to its desired outfall location with the largest single pump out of service.

(1) In duplex pump stations, the pumps shall be of the same capacity.

(2) If pumps in series are required to meet capacity or total dynamic head requirement, each set of pumps in series shall be viewed as a single pumping unit.

(3) Priming pumps as well as any other auxiliary system that is required for pump functionality shall also be provided in multiple numbers.

ii. Determination of pump capacity shall be based on wastewater flows expected to become tributary to the pump station for the entire project/development at build out. For regional pump stations, pump capacity shall be based on wastewater flows expected to become tributary from the entire service area over the life of the pump station.

(1) Interim sizing of pumps and associated pump stations shall be allowable; however, it shall only be used to meet requirements as set forth in 15A NCAC 02T .0305 or the minimum design criteria contained in this document and not for economic purposes.

(2) A conspicuous statement that specifies the initial service capacity shall be provided on the drawings for projects that are approved for an interim condition. Additional wastewater flows (i.e., those in excess of that approved for the interim condition) shall not be made tributary to the pump station until a request for permit modification is submitted to and approved by NCDENR, the pumps and associated pump station are upgraded, and the required certificate of completion and other supporting documentation are received by NCDENR.

iii. The minimum allowable design daily wastewater flow to the pump station shall be determined in accordance with 15A NCAC 02T .0305.

(1) Where a pump station is designed to serve a developed service area, historical potable water use or wastewater flow generation data may be used to determine design daily wastewater flows.

(2) Where a pump station is designed to serve a broad service area for which specific development is not known, design daily wastewater flows may be established based on historical data for the broad service area or established long-range wastewater planning criteria.

iv. The selected peak hourly wastewater flow to the pump station shall be appropriate for the service area as well as the associated wastewater generation patterns and population being served by the pump station. The minimum peak hourly wastewater flow to the pump station shall be calculated using the design daily wastewater flow in conjunction with a peaking factor determined from the following equation:

$$PF = Q_{phf} / Q_{ddf} = [(18 + \text{sqrt}(P)/(4 + \text{sqrt}(P)]$$

Where:

PF = Peaking Factor
Q_{phf} = Peak hourly flow (gpd)
Q_{ddf} = Design daily flow(gpd)
P = service population(thousands)

(1) The above equation yields a peaking factor that is intended to cover normal infiltration and inflow for well-maintained sewer systems and/or those built with modern materials and construction methods. Consideration shall be given to applying higher peaking factors for special conditions such as pump stations serving older collection systems, those serving collection systems located in areas with high actual groundwater tables, those serving areas that have combined sewer systems, etc. Infiltration and inflow allowances shall be incorporated using actual flow data whenever possible.

(2) Peaking factors for pump stations conveying industrial or other process wastewater shall be determined based on actual operating conditions of the

facility; however, in no case shall the peaking factor be less than the minimum set forth in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 2.02A.4.c.

(3) In no case shall a peaking factor less than 2.5 be used to calculate peak hourly wastewater flows for any pump station.

b. Pump capacity shall also be based upon the need to maintain a minimum velocity of two feet per second in the force main in accordance with State requirements.

iii. Selection Methodology

a. Pump selection shall be based on a hydraulic analysis of the system through which the wastewater is to be conveyed.

i. The design operating point(s) of the pump(s) shall be determined using a pump curve-system curve analysis. Pumps shall be selected such that the pumps shall be capable of pumping the required capacity, as described in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 2.02, for all total dynamic head requirements developed by the system for the lifetime of the pump station.

ii. A system curve, plotting total dynamic head versus capacity, shall be developed for all operating conditions that may be imposed on the system. Total dynamic head requirements for the system shall be calculated as the total of the following individual components:

1. Static head requirements of the system, including that associated with both the suction and discharge sides of the pumps, shall be evaluated. In addition to calculating static head with the discharge evaluation of the force main, any intermediate high points in the force main that would have an effect on the total dynamic head requirements of the pump shall be analyzed.

2. Friction head requirements of the system, including that associated with both the suction and discharge sides of the pumps, shall be evaluated. The friction head shall be calculated using the Hazen-Williams formula:

$$h_f = L[\ 4.73Q^{1.85} / C^{1.85}D^{4.87}]$$

Where:
h_f = Friction head in feet
L = Length of the pipe segment in feet
Q = Flow rate in gpm
C = Hazen Williams coefficient

D = Inside pipe diameter in inches

All operating conditions shall be evaluated including, but shall not be limited to, multiple pump operation within the subject force main, simultaneous pump station operation for common force main situations, as well as the possibility for gravity flow conditions in force main segments with extreme negative slopes that may not flow full.

3. Head derived from any minor losses of the system, including that associated with the both the suction side and discharge side of the pump, shall be evaluated. Such minor losses shall include head derived from valves and other fittings such as tees, bends, angles, etc.

iii. If applicable, the pressure head at the junction of the existing force main shall also be evaluated for its effect on the total dynamic head requirements of the system. The evaluation shall take into account the effects of simultaneous pump station operation as well as multiple pump operation in other pump stations.

iv. System curves shall be generated and evaluated not only for present day conditions, but also for those conditions that may exist over the expected lifetime of the pump station.

v. The Hazen-Williams friction coefficient, C, appropriate for the force main pipe material and age of the force main shall be used. The following maximum values shall be allowable for C:

Pipe Type	Initial Service C	End-of-Service C
DI	125	100
PVC	140	120
HDPE	140	120

vi. Friction head and minor losses associated with the system shall be evaluated at both the initial service condition and the end-of-service condition.

vii. The design operating point(s) shall be defined as the intersection of the pump curve and the calculated system curve(s).

viii. Pumps shall be selected such that all design operating points are on the pump curve as supplied by the pump manufacturer. In addition, pumps shall be selected such that the net positive suction head available ($NPSH_A$) shall be greater than the net positive suction head required ($NPSH_R$) at each of the design operating

points.

ix. Pumps shall be selected such that the pumps will not cavitate at any of the design operating points. Pumps that operate within the unstable portion of the pump curve under any of the expected design conditions shall not be allowed. Freewheeling (i.e., operating at pump run-out) or deadheading (i.e., operating at pump shut-off) of pumps shall not be allowed.

x. To the greatest extent possible, pumps shall be selected such that their operating efficiency is maximized during all hydraulic conditions that may exist over the expected lifetime of the pump station.

b. Consideration shall be given to minimizing motor speeds during the pump selection process.

c. The horsepower rating of each pump motor shall be at least 1.15 times that required by the pump when operating at all design operating conditions.

iv. Cycle and Pump Run Times

a. Constant speed pumps shall be cycled such that the number of starts are minimized and resting times are maximized to avoid overheating and overstressing of the pump motor.

i. Automatic pump alternation shall be provided.

ii. Pumps shall be designed to operate between two and eight times per hour at design daily flow in accordance with 15A NCAC 02T .0350(h)(1) whenever practicable (see NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 2.04A.2.b.).

1. The following equation shall be used to determine the active storage volume in the pump station (i.e., the volume between the pump-on and all pump-off elevations) required to elicit the required pump cycle time:

$$V = T\ Q_{ddf}\ [1-(Q_{ddf}/Q)]$$

V = active volume within the pump station (gallons)
T = allowable cycle time between starts (minutes)
Q_{ddf} = design daily flow to pump station (gallons per minute)
Q = pumping rate of a single pump (gallons per minute)

2. If the wastewater generation patterns are such that less than two pumping cycles per hour will occur at design daily flow or if the pump station

is intended to provide equalization of hydraulic surges, measures to control odor and corrosion shall be employed when resultant detention times cause septic conditions. These measures shall take into consideration protection of the pump station, the force main, the outfall sewer, any related appurtenances, as well as the surrounding area.

b. Consideration shall be given to using variable speed pumps for main pump stations or those pump stations that discharge directly into the wastewater treatment facility.

c. Pump run times shall be such that excessive wear of the pumps does not occur.

d. At design daily flow, adequate time shall be provided to allow a constant speed pump to "ramp up" to full speed before the pumping cycle ends.

e. Pump run times at design daily flow shall not be less than or greater than those recommended by the pump manufacturer.

j. Pump Station Design

i. General Requirements

a. Pump stations shall be designed to achieve total containment of the influent wastewater prior to being conveyed through the force main

b. Pump stations shall be designed such that infiltration and inflow is minimized.

ii. Site Selection

a. Location and Access

i. Pump stations shall be designed to achieve total containment of the influent wastewater prior to being conveyed through the force main.

ii. Pump station sites shall be accessible by an all-weather roadway in accordance with 15A NCAC 02T .0350(h)(4)

1. The roadway shall be provided from a hard surface road. The minimum acceptable surface shall be a 6" compact gravel base able to support large vehicular traffic loads.

2. Wherever practicable, no portion of the roadway shall be located below

the 100-year flood elevation as identified on the most recent FEMA Flood Insurance Rate map when available or as established through appropriate modeling techniques.

3. The roadway shall be designed to accommodate the largest vehicle expected to service the pump station. In no case shall the roadway be less than 12 feet in width. Roadway widths may me reduced to mitigate wetland impacts.

4. At a minimum, the roadway shall be constructed from a six-inch layer of compacted aggregate base course (ABC) stone. In no case shall uncompacted gravel or stone material be allowed for roadway construction.

b. Security

i. Access to the pump station structures as well as all associated equipment and appurtenances shall be restricted in accordance with 15A NCAC 02T.0350(h)(4)

1. All ports of entry into pump station shall be locked.

2. Fencing provided around pump station structures shall be of sufficient height and material to deter entry. Locked gates, a minimum of 14-feet wide, shall be provided in the fence to allow vehicular access by operation and maintenance staff. Consideration shall be given to complying with the requirements in Section 3.02B.1.c. as well.

3. There shall be no overhead obstruction above the pump station to allow the use of a boom truck at the pump station for lifting pumps. Additionally, stainless steel chain shall be used for lifting out the pumps and the cable shall be in a single length with the cable being able to extend 15 feet above the wetwell hatch.

ii. The pump station shall be provided with adequate outdoor and indoor lighting to facilitate normal and emergency operation and maintenance activities during daylight and non-daylight hours.

iii. Safety placards for all pump station structures and equipment, as required by OSHA, shall be provided and be readily visible.

iii. Structural Design

a. Materials of Construction

i. Pump station structures shall be designed and built in complete compliance

with all applicable state, local, and federal codes as well as any applicable OSHA standards.

ii. Material selection for pump station structures shall be based on installation and operating factors including, but not limited to, the following:

1. Physical, chemical, and biological wastewater characteristics.

2. Corrosive gas production.

3. Soil characteristics.

4. Groundwater presence.

iii. Pump station structures shall be completely separated unless made completely watertight and gas-tight.

iv. Pump station structures shall be adequately protected to minimize damage from vehicular traffic.

b. Buoyancy Protection

i. Below-ground pump station structures shall be protected from buoyant forces of groundwater.

ii. Buoyancy protection shall be demonstrated through the use of flotation calculations.

1. Flotation calculations shall be performed on below-ground pump station structures using the assumption that the elevation of the groundwater table is equivalent to the ground elevation.

2. Flotation calculations shall not add the weight of the pumps, internal piping and appurtenances, or wastewater present in the pump station, including the wastewater below the all pumps-off activation level, into the downward forces used to counteract buoyancy.

3. The use of the saturated weight of any soil above the extended footing of the pump station structure shall be allowed in the flotation calculations.

iii. Flotation calculations shall show that the design of the below-ground pump station structures will be protected from buoyancy with a factor of safety that is equal to or greater than one.

c. Flood Resistance

i. Pump station structures as well as all associated equipment and appurtenances shall be protected from the 100-year flood, in accordance with 15A NCAC 02T .0350(e).

ii. Such protection measures shall ensure that the pump station shall remain fully functional, operational, and free from physical damage during a 100-year flood.

iii. The pump station shall be protected from inundation of floodwaters by elevating structures at least two-feet above the 100-year flood elevation. An alternate design shall include providing all pump station structures with watertight ports of entry as well as electrical, instrumentation/control, and ventilation systems that are elevated at least two-feet above the 100-year flood elevations.

iv. The 100-year flood elevation shall be that as identified on the most recent FEMA Flood Insurance Rate map when available or as established through appropriate modeling techniques.

d. Solids Collection

i. Wet wells shall be designed to minimize pump or pump suction piping operational problems resulting from the accumulation of solids and grit material within the wet well.

1. Acceptable designs include the use of fillets and sloped wet well floors alone or in conjunction with a hopper bottom.

2. The design of fillets and slopes shall be such that solids are effectively moved toward the pump or pump suction piping.

ii. No projections within the wet well which would allow deposition of solids under normal operating conditions shall be allowed.

e. Depth

i. Pump Submergence Depth

1. Sufficient submergence of the pump or pump suction piping shall be provided to prevent the occurrence of vortexing within the wet well.

2. In no case shall the all pumps-off activation level be less than the minimum level required for successful pump operation, as recommended by the pump

manufacturer.

ii. The wet well shall be provided with a depth as required to maintain the active storage volume as required in Section 2.04A.2.a of the NCDENR Minimum Design Criteria.

iii. The wet well shall be provided with a depth as required to maintain the emergency storage volume as required in Section 5.04B.3 and Section 5.04B.4. of the NCDENR Minimum Design Criteria.

iv. Piping and Valves

a. Suction and Discharge Piping Configurations

i. Each pump shall be provided with separate suction and discharge piping systems

1. Pump suction and discharge piping shall be no less than four inches in diameter unless the pump is capable of grinding, chopping, or cutting solids or a mechanical means of reducing the size of a three-inch solid and any trash or stringy material that can pass through a four-inch hose is installed in the pump station. Acceptable mechanical means of solids reduction shall be as defined in Section 2.01C.1.b of the NCDENR Minimum Design Criteria.

2. The ultimate pump suction and discharge piping sized shall be selected such that a velocity of between two and eight feet per second is achieved.

ii. The discharge piping systems shall be provided with sufficient valves to effect proper operation and maintenance of the pump station during both normal and emergency conditions.

1. Selected valves shall be suitable for use with raw, unscreened wastewater and shall be of a design suitable for its function, its installation location, as well as the normal and maximum operating pressures expected at the pump station.

(i) A full-closing shut-off valve shall be provided on the discharge piping of each pump and on the suction piping of each dry well pump.

(ii) A check valve shall be provided on the discharge piping of each pump, between the pump and the shut-off valve. Check valves shall be places in the horizontal position unless the valve is of a ball check-type.

2. All valves shall be located such that they are readily accessible. Valves shall be placed either in the dry well or in a separate valve vault.

b. Pipe Connections

i. Flexible pipe joints shall be used on pipes between the pump station structures to allow for differential settlement without compromising the integrity of the overall pump station.

ii. Pipe inlets and outlets of pump station structures shall be made watertight.

iii. Existing pump station structures shall be core drilled or saw-cut when connections are made through the structure wall. In no case shall penetrations into pump station structures be made by hammering.

c. Water Service

i. Wherever practicable or required by the design, potable or reclaimed water service shall be provided to the pump station.

ii. Cross-connection control for potable water services shall be provided in accordance with 15A NCAC 18C .0406(b). Cross-connection control for reclaimed water services shall be provided in accordance with 15A NCAC 02T .0909(f).

d. Pig Launching/Retrieval Stations

i. When pig launching and retrieval stations are made part of the pump station, their design shall be such that they may be isolated from the force main.

ii. The design of the pig retrieval station shall be such that accumulated material dislodged from the force main may be properly removed and disposed.

v. Appurtenances

a. Consideration shall be given to protecting pump station structures and equipment from physical damage or clogging from solid material normally present in wastewater through the use of screening and other solids reducing equipment.

b. Pump Removal Methods/Equipment

i. Provisions shall be so that the largest piece of equipment installed at the pump station may be removed. Such provision may include supplying of hoisting equipment and/or designing sufficient clearance around the pump station for mobile hoisting equipment access.

ii. Pump station structures shall be provided with access hatches, doors, sky lights, etc. of sufficient size such that the largest piece of equipment may be removed without damaging the integrity of the structural design.

iii. Pump stations utilizing submersible pumps installed in wet wells shall be provided with a system that allows for the removal and installation of the pumps without requiring entry into the wet well.

1. Each pump shall be provided with a guide rail system and a lift-out chain.

2. Both the guide rail system and the lift-out chain shall be capable of withstanding the forces required to disengage the pump from the wet well.

3. Both the guide rail system and the lift-out chain shall be manufactured of stainless steel. Under no circumstances shall steel or galvanized steel be used.

c. Access Equipment

i. Each pump station structure shall be designed such that access to perform routine and emergency operation and maintenance is easy, unobstructed, and safe.

ii. Each pump station structure shall be provided with a separate means of access. Under no circumstance shall access to the wet well be provided through a dry well.

iii. Steps, ladders, stairs, landings, hatches, and other means of access shall conform to OSHA standards as well as all applicable local and state building codes regarding design characteristics.

d. Ventilation Equipment

i. Pump stations shall be adequately vented in accordance with 15A NCAC 02T .0350(h)(3) as well as in complete compliance with all applicable local and state building codes as well as OSHA and NFPA standards.

ii. At a minimum, pump station wet wells shall be provided with a gooseneck-type vent. Active ventilation units shall also be acceptable.

1. Vents shall be constructed of sturdy material that is resistant to ultraviolet light and adequately supported to withstand damage during normal and emergency operation and maintenance.

2. Vent elevations shall be a minimum of two feet above the 100-year flood elevation as identified on the most recent FEMA map when available or as established through appropriate modeling techniques.

3. Vents shall be provided with an insect/bird screen of stainless steel, aluminum, corrosion-resistant material. Under no circumstances shall steel or galvanized steel be used.

iii. Dry wells or other enclosed pump station structures into which routine operator entry is required shall either have a positive-pressure ventilation system that meets, at a minimum, the requirements of NFPA 820 "Standard for Fire Protection in Wastewater Treatment and Collection Facilities.". Consideration shall be given to installing sensor and alarm systems to detect the accumulation of dangerous levels of hazardous gases.

e. Other Equipment

i. Consideration shall be given to controlling the pump station temperature and humidity to a level appropriate for reliable operation of the electrical and instrumentation/control systems.

ii. Pump station structures other than the wetwell shall be provided with a means to remove accumulated water and wastewater from the structure. All floor and walkway surfaces shall be sloped such that water and wastewater drains to the removal area under the influence of gravity. Acceptable removal means include the following:

1. An appropriately-sized drainage pipe.

(i) The drainage pipe shall convey accumulated water and wastewater to the wet well or other available entry point into the wastewater collection system. Under no circumstances shall the drainage pipe convey accumulated water and wastewater to daylight, into a surface water, or into the ground.

(ii) The discharge of the drainage pipe shall be higher than the high-water alarm activation level in the wet well or the maximum water level expected at the other available entry point into the wastewater collection system.

(iii) The drainage pipe shall be provided with device to prevent backflow of wastewater and gases from the wet well into the structure.

k. Electrical and Instrumentation/Control Systems Design

i. General Requirements

a. Electrical systems for pump stations shall be designed and installed in strict conformance with NFPA 70 "National Electric Code," ANSI, as well as all applicable federal, state, and local codes.

i. In general, electrical and instrumentation/control systems and components shall be protected against corrosive conditions.

ii. If located in a wet well or other location where explosive or flammable gases may concentrate, electrical and instrumentation/control systems and components shall meet the requirements for a Class I, Group D, Division I location.

b. Each pump and motor unit shall be provided with a separate electrical supply, motor starter, alarm sensors, as well as electrical and instrumentation/control systems and components.

i. Electrical and instrumentation/control systems and components shall be located such that they may be disconnected from outside a wet well.

ii. Cables and conduits shall be provided with seals that are both water-tight and gas-tight, shall be protected from corrosion, and shall allow separate strain relief.

c. The main power feed to all pump stations shall be equipped with an above-grade, fused disconnect switch.

ii. Enclosures

a. Enclosures for electrical and control components for the pump station shall be located outside of the wet well and in a location such that they are readily accessible, ensure maximum electrical and personnel safety, and are protected from damage due to vehicular traffic and flooding.

b. Enclosures shall have a NEMA-rating that is appropriate for the installation location at the pump station.

i. If not housed, enclosures shall have a minimum NEMA 3R rating. NEMA 4X

enclosures shall be used in locations where the potential for flooding and the development and accumulation of corrosive gases exist. NEMA 4X stainless steel enclosures shall be used for all outdoor installations.

ii. Enclosures shall be protected by a conduit seal or other appropriate sealing method that meets the requirements of NFPA 70 to protect the wet well atmosphere from gaining access to the enclosure. This seal shall be located such that it will not be disturbed during routine operation and maintenance functions at the wet well for a Class I, Division 2 location.

c. All enclosures as well as all switches and indicator lights, whether mounted on an inner door or face of the enclosure, shall be provided with a label that conforms to UL descriptions and procedures.

d. The applicant's lock-out/tag-out procedures shall be considered in the design of all enclosures to be installed at the pump station.

iii. Instrumentation and Controls

a. Wastewater Level Sensing Equipment

i. Pump station cycles, as described in Section 2.04A.2., shall be controlled through the use of wastewater level sensing equipment in the wet well.

ii. At a minimum, wastewater levels within the wet well shall be detected through the use of sealed mercury-type float switches. In the event that an alternate method of level detection (i.e., bubble tube, ultrasonic meter, etc.) is used, a float switch at the high-water alarm level shall be installed as a back-up.

iii. Wastewater level sensing equipment shall be used to indicate the following levels and operate the pump station correspondingly: all pumps off, lead pump on, lag pump on, and high-water alarm.

iv. Wastewater level sensing equipment shall be located so as not to be affected by flows entering the wet well or the turbulence created by the suction of the pump.

b. Components

i. The pump station shall be equipped with sufficient instrumentation/control systems and components to monitor and control key operating conditions.

ii. At a minimum, the following systems and components shall be provided for

the pump station:

1. Pump Station Function

(i) Each pump installed at the pump station shall be provided with a "Hand-Off-Auto" selector switch so that the operational mode of the pump may be selected.

(ii) Each pump installed at the pump station shall have a pump run timer that is capable of keeping a cumulative log of the operational time of each pump.

2. Sufficient indicator lights shall be used to demonstrate the operational status of the pump station. The indication lights shall be specific to the condition detected. At a minimum, indicator lights shall be provided for each pump to indicate a pump on condition and a pump alarm/failure condition.

3. Weather-proof audible and visual alarms that are external to any structure or enclosure shall be provided at the pump station in accordance with 15A NCAC 2H .0219(h)(5). In the event of a power loss at the pump station or a failure of the automatically-activated stand-by power generation source, the alarm system shall be operated from a battery back-up power source. This battery back-up power source shall be provided with continuous charge. At a minimum, the following conditions shall be monitored by the system, and each shall cause activation of the audible and visual alarms:

(i) Pump failure.

(ii) Wastewater level sensing failure (if applicable).

(iii) High-water in the wet well.

(iv) High-water level in the dry well sump (if applicable).

(v) Loss of telemetry transmission line (if applicable).

(vi) Loss of power supply.

(vii)Automatically-activated stand-by power generation source failure (if applicable).

4. A telemetry system shall be installed at all pump stations regardless of the reliability method employed in the pump station design.

(i) The telemetry system shall contact personnel capable of initiating a response to a pump station alarm condition 24 hours per day, 365 days per year.

(ii) In the event of a power supply loss at the pump station or a failure of the automatically-activated stand-by power generation source, the telemetry system shall be operated from a battery back-up power source. This battery back-up power source shall be provided with continuous charge.

(iii) The telemetry system shall be activated for any of the following alarm conditions: high-water in the wet well, pump failure, loss of power supply, and automatically-activated stand-by power generation source failure (if applicable).

5. Appurtenances

(i) Sufficient 110-volt electrical receptacles shall be provided to facilitate maintenance at the pump station. If located in an outdoor area, the receptacles shall be of the ground fault interruptible type and shall be protected from the weather elements.

(ii) If reliability for the pump station is based on a contingency plan that involves portable power generation units (see Section 5.04B.3.), the pump station shall be provided with a quick connection plumbing port for a mobile by-pass pump.

iv. Reliability

a. Pump station reliability shall be in accordance with 15A NCAC 02T .0350(h)(1) and shall be considered a key, integral part of the overall pump station design.

b. One of the following reliability options shall be incorporated into the pump station design:

i. The pump station shall be connected to multiple power sources.

1. A multiple power source shall be defined as a completely separate power feeder line(s) connected to the pump station from a substation or transformer that is independent from the primary feeder.

2. Each separate substation or transformer and associated transmission lines shall be capable of starting and operating the pump station at its rated capacity.

ii. The pump station shall be connected to an automatically-activated stand-by bypass pumping system. The pumping system will operate independently from the pump station submersible pumps and be activated by an independent level sensor/ float system.

1. The permanently installed emergency back-up pumpset specified in this section will be used to pump wastewater and raw sewage in applications requiring a suction lift or as an inline booster pump.

2. The pump and accessories shall be supplied by the pump manufacturer.

3. The pump shall be fitted with a fully automatic priming system incorporating an air compressor, air ejector assembly, and an air/water separation tank. The priming system shall be capable of priming the pump from a completely dry pump casing. The air ejector shall operate on the discharge side of the compressor, eliminating the possibility of water being drawn into the air source. The pump must be capable of running totally dry for periods up to twenty-four hours, then automatically re-priming and returning to normal pumping volumes without need for any adjustment.

4. The priming system shall not use a vacuum or diaphragm pump, nor require the use of a "Foot"-type valve. It shall contain no moving parts or protective float gear. Priming systems that require manual water additions to facilitate pump priming are not acceptable. A demonstration of the pump's ability to repeatedly cycle from dry suction / pump / snore / repriming / pump shall be required. This will necessitate the draining of all residual water from the pump case to initiate a dry suction starting condition.

5. Pump and priming system shall be fully automatic, needing no form of adjustment or manual addition of water for the priming system. The pump shall be capable of static suction lifts to twenty-eight vertical feet, at sea level. It shall also be capable of operation using extended suction lines.

6. Equipment acceptance shall be contingent upon the pumps ability to run continuously at full speed in a completely dry condition for periods up to twenty-four hours. This may require the draining of all residual water in the pump casing to simulate a dry suction/case condition. The engineer may require a demonstration.

7. The engine and pump shall be completely enclosed with fourteen-gauge sheet metal panels backed with one-inch and two-inch layers of polydamp acoustical sound-deadening material. The acoustical enclosure shall reduce pump and engine noise to sixty-eight dBA or less at a distance of thirty feet. The enclosure shall be removable for easy access to the engine/pump for maintenance and repair. The enclosure doors shall all be equipped with latches that are keyed alike. For maintenance and service needs, the enclosure sides shall have hinged doors for quick access to the engine oil fill, fuel fill port, oil dipstick, and filters.
8. A complete submittal of the bypass pumping system shall be submitted to Pluris for review. This submittal shall include all engineering calculations for the system. Pluris may be contacted prior to bypass system design for additional specifications and acceptable system manufacturers.

l. Operations and Maintenance (O&M) Manuals

i. An O&M Manual shall be prepared for each pump station and shall be made available to the applicant upon start-up of the pump station/force main system.

ii. A copy of the O&M Manual shall be kept at the applicant's main office. The O&M Manual shall be kept on file for the life of the pump station and updated as required.

ii. At a minimum, O&M Manuals shall contain the following minimum information:

a. Approved shop drawings, including design data for all installed equipment and each major component and a pump curve/system curve analysis showing the design operating point(s).

b. Control panel wiring diagrams.

c. Warranty information for all installed equipment and each major component.

d. Inventory, functional descriptions, and complete operating instructions for all installed equipment and each major component.

e. Instructions for start-up/shut-down as well as for calibration and adjustment of all installed equipment and each major component.

f. Recommended maintenance management system, including preventative and predictive maintenance, for all installed equipment and each major component.

g. Contingency plan and analysis of critical safety issues.

h. Contact information for local service companies as well as instructions for replacement of all installed equipment and each major component.

i. Contact information for local contractors capable of performing emergency repairs.

j. Contact information for regulatory and other agencies.

3. Testing

a. Operational Test - Before the operational test is conducted, the required copies of the Operation and Maintenance Manuals shall be delivered to Pluris and the wet well shall be thoroughly cleaned to remove dirt, mud, gravel and other foreign debris. The operational test shall check the proper functioning of the pumps and pump controls. The pump and motor serial numbers shall be verified. All components and motor serial numbers shall be verified. All components of the pump station shall be checked to ensure that they are capable of performing the service intended. The operational test shall be performed by Pluris. The Contractor or Developer shall ensure that a representative from the pump station equipment manufacturer is present at the operational test to review proper operation of the equipment with Pluris personnel.

b. Contractor's Responsibility - The Contractor shall furnish all materials, labor, and equipment to perform all testing. Water for testing purposes will be provided by Pluris. The Contractor shall coordinate with Pluris for the use of water for testing.

c. Watertightness Testing (Pump Station Testing)

   i. Wetwells and other wastewater-containing structures at the pump station shall be inspected and tested for watertightness.

   ii. The watertightness test for the wet well and other wastewater-containing structures at the pump station shall be completed separately and independently of the leakage test performed on the force main as required in Section 6.04D of the NCDENR Minimum Design Criteria.

   iii. The watertightness test shall be performed in the presence of the applicant, the PE, or other authorized representative.

   iv. The watertightness test shall be performed in accordance with ACI 350.1R "Testing Reinforced Concrete Structures for Watertightness," AWWA D100 "Welded Steel Tanks for Water Storage," or the manufacturer's recommendations. A vacuum test

method in accordance with ASTM C1244 "Standard Test Method for Concrete Sewer Manholes by Negative Test Pressure (Vacuum) Test" may be used for small diameter wetwells in lieu of a hydraulic test

a. Unless the pump station wetwell is constructed of cast-in-place concrete, testing shall not commence until the structure being tested has been fully assembled and backfilling is complete.

b. All inlets and outlets in the structure shall be temporarily plugged and braced or otherwise sealed prior to initiating the test.

c. Pump station wetwells that fail to meet the watertightness test requirements shall be inspected, made watertight, and retested until the test passage is assured.

d. Pump Testing

i. Factory Testing

a. All pumps shall be tested by the manufacturer in accordance with the appropriate UL standard prior to shipment for installation.

b. The results of all factory testing shall be maintained by the applicant as part of the construction record documentation as stipulated in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 1.03B.

ii. Drawdown Testing

a. Following installation, each pump in the pump station shall be subjected to a drawdown test or other similar testing procedure to confirm that the pump is operating at or near the required design operating point(s).

b. The drawdown test shall be performed in the presence of the applicant, the PE, or other authorized representative.

c. The results of all drawdown testing shall be maintained by the applicant as part of the construction record documentation as stipulated in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 1.03B.

iii. Witnessed Testing

a. Consideration shall be given by the applicant to require a witnessed test for large

pumps, pumps in critical installations, or pump replacement/repair situations.

b. All witnessed testing shall be performed in accordance with the appropriate HI standard.

c. Witnessed testing shall be performed in the presence of the applicant, the PE, or other authorized representative.

d. The results of all witnessed testing shall be maintained by the applicant as part of the construction record documentation as stipulated in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 1.03B.

e. Electrical and Instrumentation/Control System Testing

   i. The applicant shall ensure that a formal testing program of all electrical as well as instrumentation and control systems installed at the pump station is developed and performed.

   ii. The program may consist of a combination of unwitnessed/witnessed factory tests, field readiness tests, and witnessed field tests. At a minimum, however, the applicant shall witness a field test of the pump station's electrical and instrumentation/control systems. The basic functions which shall be tested for operation as intended by the pump station design shall include, but shall not be limited to, the following:

      a. Pump operational functions.

      b. Level-sensing equipment.

      c. Alarm system.

      d. Telemetry system.

      e. Stand-by or emergency power system.

   iii. All testing of the electrical and instrumentation/control systems shall be performed in the presence of the applicant, the PE, or other authorized representative.

   iv. The results of all testing shall be maintained by the applicant as part of the construction record documentation as stipulated in NC DENR's Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains Section 1.03B.

4. Electrical

a. General - Electrical service to all pump stations shall be three phase, 240or 460 V AC with a wye connection. The electrical power entrance shall be through a meter base, followed by a NEMA 4X heavy duty, single throw, fusible safety switch with a solid neutral; followed by a NEMA 4X heavy duty, double throw, three pole safety switch which feeds the control panel from one side and heavy duty, circuit breaking 4 wire, 4 pole receptacle assembly as manufactured by Crouse-Hinds or other approved equal from the other side. All of these electrical components shall be suitably sized to be capable of service with both sewage pumps running.

All electrical components, including panel shall be sealed off with Ductiseal type sealant in accordance with the N. C. Electrical Code requirements for electrical service to gas pumps.

b. Control Equipment Enclosure

i. NEMA4X Enclosure - Enclosure shall be a NEMA type 4X_and be of suitable size to house all components. A locking hasp shall be provided in addition to screw clamp type latches. Enclosure shall be fabricated from 14 gauge steel. The top of the enclosure shall serve as a drip shield and the seam free sides shall prevent rain and sleet from entering. Inner panel shall be made of 12 gauge steel and shall be painted white. The enclosure and interior panel shall be painted with heat fused modified polyester powder, electrostatically applied over a phosphatized base. Enclosure shall be ANSI/ASI 61 grey.

ii. Hinged Inner Door – An inner door shall be furnished. Overload reset push buttons, circuit breakers, switches and pilot lights shall be the only components accessible with door closed. Door shall be hinged and may be opened when service is required.

iii. Line Terminal Block – A terminal block shall be furnished with properly sized line lugs to accept the main power source entering the control panel. Load lugs shall be adequate to accept all required load side wiring requirements. All live parts shall be fully shielded.

iv. Motor Circuit Breakers (240 V AC) - A properly sized, molded case, thermal magnetic circuit breaker shall be provided for each pump motor. Line and load sides shall be equipped with lugs properly sized for the horsepower and current rating of the motor(s). They shall be attached to mounting brackets which are specifically manufactured for use with the particular circuit breaker. The interrupting rating shall be 10,000 RMS symmetrical amps.

v. Transformer Primary Circuit Breaker (When Transformer Is Required) – A properly

sized, two pole, molded case circuit breaker shall be furnished ahead of the control power 120 V AC power transformer for short circuit protection and disconnecting power to the transformer. The circuit breaker shall conform to the specifications for the motor circuit breaker(s).

vi. Control Power Transformer (When Neutral Is Not Available at Jobsite – Std. on 460 V AC) - An industrial quality control transformer shall be furnished to provide control voltage. The transformer shall be sized with an adequate KVA rating to provide 120 V AC power for all items required in the control and alarm circuits. - Transformer shall be protected in its secondary by properly sized fuses and/or circuit breaker(s).

vii. Magnetic Contactors and Overload Relays- A magnetic contactor shall be furnished for each motor. A separate, panel mounted, 3 leg (three phase) or 1 leg (single phase) overload relay shall be supplied for each motor. Each leg of the overload relay shall be equipped with a properly sized overload heater. Contractor and overload relay shall be properly sized for the required horsepower, voltage and phase.

viii. Elapsed Time Meters – Six digit, non-resetable elapsed time meters shall be mounted in the control panel enclosure t o record the running time of each pump.

ix. Condensation Strip Heater with Thermostat A strip heater shall be furnished to prevent condensation within the control panel enclosure. The heater shall be controlled by a panel mounted, adjustable thermostat.

x. Phase and Voltage Monitor- A phase failure, reversal and under voltage monitor shall be supplied to prevent the motors from running under low voltage, phase loss, or phase reversal conditions. The monitor will lock out the control circuit until the problem is corrected and automatically reset.

xi. Lightning Arrestor- Suitable lightning arrestors shall be provided to protect motors and control equipment from lightning induced line surges.

xii. Thru-Door Overload Reset Push Buttons - Overload reset push buttons shall be provided for each overload relay. Push buttons shall be mounted so that with inner door closed, overload relays may be reset without entering high voltage compartment.

xiii. Switches - Heavy duty industrial grade oiltight switches shall be provided for each pump for "Hands-Off-Automatic' operation selection. All switch components shall be made of corrosion resistant metals and polyesters. Contact blocks shall be made of see-through polycarbonate for simplified inspection of contacts, Cams and strokes shall be Teflon impregnated for abrasion free service without lubrication. The

switches required shall be as follows:

Switch Function (Name Plate)	Voltage
Manual-off-Automatic	120 V AC

xiv. Pilot Lights – Full voltage heavy duty industrial grade oiltight pilot lights shall be provided. All pilot light components shall be made of corrosion resistant metals and polyesters. An insulated socket shall be furnished to eliminate the possibility of shock during bulb change. Lens shall be made of lexan. The pilot lights required shall be as follows:

Pilot Light Function (Name Plate)	Voltage	Lens Color
PUMP 1	120 V AC	GREEN
PUMP 2	120 V AC	GREEN

xv. Seal Failure Circuit Test Push Button (illuminated) - Heavy duty industrial grade oiltight push buttons shall be provided for each submersible pump motor. All push button components shall be made of corrosion resistant metals and polyesters. Contact blocks shall be made of see-through polycarbonate for simplified inspection of contacts. An insulated socket shall be furnished to eliminate the possibility of shock during bulb change. Lens shall be made of lexan. The push buttons required shall be as follows:

Pilot Light Function (Name Plate)	Voltage	Lens Color
P1 SEAL FAIL	120 V AC	AMBER
P2 SEAL FAIL	120 V AC	AMBER

xvi. Pump Alternator Circuit (For Duplex Pump Operation) - The electromechanical alternator relay shall be of industrial design specifically for use in pump applications. It shall have single pole double throw heavy duty 10 amp silver cadmium oxide contacts enclosed in a transparent cover. The snal action contacts shall transfer when the unit is deenergized. The circuit shall never be closed or opened while current is being conducted. The alternator circuit shall alternate the lead pump position between the pumps and shall allow the lag pump to start in response to a rising water level in the wetwell. (P1 – ALT – P2 selector switch)

xvii. Power Failure - Once power is restored after a failure and the pump has pumped

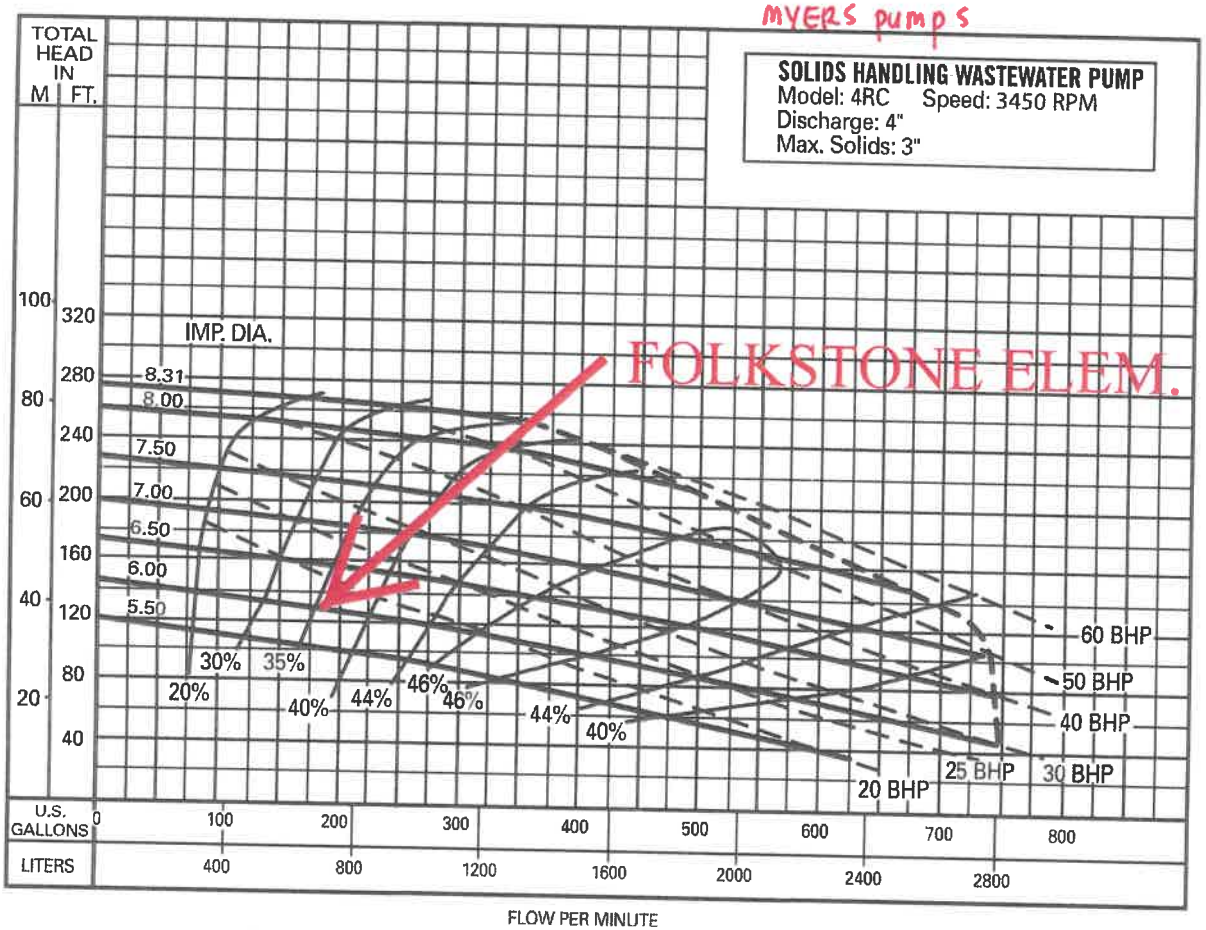
the water from alarm level down to pump off, the alarm should automatically reset itself.

xviii. Control Relay(s) - Plug-in control relays with 120 V AC coils shall be provided as required. Contact rating shall be 5 amps (minimum). Sockets shall be of the same manufacture as the relays and hold-down clips shall be furnished to prevent relay form sliding out of the socket.

xix. High Wetwell Level Alarm - The control panel shall be provided with a suitable alarm circuit, activated by a separate level control. This alarm shall signal a high water condition in the sump. Terminals shall be furnished in the control panel for connection of an externally mounted alarm device. A red flashing light shall be provided as a visual alarm and a horn provided as an audible alarm of the high water condition in the wetwell. The pump station shall also be equipped with buttons to both test and silence the horn.

3450 RPM

MYERS pumps

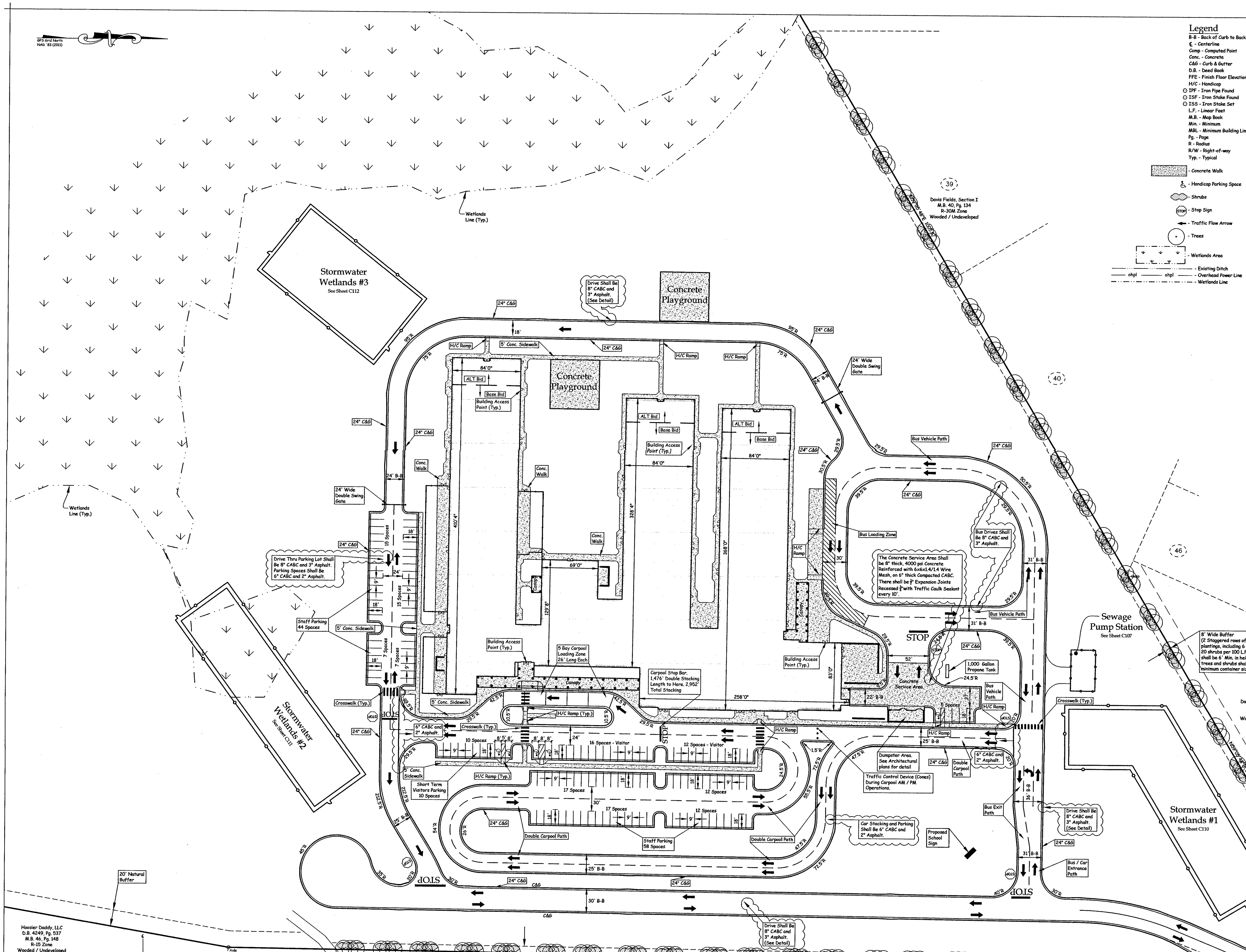


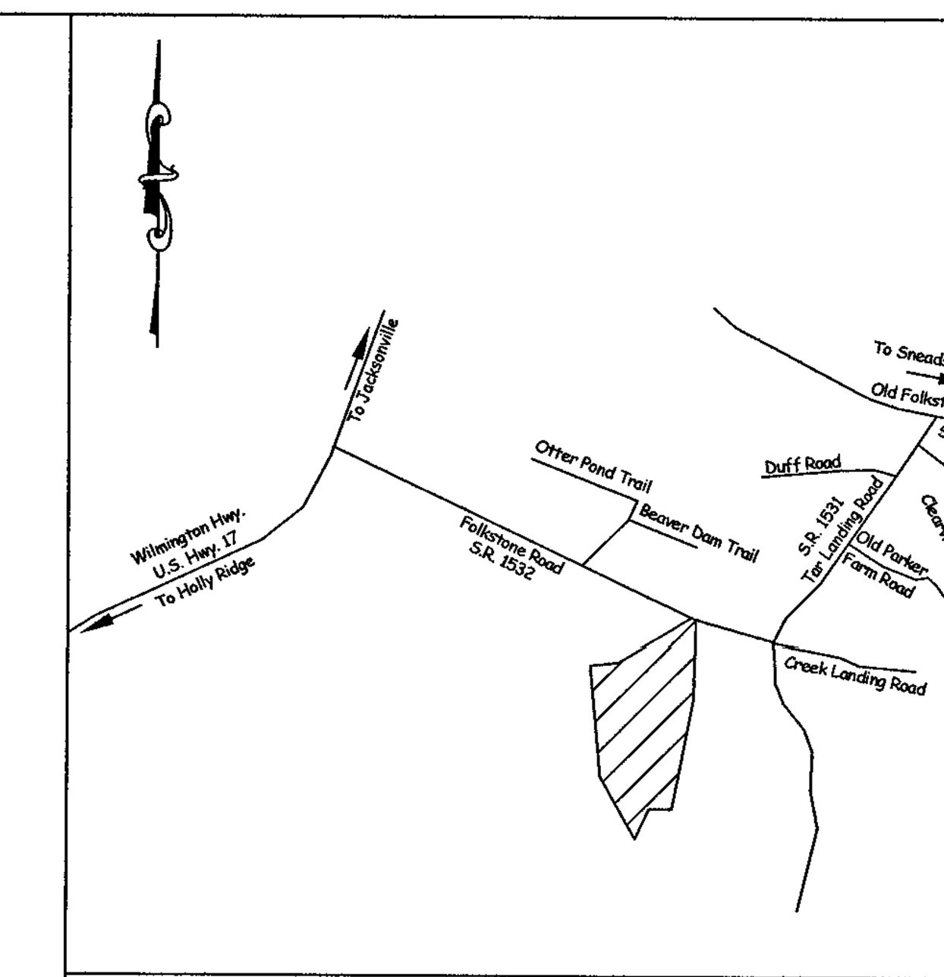
Pump performance is based on clear water (1.0 specific gravity @ 68°F) and pump fluid end (hydraulic) efficiency. Motor data based on 40°C ambient temperature.

FOLKSTONE ELEM. PUMP CURVE AND ELECTRICAL DATA

Available Models		Motor Electrical Data												
Standard	Hazardous Location	HP	Volts	Phase	Hertz	Start Amps	Run Amps	Service Factor Amps	Run kW	Service Factor kW	Start KVA	Run KVA	NEC Code Letter	Service Factor
4RC200M2-23	4RCX200M2-23	20	230	3	60	406	68	80	24.0	27.5	162	27.1	G	1.2
4RC200M2-43	4RCX200M2-43	20	460	3	60	203	34	40	24.0	27.5	162	27.1	G	1.2
4RC200M2-53	4RCX200M2-53	20	575	3	60	162	27.2	32	24.0	27.5	162	27.1	G	1.2
4RC250M2-23	4RCX250M2-23	25	230	3	60	406	83	96	28	32.5	162	33.1	G	1.2
4RC250M2-43	4RCX250M2-43	25	460	3	60	203	41.5	48	28	32.5	162	33.1	G	1.2
4RC250M2-53	4RCX250M2-53	25	575	3	60	162	33.2	38.4	28	32.5	162	33.1	G	1.2
4RC300M2-23	4RCX300M2-23	30	230	3	60	406	95	115	33.4	38.6	162	37.8	G	1.2
4RC300M2-43	4RCX300M2-43	30	460	3	60	203	47.5	57.5	33.4	38.6	162	37.8	G	1.2
4RC300M2-53	4RCX300M2-53	30	575	3	60	162	38	46	33.4	38.6	162	37.8	G	1.2
4RC400M2-43	4RCX400M2-43	40	460	3	60	275	59	70	42.0	49.5	217	47.0	G	1.2

ADDENDUM #1
ISSUED: August 22, 2019





Legend

B-B - Back of Curb to Back of Curb
℄ - Centerline
Comp - Computed Point
Conc. - Concrete
C&G - Curb & Gutter
D.B. - Deed Book
FFE - Finish Floor Elevation
H/C - Handicap
IPF - Iron Pipe Found
ISF - Iron Stake Found
ISS - Iron Stake Set
L.F. - Linear Feet
M.B. - Map Book
Min. - Minimum
MBL - Minimum Building Line
Pg. - Page
R - Radius
R/W - Right-of-way
Typ. - Typical

- Concrete Walk
- Handicap Parking Space
- Shrubs
- Stop Sign
- Traffic Flow Arrow
- Trees
- Wetlands Area
- Existing Ditch
- Overhead Power Line
- Wetlands Line

Tract Data

Total Acreage .... 100.6 Ac.
Zone .... O&I
Proposed Use .... Public Elementary School
Existing Use .... Undeveloped / Wooded

Building Data

Proposed Building .... 124,431 ± S.F.
Proposed Canopies .... 4,723 ± S.F.
129,154 ± S.F. (Total)

Parking Data

Parking Required .... Two (2) Spaces for Each Classroom and Administrative Office and One (1) Large Space for Each Bus
55 Classrooms x 2 Spaces = 110 Spaces
11 Offices x 2 Spaces = 22 Spaces
Total Spaces = 132 Spaces (5 H/C Spaces)

Proposed Parking .... 145 Spaces (5 H/C Spaces)

Tax Map 761, Parcel 51
Tax Map 761, Parcel 56.10

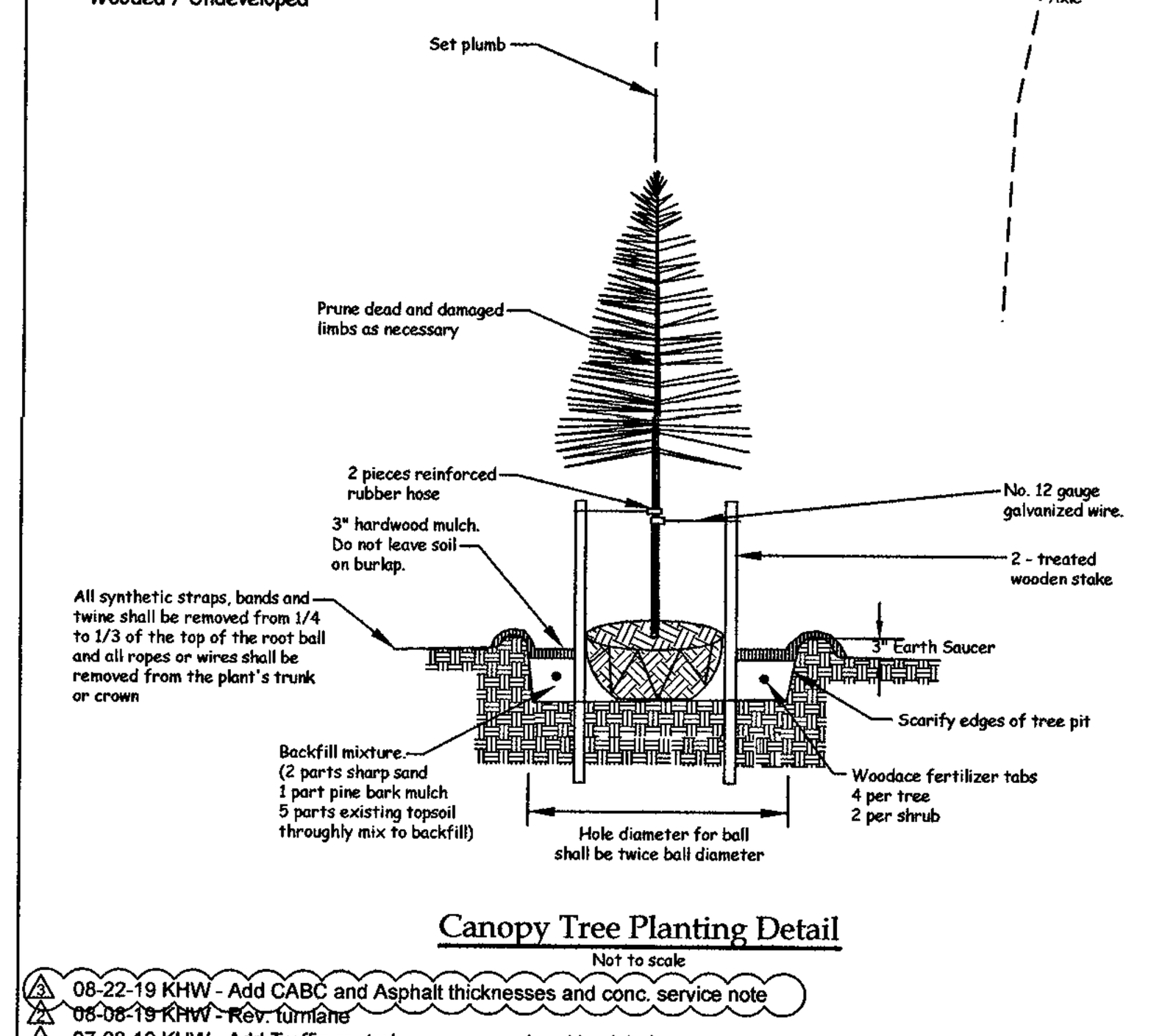
Deed Book: 4876, Pg. 425
4876, Pg. 429
Map Book: 22, Pg. 74
25, Pg. 157

Setbacks:

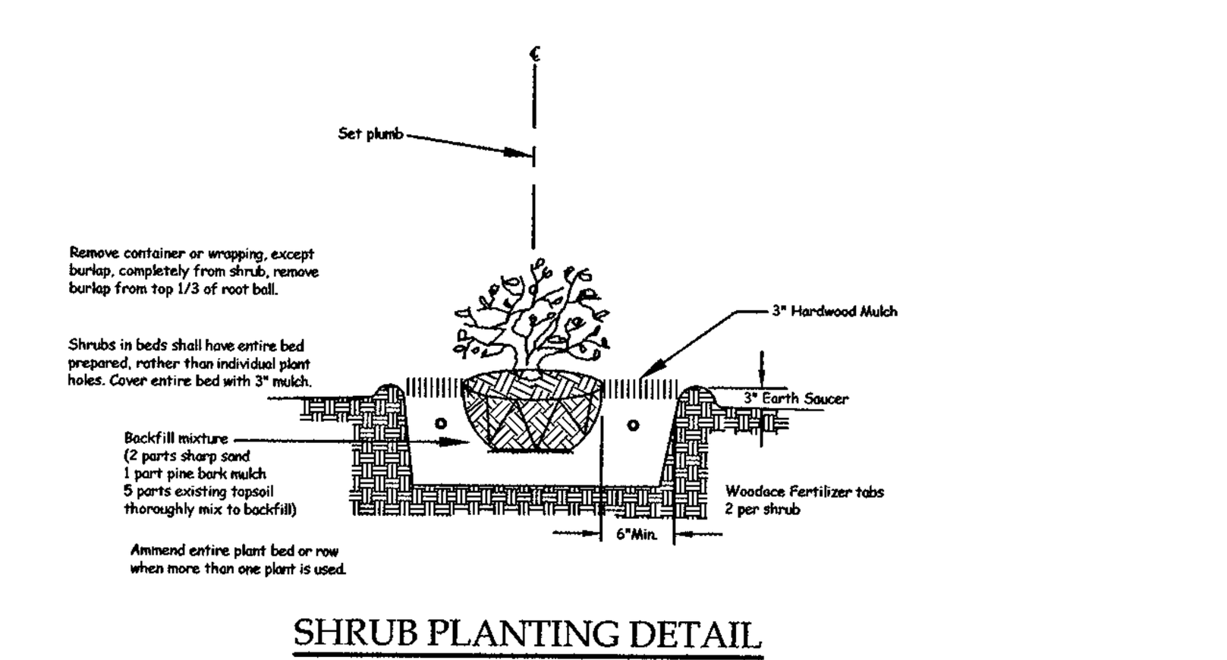
Front Yard .... 25'
Side Yard .... 8'
Rear Yard .... 15'

Notes:

1. Boundary taken from Map Book 22, Page 74 and a partial survey by Parker & Associates, Inc.
2. Topography shown is taken from actual survey by Parker & Associates, Inc. dated February 2019.
3. Wetlands delineation taken from ECS Southeast, LLP dated June 22, 2018.
4. This site is not affected by any special flood hazard per FIRM CPN 370340 4348 J (Onslow County), effective Nov. 3, 2005.
5. All distances are horizontal ground, U.S. survey Feet.
6. All acreages calculated by coordinates.
7. The existence of utilities may imply the existence of an easement.
8. Adjoiner property information per Onslow County Tax Records.
9. No register of deed search done by or furnished to surveyor regarding deed or covenant restrictions.
10. See Rest of Plans for Detailed Design Information.



Canopy Tree Planting Detail



SHRUB PLANTING DETAIL

Note:

Contractor shall insure that he and all his workers (contractors, subcontractors and other site personnel) do not damage construction stakes or other measures used in laying out the project whether by the Engineer or another entity including those under the employ of the contractor. Contractor shall cause his workers to observe and verify to the fullest extent practicable that stakes, other measures and grades are, or appear to be, accurate and correct, and immediately, but prior to any associated work, notify the staking entity of any potential conflict, error or question regarding the work. The Engineer shall not be responsible if all of the above measures are not strictly adhered to. The Engineer shall not be responsible where due to damage, his staking can not be verified. For critical or costly components of the work, where the contractor believes that staking may not be preserved, the contractor shall request the staking entity to place staking in an area where its preservation can be insured.

All Radii Are From Back of Curb

All Radii are 5' Unless Otherwise Noted

All Dimensions Are From Back of Curb to Back of Curb Unless Otherwise Noted

Owner / Developer:
Onslow County Board of Education
200 Broadhurst Road
Jacksonville, North Carolina 28540
(910) 455-2211

GRAPHIC SCALE: 1"=50'
0 50 100 150 FEET

PARKER & ASSOCIATES, INC.

PINNACLE ARCHITECTURE PROFESSIONAL ASSOCIATION
701 EAST BAY STREET, SUITE 302 CHARLESTON, SOUTH CAROLINA 29403
P.O. BOX 187, 630 TEAM ROAD, SUITE 200 MATTHEWS, NORTH CAROLINA 28106

STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

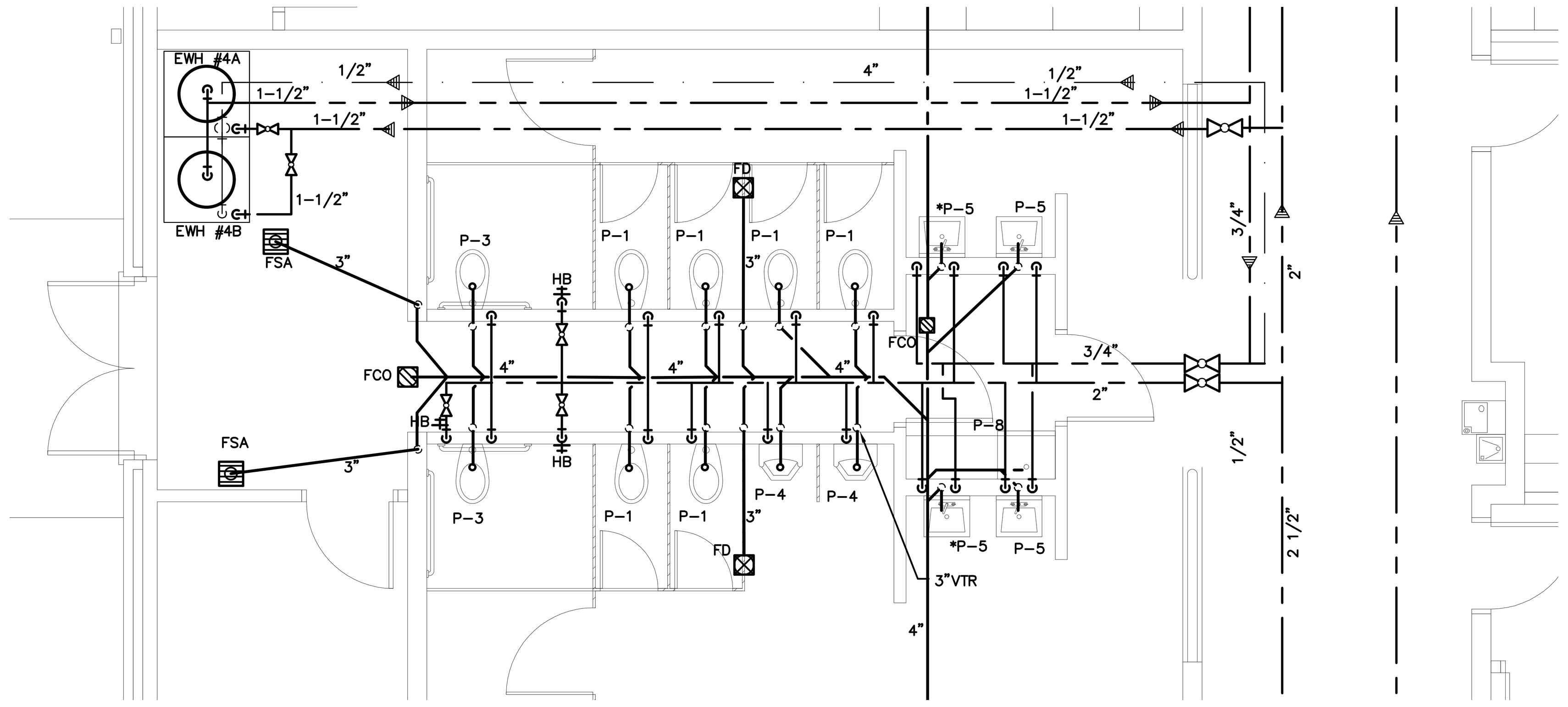
SITE PLAN

ISSUE DATE: 04-30-2019

REVISION SCHEDULE

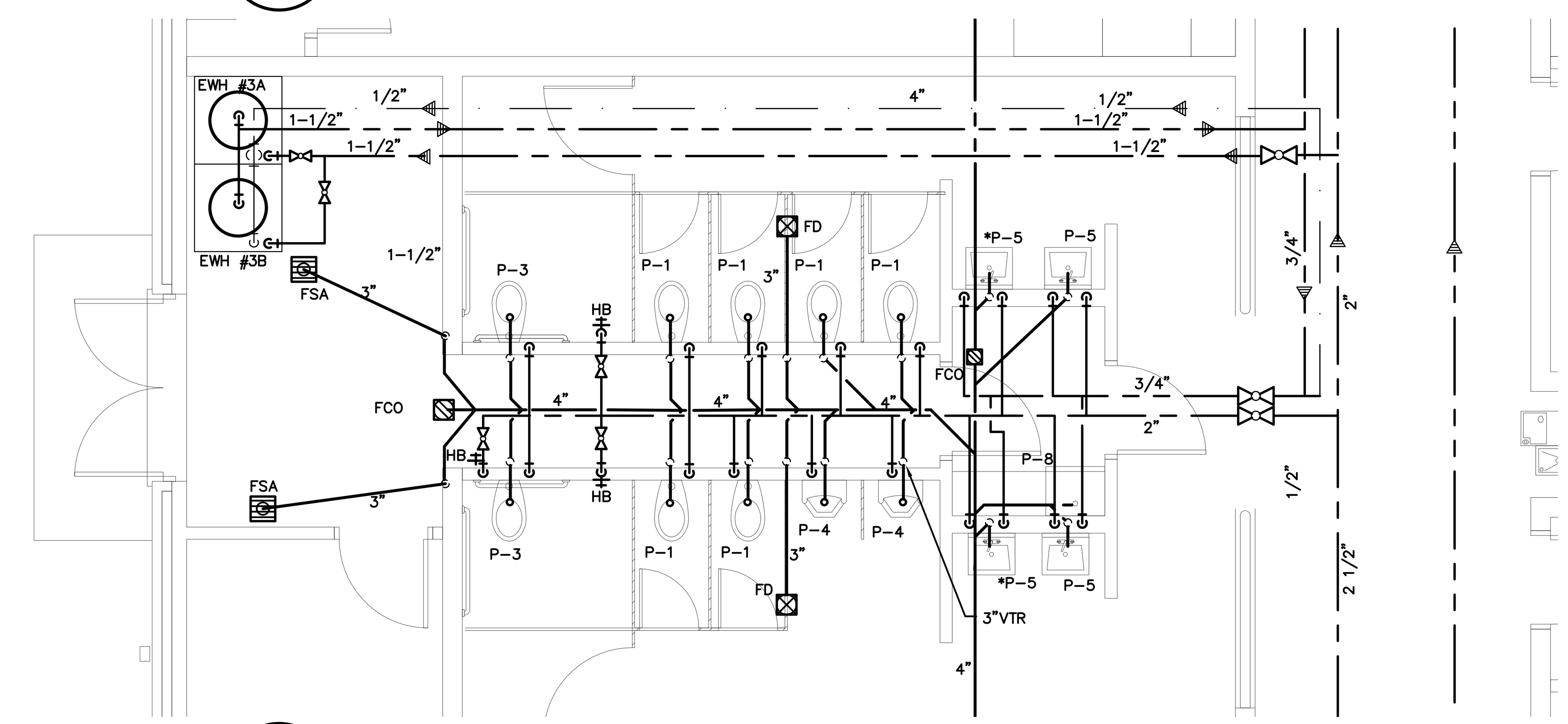
#	DATE	REFERENCE
1	07-08-19	See Revision Notes
2	08-08-19	
3	08-22-19	

C101



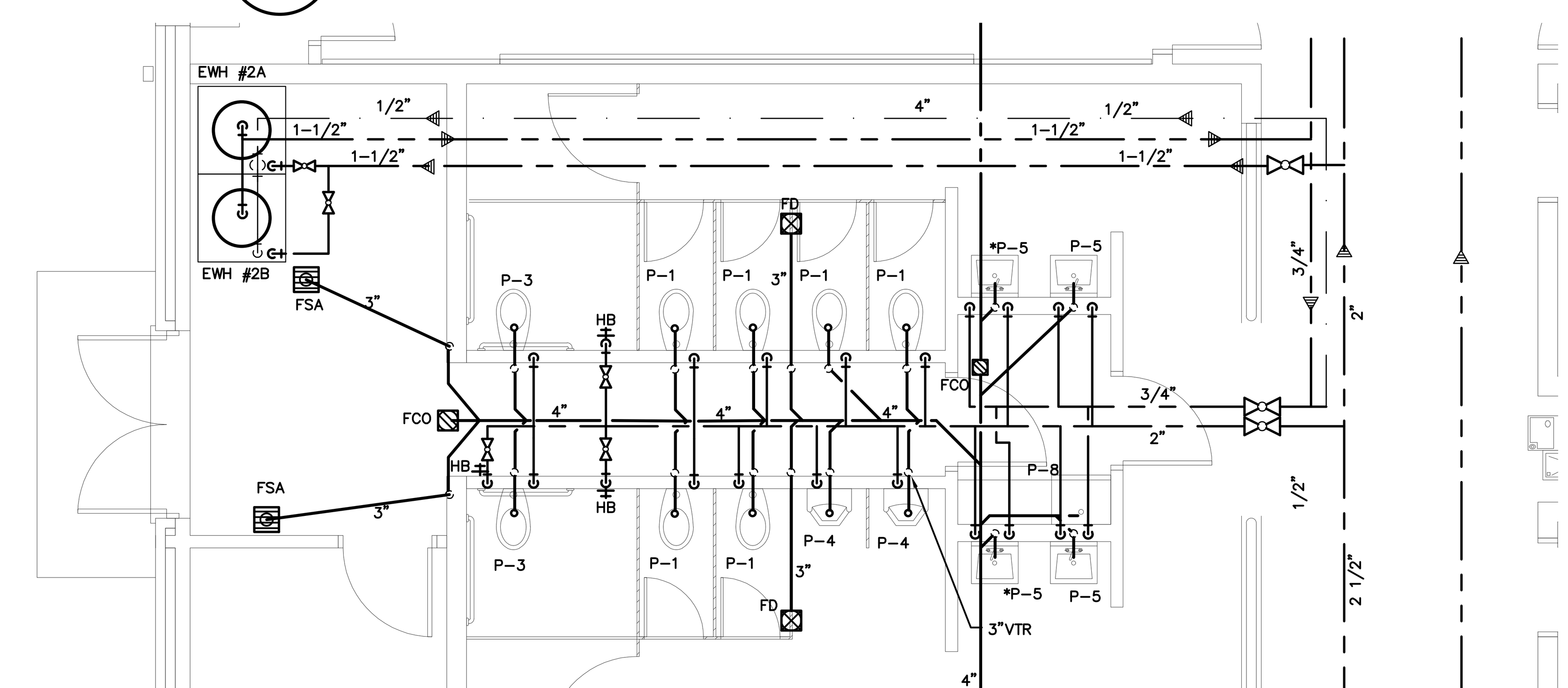
4 / P200 PARTIAL FLOOR PLAN AREA "D"

SCALE: 1/4" = 1'-0"



3 / P200 PARTIAL FLOOR PLAN AREA "E"

SCALE: 1/4" = 1'-0"



2 / P200 PARTIAL FLOOR PLAN AREA "G"

SCALE: 1/4" = 1'-0"

KITCHEN EQUIPMENT SCHEDULE

SYM	NAME	CW	HW	140° HW	WASTE	IW	V	GAS	DESCRIPTION
7	STEAMER	1/2"	–	–	–	1-1/2"	–	–	KITCHEN EQUIPMENT BY OTHERS, P.C. TO MAKE FINAL CONNECTIONS FOR WASTE, WATER, VENT PIPING
10	TILTING BRAISING PAN	1/2"	–	–	–	TD	–	–	KITCHEN EQUIPMENT BY OTHERS, P.C. TO MAKE FINAL CONNECTIONS FOR WASTE, WATER, VENT & GAS PIPING
14	ICE MACHINE	1/2"	–	–	–	FD	–	–	P.C. TO PROVIDE VALVE & BOX CONNECTIONS W/OATEY MODEL 38608, MAKE FINAL CONNECTION
21	1-COMPT. PREP SINK	1/2"		1/2"	–	FS	–	–	KITCHEN EQUIPMENT BY OTHERS, P.C. TO MAKE FINAL CONNECTIONS FOR WASTE, WATER, VENT PIPING
22	3-COMPT. SINK WITH PRE-RINSE	1@1/2" 1@3/4"	–	1@1/2" 1@3/4"	–	FS	–	–	KITCHEN EQUIPMENT BY OTHERS, P.C. TO MAKE FINAL CONNECTIONS FOR WASTE, WATER, VENT PIPING
23	2-COMPT. PREP SINK	1/2"	–	1/2"	–	FS	–	–	KITCHEN EQUIPMENT BY OTHERS, P.C. TO MAKE FINAL CONNECTIONS FOR WASTE, WATER, VENT PIPING
24	DISHWASHER	–	–	3/4"	–	2" FSDW	–	–	KITCHEN EQUIPMENT BY OTHERS, P.C. TO MAKE FINAL CONNECTIONS FOR WATER PIPING
35	PRE RINSE UNIT	1/2"	–	1/2"	–	FS	–	–	KITCHEN EQUIPMENT BY OTHERS, P.C. TO MAKE FINAL CONNECTIONS FOR WATER PIPING
38	DISPOSER	1/2"	–	–	–	2" FSDW	–	–	KITCHEN EQUIPMENT BY OTHERS, P.C. TO MAKE FINAL CONNECTIONS FOR WATER PIPING
TD	TRENCH DRAIN	–	–	–	4"	–	–	–	KITCHEN EQUIPMENT BY KITCHEN EQUIPMENT SUPPLIER. PC SHALL MAKE FINAL CONNECTION

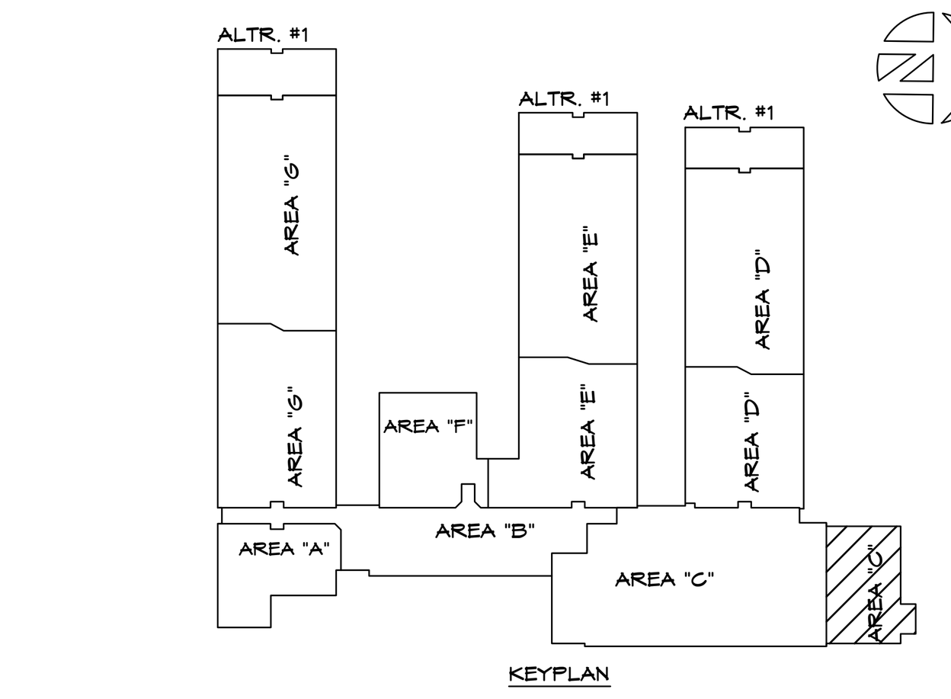
1. P.C. SHALL PROCURE A KITCHEN CONTRACTOR DRAWING BEFORE BEGINNING ROUGH-IN
2. P.C. SHALL PROVIDE ALL TRAPS, VALVES, SUPPLIES & MAKE ALL NECESSARY PLUMBING CONNECTIONS.

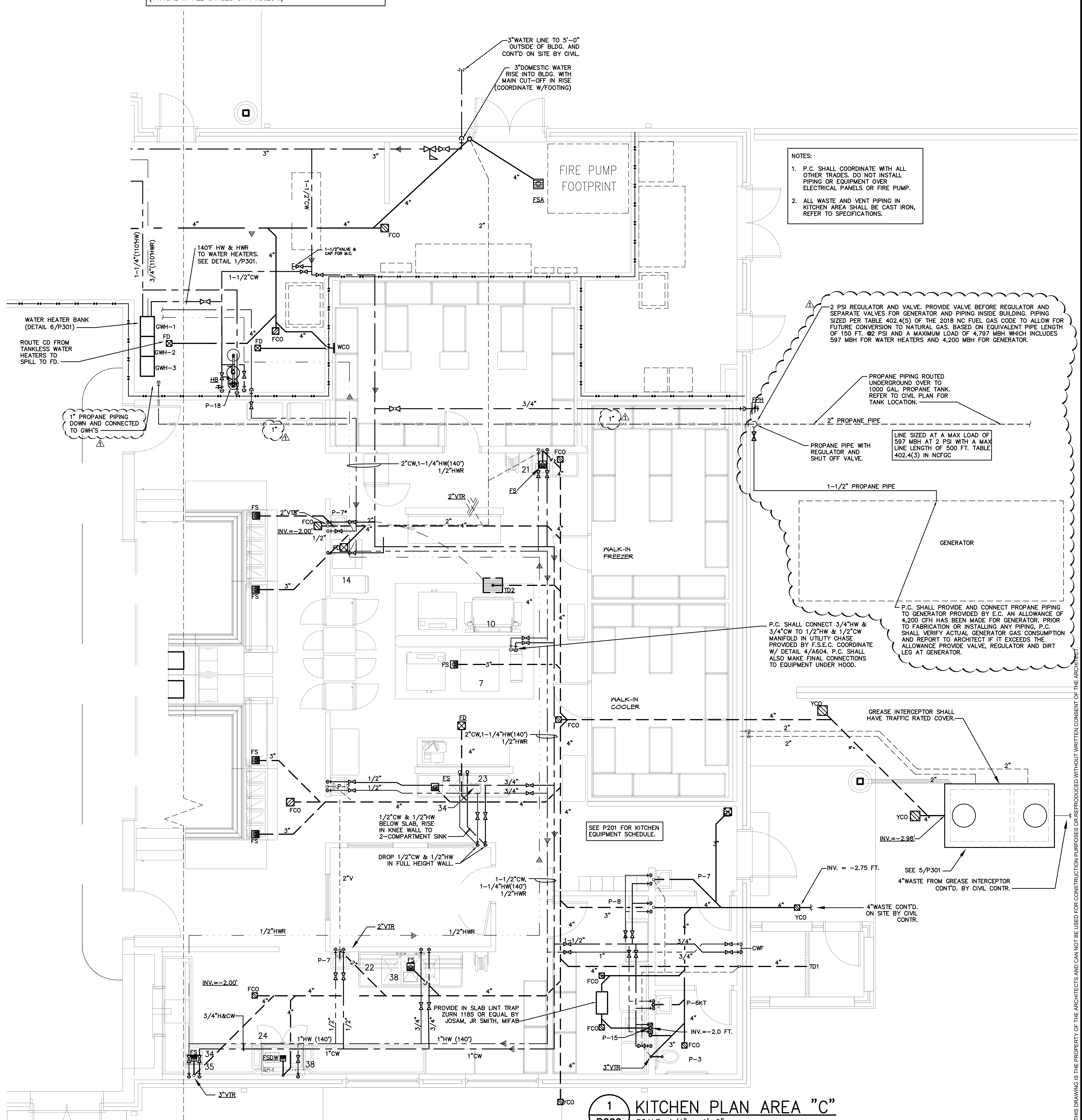
FIRE RATED WALLS

———	1 HOUR WALL
———	2 HOUR WALL

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO APPLY THE PROPER FIRE-SAFING DETAIL FOR ALL DUCT AND PIPE PENETRATIONS THRU RATED & NON-RATED WALL AND FLOOR/CEILING ASSEMBLIES.

1/4" = 1'-0" — 0 5 10 FEET





1 / P200 KITCHEN PLAN AREA "C"

SCALE: 1/4" = 1'-0"

CONTRACTOR TO VERIFY ALL DIMENSIONS.
McKNIGHT·SMITH WARD · GRIFFIN ENGINEERS, INCORPORATED
PO Box 240826 · 4223 South Boulevard
Charlotte, NC F-0595
704/527-2112 18-219
NORTH CAROLINA PROFESSIONAL ENGINEER 17250 J. CRAIG CHAMPION 08-22-19
PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 F: (704) 847-9853

ISSUE DATE: 04.30.2019
DRAWN BY: MHK
CHECKED BY: JCC
PROJECT: 1821

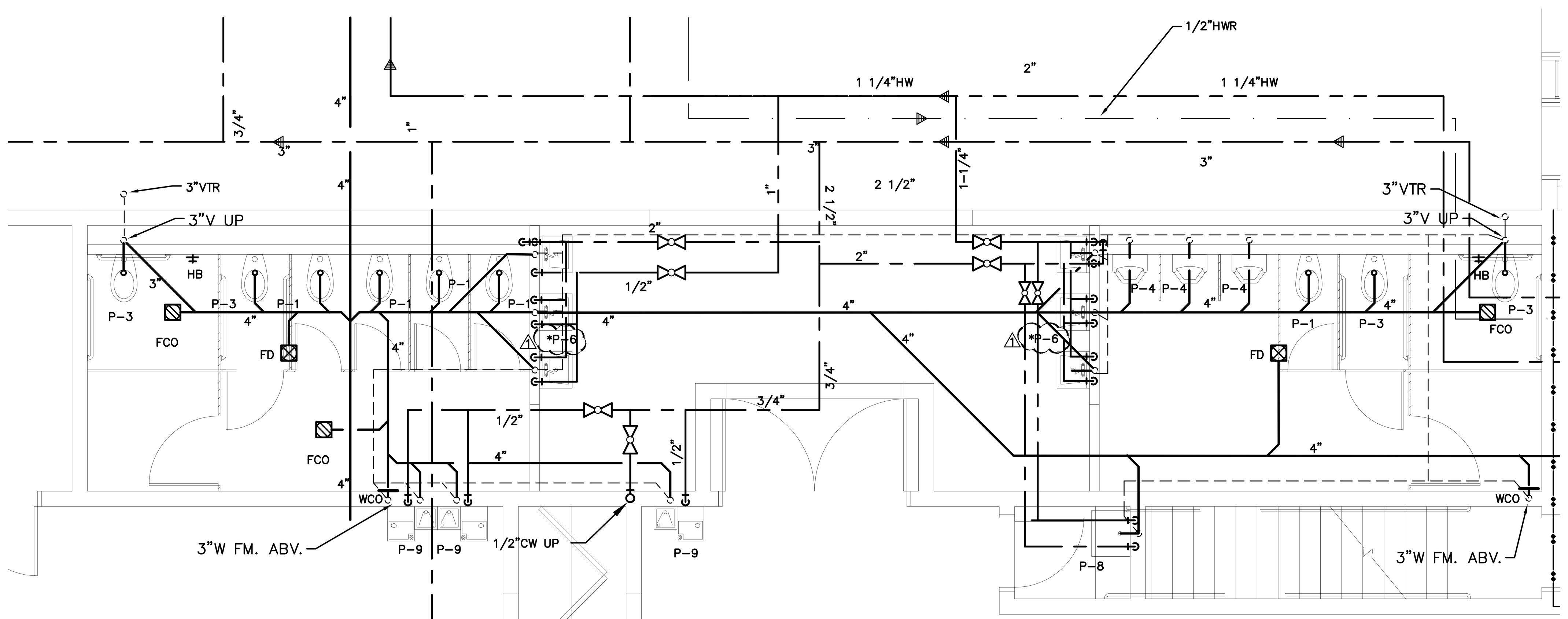
STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

ENLARGED PLANS

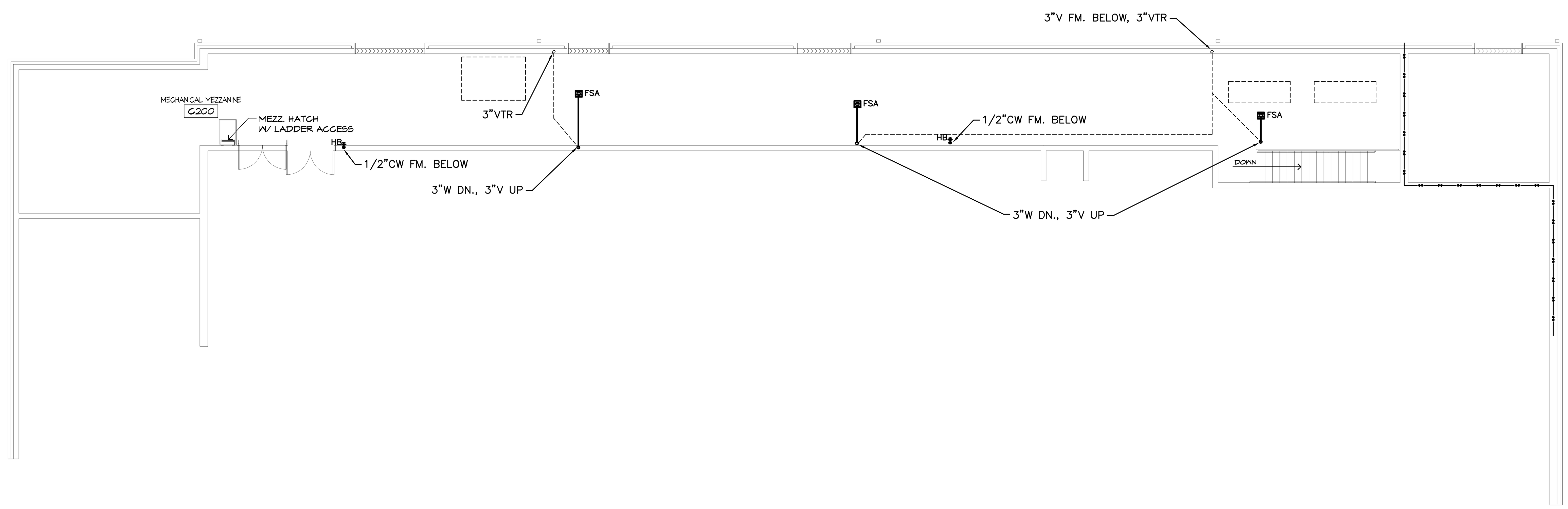
REVISION SCHEDULE

△	DATE	REFERENCE
1	8.22.19	ADDENDUM #1

P200



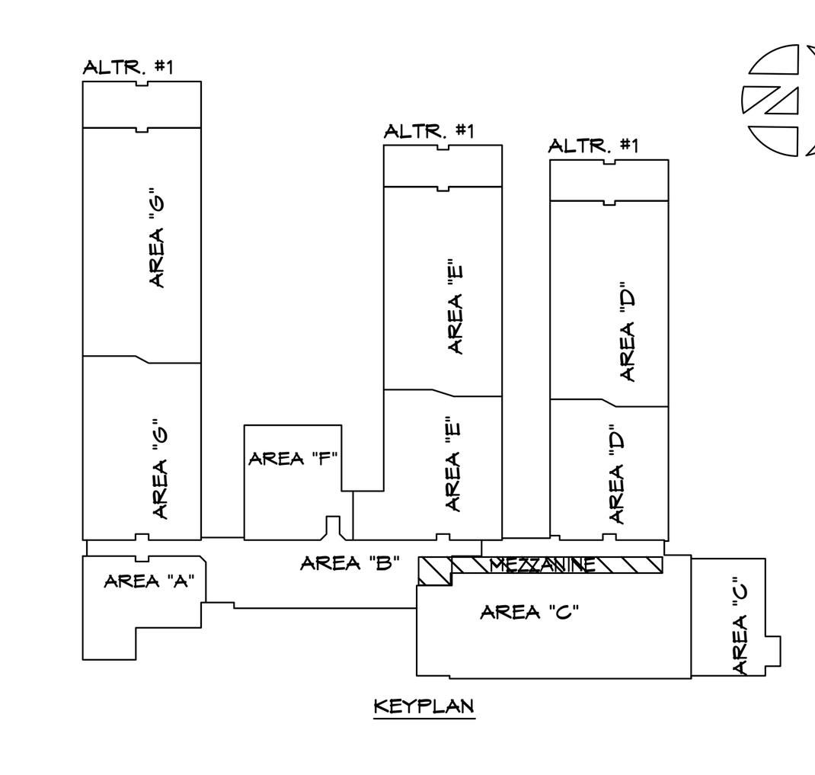
2 P201 PARTIAL FLOOR PLAN AREA "C"
SCALE: 1/4" = 1'-0"



1 P201 MEZZANINE PLAN
SCALE: 1/8" = 1'-0"

FIRE RATED WALLS	
	1 HOUR WALL
	2 HOUR WALL

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO APPLY THE PROPER FIRE-SAFING DETAIL FOR ALL DUCT AND PIPE PENETRATIONS THRU RATED & NON-RATED WALL AND FLOOR/CEILING ASSEMBLIES.



McKNIGHT-SMITH WARD · GRIFFIN ENGINEERS, INCORPORATED

CONTRACTOR TO VERIFY ALL DIMENSIONS.

PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 F: (704) 847-9853

ISSUE DATE: 04.30.2019
DRAWN BY: MHK
CHECKED BY: JCG
PROJECT: 1821

STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

ENLARGED PLANS

REVISION SCHEDULE

	DATE	REFERENCE
1	8.22.19	ADDENDUM #1

PLUMBING FIXTURE SCHEDULE

SYM	DESCRIPTION	CW	HW	W	V	MODEL NUMBER	REMARKS
P-1	WATER CLOSET (STUDENT)	1-1/4"	–	3"	2"	AMERICAN STANDARD "MADERA" 2234.015; BENEKE 527SS SEAT; SLOAN REGAL 115-1.6-YK FLUSH VALVE	1,4,5,6
P-2	WATER CLOSET (ADA STUDENT)	1-1/4"	–	3"	2"	AMERICAN STANDARD "MADERA" 2234.015; BENEKE 527SS SEAT; SLOAN REGAL 111 FLUSH VALVE	1,4,5,6,7,8
P-3	WATER CLOSET (ADA ADULT)	1-1/4"	–	3"	2"	KOHLER "HIGHCLIFF" K-96057-0; BENEKE 527SS SEAT; SLOAN REGAL 111 FLUSH VALVE	1,4,5,6,7,8
P-4	URINAL	3/4"	–	2"	2"	KOHLER "DEXTER" K-5016-ET W/SLOAN REGAL 186-1 FLUSH VALVE	1,3,4,6
P-5	LAVATORY	1/2"	1/2"	2"	2"	KOHLER "HUDSON" K-2861; MOEN 8301 FAUCET (NOTE 25); K-7607 SUPPLY; K-8998 TRAP; K-7715 DRAIN.	1,2,3,9,14, 15,18
P-6	3 STATION LAVATORY	1/2"	1/2"	2"	2"	BRADLEY FREQUENCY SERIES 3-STATION, FL-3H;MOEN 8301 FAUCET (NOTE 25); K-7607 SUPPLY; K-8998 TRAP K-7715 DRAIN.K-7607 SUPPLY; K-8998 TRAP; K-7715 DRAIN.	1,2,3,9,14, 15,18
P-6KT	LAVATORY (KITCHEN TOILET)	1/2"	1/2"	2"	2"	KOHLER "HUDSON" K-2861, K-7607 SUPPLY, K-8998 TRAP, K-7715 DRAIN; T&S LEVER FAUCET; SYMMONS 5-210-CK MIXING VALVE BELOW LAV	1,2,3,9,14, 15,18,23
P-7	LAVATORY (KITCHEN)	1/2"	1/2"	2"	2"	KOHLER "HUDSON" K-2861, K-7607 SUPPLY, K-8998 TRAP, K-7715 DRAIN; T&S LEVER FAUCET; SYMMONS 5-210-CK MIXING VALVE BELOW LAV	1,2,3,9,14, 18,23
P-8	MOP BASIN	1/2"	1/2"	3"	2"	FIAT MSB-2424 W/830-AA FAUCET, 832-AA HOSE BRACKET (INCLUDES SS RIM GUARD) & SEALANT AS REQUIRED.	4,9,13,19
P-9	WATER COOLER	1/2"	–	2"	2"	HALSEY TAYLOR HTHB-HBRGRN8BL-WF; PROVIDE ACCESSORY APRON ON UPPER UNIT. PROVIDE STOP & TRAP. ALL STAINLESS STEEL FINISH.	1,3,12,21
P-10	SGL. COMPT. SINK (ADA)	1/2"	1/2"	2"	2"	ELKAY LRAD-2219-55 W/LK-335 STRAINER; T&S LEVER HANDLE FAUCET; KOHLER K-7607 SUPPLY, K-9000 TRAP	1,2,10,17
P-11	OMITTED						
P-12	HEALTH ROOM SINK (ADA)	1/2"	1/2"	2"	2"	ELKAY LRAD-2219-55 (WITH HOLE DRILLED FOR EYEWASH), LK-335 STRAINER; T&S LEVER HANDLE FAUCET; KOHLER K-7607 SUPPLY, K-9000 TRAP; GUARDIAN G1849LH-TMV EYEWASH	1,2,9,10,24
P-13	UTILITY BOX	1/2"	–	–	–	GUY GRAY W9700HA	22
P-14	SHOWER TRIM (H/C)	1/2"	1/2"	–	–	SYMMONS 96-500-B30-X-V W/ CHROME PLATED BRASS ESCUTCHEON PROVIDE SHOWER PAN AS NEEDED	11
P-15	WASHER CONNECTION BOX	1/2"	1/2"	2"	2"	GUY GRAY WB200HA	22
P-16	ARTROOM SINK	1/2"	1/2"	2"	2"	ELKAY LR-3122 W/LK-335 STRAINER; T&S LEVER HANDLE FAUCET; KOHLER K-7607 SUPPY; ZURN Z-1180 CLAY TRAP	1,2,10,17
P-17	ARTROOM SINK (ADA)	1/2"	1/2"	2"	2"	ELKAY LRAD-3122-55 W/LK-335 STRAINER; T&S LEVER HANDLE FAUCET; KOHLER K-7607 SUPPY; ZURN Z-1180 CLAY TRAP	1,2,10,17
P-18	EMERG. SHOWER & EYEWASH	1-1/4" TW		2"	2"	HAWS 8300-8309 CRP COMB. SHWR/EYE WASH W/TWBS.SH	16

1. SEE ARCHITECTURAL PLANS FOR EXACT LOCATION AND MOUNTING HEIGHTS OF ALL FIXTURES.
2. PROVIDE TRUEBRO MODEL 102 INSULATION KIT, PLUMBEREX MODEL PRO-2000 OR McGUIRE PWV8902 PREWRAPPED CAST P-TRAP ASSEMBLY KIT ON ALL HANDICAP ACCESSIBLE LAVATORIES AND/OR SINKS.
3. PROVIDE CARRIERS FOR ALL WALL MOUNTED FIXTURES. FOR LAVATORY CARRIERS, PROVIDE CONCEALED ARMS FOR GYPBOARD WALLS, SINGLE HANGER FOR BLOCK WALLS.
4. EQUAL CHINA FIXTURE BY AMERICAN STANDARD, ZURN & SLOAN.
5. EQUAL TOILET SEAT BY BEMIS, OLSONITE & BENEKE.
6. EQUAL FLUSH VALVES BY ZURN & TOTO.
7. TOP OF FLUSH VALVE SHALL BE LOCATED MINIMUM 3" BELOW BOTTOM OF GRAB BAR. P.C. TO CUT OUTLET TUBE AS REQUIRED.
8. FLUSH VALVE MECHANISM SHALL BE LOCATED OPPOSITE OF HAND RAIL AS PER ADA REQUIREMENT.
9. EQUAL FAUCETS BY SYMMONS, CHICAGO FAUCETS, DELTA, MOEN & AMERICAN STANDARD.
10. EQUAL STAINLESS STEEL SINKS FRANKE & JUST.
11. EQUAL SHOWER TRIM BY BY LEONARD, ZURN & SPEAKMAN.
12. EQUAL WATER COOLERS/DRINKING FOUNTAINS BY OASIS, SUNROC, HAWS & ELKAY.
13. EQUAL MOP BASINS BY SWANSTONE, E.L.MUSTEE.
14. WHEN ASTERISK ("*") PREFIX IS USED, PROVIDE TRAP PRIMER AND PIPE 1/2" LINE BELOW SLAB TO FLOOR DRAIN.
15. PROVIDE VANDAL-PROOF AERATORS ON LAVATORY FAUCETS (E26-05-05).
16. EQUAL SAFETY SHOWER/EYEWASH BY BRADLEY & GUARDIAN.
17. EQUAL FAUCETS BY CHICAGO FAUCETS, T&S, ELKAY, ZURN & AMERICAN STANDARD. SINGLE SINK = RIGID SPOUT; DOUBLE SINK = RESTRICTED SPOUT.
18. EQUAL CAST IRON LAVATORIES BY CECO & ZURN.
19. PROVIDE TRAP AND TAILPIECE (FIRE RETARDANT POLYPROPYLENE – ACID RESISTANT).
20. PROVIDE INTEGRAL CHECK STOPS AT ALL WALL FAUCETS.
21. ACCESSORY APRON MAY BE OMITTED IF WATER COOLER IS RECESSED.
22. EQUAL SPECIALTY FIXTURES BY OATEY, SIOUX CHIEF.
23. MIXING VALVE TEMPERS 140° WATER TO 110°. EQUALS VALVES BY LAWLER, LEONARD
24. EXTRA HOLE DRILLED IN RIGHT SIDE OF SINK FOR EYEWASH. EQUAL EYEWASH BY BRADLEY, ENCON. (EYEWASH MIXING VALVE BELOW COUNTER)
25. MOEN FAUCET FOR AC CONNECTION. TRANSFORMER 104630 (UP TO 8 DEVICES), 182538 CONNECTOR FOR EACH DEVICE.

BLDG. LOAD SUMMARY

WATER FU	847
WATER GPM	192
WASTE FU	519
HW GPH (110°F)	600
HW GPH (140°F)	306

PLUMBING SPECIALTIES SCHEDULE

SYM	DESCRIPTION	MODEL NUMBER	REMARKS
FD	FLOOR DRAIN	ZURN ZN-415-S (-P WHERE TRAP PRIMER REQ'D)	1
SFD	SHOWER FLOOR DRAIN	ZURN Z-415-B WITH POLISHED CHROME TOP	1
FCO	FLOOR CLEANOUT	ZURN ZN-1400-T WITH NIKALOY TOP, CARPET MARKERS AS REQUIRED, SEE ARCHITECTURAL FINISH SCHEDULE FOR CARPETED AREAS.	1
YCO	YARD CLEANOUT	ZURN Z-1406-HD WITH CAST IRON TOP	1
FPH	FROST-PROOF HYDRANT	WOODFORD #65 WITH VACUUM BREAKER	2,3
HB	HOSE BIBB	WOODFORD #24 WITH LOOSE KEY, CHROME PLATED, VACUUM BREAKER.	2,3
WCO	WALL CLEANOUT	ZURN Z-1446 W/STAINLESS STEEL COVER	1
◯	SHOCK ABSORBER	SIOUX CHIEF, A=652-A, B=653-B, C=654-C, D=655-D	1
TP	TRAP PRIMER	ZURN Z-1022 @ TRAP TO Z-1023 @ FLOOR DRAIN.	1
TP2	TRAP PRIMER	PRECISION PRODUCTS MODEL PR-500 W/SS-X & DU-X.	1
FS	FLOOR SINK	ZURN ZN-1901-2 W/ 1/2 GRATE & SEDIMENT BUCKET.	1
FSA	FLOOR SINK	ZURN ZN-1901 W/SEDIMENT BUCKET & NICKEL BRONZE GRATE.	1
FSB	FLOOR SINK	BY KITCHEN EQUIPMENT SUPPLIER. P.C. TO ROUGH-IN AND MAKE FINAL CONNECTION	
CWF	CANWASH FITTING	WOODFORD MODEL HC67 SERIES	2,3
TD1	TRENCH DRAIN	ABT POLYDRAIN 6"W x 6'L	1
TD2	TRENCH DRAIN	ZURN MODEL Z893 SIZE 18 (20.3"X24"X4")	1

1. EQUALS BY JOSAM, JAY R. SMITH & WADE.
2. EQUALS BY JOSAM, JAY R. SMITH, WADE & PRIER.
3. PROVIDE INTEGRAL CHECK STOPS AT ALL WALL FAUCETS.

PLUMBING LEGEND

SYMBOL	ABBREVIATION	DESCRIPTION
	CW	COLD WATER
	HW (110°F)	HOT WATER
	HW (140°F)	HOT WATER
	HWR (110°F)	HOT WATER RETURN
	HWR (140°F)	HOT WATER RETURN
	W	WASTE
	GW	GREASE LADEN WASTE LINE
	V	VENT
—G—	G	GAS
	VTR	VENT THRU ROOF
		GLOBE VALVE
		BALL VALVE
		CHECK VALVE
		UNION
		PRESSURE REDUCING VALVE
	FPH	FROST PROOF HYDRANT
	HB	HOSE BIBB
		SHOCK ABSORBER
	FCO	FLOOR CLEANOUT
	FCO/YCO	FLOOR OR YARD CLEANOUT
	FS/FD	FLOOR SINK OR SQUARE FL. DRAIN
		VACUUM BREAKER
		AQUASTAT

GREASE INTERCEPTOR NOTES:

A. INTERIOR BAFFLES SHALL DISTRIBUTE FLOWS. BAFFLES SHALL EXTEND SIX (6) INCHES ABOVE WATER LINE BUT, CANNOT FLOOD THE INLET PIPE.

B. MINIMUM 2:1 LENGTH TO WIDTH RATIO.

C. LOW VELOCITY FLOW NEAR OUTLET.

D. BAFFLE WALL BE LOCATED A DISTANCE FROM INLET WALL OF 2/3 TO 3/4 OF THE TOTAL LENGTH OF THE INTERCEPTOR

E. NINE (9) INCHES OF FREEBOARD AT GREASE INTERCEPTOR TOP.

F. EACH GREASE INTERCEPTOR SHALL HAVE INLET AND OUTLET TEES. THE OUTLET TEE SHALL EXTEND 50% INTO THE LIQUID DEPTH. THE INLET TEE SHALL EXTEND 25% INTO THE LIQUID DEPTH. INLET AND OUTLET TEE MUST BE PLUGGED AT THE TOP OF THE SANITARY TEE AND BE A MINIMUM OF THREE (3) INCHES IN DIAMETER.

G. ACCESS OPENINGS OVER THE INLET, OUTLET, AND EACH COMPARTMENT WITHIN THE GREASE INTERCEPTOR. EACH OPENING SHALL BE TWENTY-FOUR (24) INCHES IN DIAMETER AND CONTAIN PICK HOLES. ALL COVERS SHALL BE CONSTRUCTED OF CAST IRON OR EQUIVALENT TRAFFIC BEARING MATERIAL. MANHOLES/COVERS MUST EXTEND TO THE FINISHED GRADE AND SHALL BE INSTALLED TO EXCLUDE THE ENTRANCE OF SURFACE OR STORM WATER INTO THE INTERCEPTOR.

H. FULL SIZE CLEANOUTS SHALL BE INSTALLED ON THE INLET AND OUTLET SIDES OF THE INTERCEPTOR AND EXTENDED TO GRADE.

I. GREASE INTERCEPTORS MUST BE VENTED IN ACCORDANCE WITH THE NC STATE PLUMBING CODE WITH A MINIMUM 2" DIAMETER VENT PIPING. VENT CONNECTIONS MAY BE MADE THROUGH THE TOP OF THE INTERCEPTOR, IN WHICH CASE THE BOTTOM OF THE VENT SHALL EXTEND NO CLOSER THAN 6" TO THE STATIC WATER LEVEL, OR MAY BE MADE THROUGH THE SIDE OF THE INTERCEPTOR'S ACCESS OPENING.

J. MINIMUM CONCRETE COMPRESSIVE STRENGTH OF 3,500 PSI.

K. JOINTS SHOULD BE PROPERLY SEALED TO PREVENT INFILTRATION OR EXFILTRATION.

L. GREASE INTERCEPTORS MUST MEET A MINIMUM STRUCTURAL DESIGN OF 150-POUNDS/SQUARE FOOT FOR NON TRAFFIC INSTALLATIONS. FOR VEHICULAR TRAFFIC CONDITIONS THE GREASE INTERCEPTOR SHALL BE DESIGNED TO WITHSTAND A H-20 WHEEL LOAD.

M. GREASE INTERCEPTORS SHALL MEET THE FOLLOWING STANDARDS: ASTM C-1227 FOR SEPTIC TANKS, C-913 FOR PRECAST CONCRETE WATER AND WASTEWATER STRUCTURES, ACI-318 FOR DESIGN AND ASTM C-890 FOR ESTABLISHING MINIMUM STRUCTURAL DESIGN LOADING.

N. A NORTH CAROLINA DESIGN PROFESSIONAL WILL SPECIFICALLY DESIGN CAST IN PLACE OR MASONRY TANKS. TANKS MUST BE MANUFACTURED AS A GREASE INTERCEPTOR.

ELECTRIC WATER HEATER SCHEDULE

Unit Tag	Capacity					Recirc Pump	Expansion Tank	Location	Model	Remarks	Detail
	Input (KW)	Volt/Phase	Recovery (GPH)	Tank Volume (Gallons)	Temp Rise (F)						
EWH #1	4.5	240/1	20.7	50	90	Yes	Yes	Storage B120	AO Smith E6-50R45DV	1-5	4/P301
EWH #2A	4.5	240/1	20.7	50	90	Yes	Yes	Utility G115.1	AO Smith E6-50R45DV	1-2, 4-6	4/P301
EWH #2B	4.5	240/1	20.7	50	90	Yes	Yes	Utility G115.1	AO Smith E6-50R45DV	1-2, 4-6	4/P301
EWH #3A	4.5	240/1	20.7	50	90	Yes	Yes	Utility E115.1	AO Smith E6-50R45DV	1-2, 4-6	4/P301
EWH #3B	4.5	240/1	20.7	50	90	Yes	Yes	Utility E115.1	AO Smith E6-50R45DV	1-2, 4-6	4/P301
EWH #4A	4.5	240/1	20.7	50	90	Yes	Yes	Utility D115.1	AO Smith E6-50R45DV	1-2, 4-6	4/P301
EWH #4B	4.5	240/1	20.7	50	90	Yes	Yes	Utility D115.1	AO Smith E6-50R45DV	1-2, 4-6	4/P301

1. EQUALS BY STATE, A.O. SMITH, RHEEM.
2. RECIRCULATION PUMPS ARE BELL & GOSSET NBF-22, 92 WATTS, 115V/1-PH, ALL BRONZE; EQUALS BY AURUORA, GRUNDFOS
3. EXPANSION TANKS ARE AMTROL ST-5 OR EQUALS BY STATE, TACO
4. NON-SIMULTANEOUS ELEMENTS
5. DISCONNECT BY E.C. WATER HEATERS TO BE PROVIDED WITH 208V POWER.
6. PROVIDE ONE EXPANSION TANK (AMTROL ST-12) AND RECIRCULATION PUMP FOR WATER HEATERS IN SERIES. REFER TO PLANS TO IDENTIFY UNITS IN SERIES TOGETHER.

LIQUID PROPANE TANKLESS WATER HEATER SCHEDULE

Unit Tag	Capacity				Flue Size	Recirc Pump	Electrical Data			Expansion Tank	Location	Model	Remarks	Detail
	Input (MBH)	Efficiency	GPM	Temp Rise (F)			HP	Volt	Phase					
GWH-1 GWH-2 GWH-3	19.9 MIN 199 MAX VARIABLE	96%	5.6	67	NOTE 4	YES	–	120	1	YES	SEE PLANS	NAVIEN NPE-240A	1-6	5/P301

1. EQUALS BY RINNAI, INTELLIHOT.
2. EXPANSION TANKS ARE AMTROL OR EQUALS BY STATE, TACO; MODEL ST-5
3. HOT WATER, COLD WATER, GAS, COMBUSTION AIR, AND VENT PIPE MANIFOLDS BY WATER HEATER MFG.
4. CONCENTRIC WALL VENT BY WATER HEATER MFG.
5. CONTROLS FOR ALL THREE WATER HEATERS TO OPERATE AS ONE SYSTEM.
6. ALL ITEMS FOR COMPLETE SYSTEM BY WATER HEATER MFG.

CONTRACTOR TO VERIFY ALL DIMENSIONS.

McKNIGHT·SMITH WARD · GRIFFIN
ENGINEERS, INCORPORATED
PO Box 240826 · 4223 South Boulevard
Charlotte, NC F-0595
704/527-2112 18-219

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 17250 J. CRAIG CHAMPION
08-22-19

PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 F: (704) 847-9853

STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

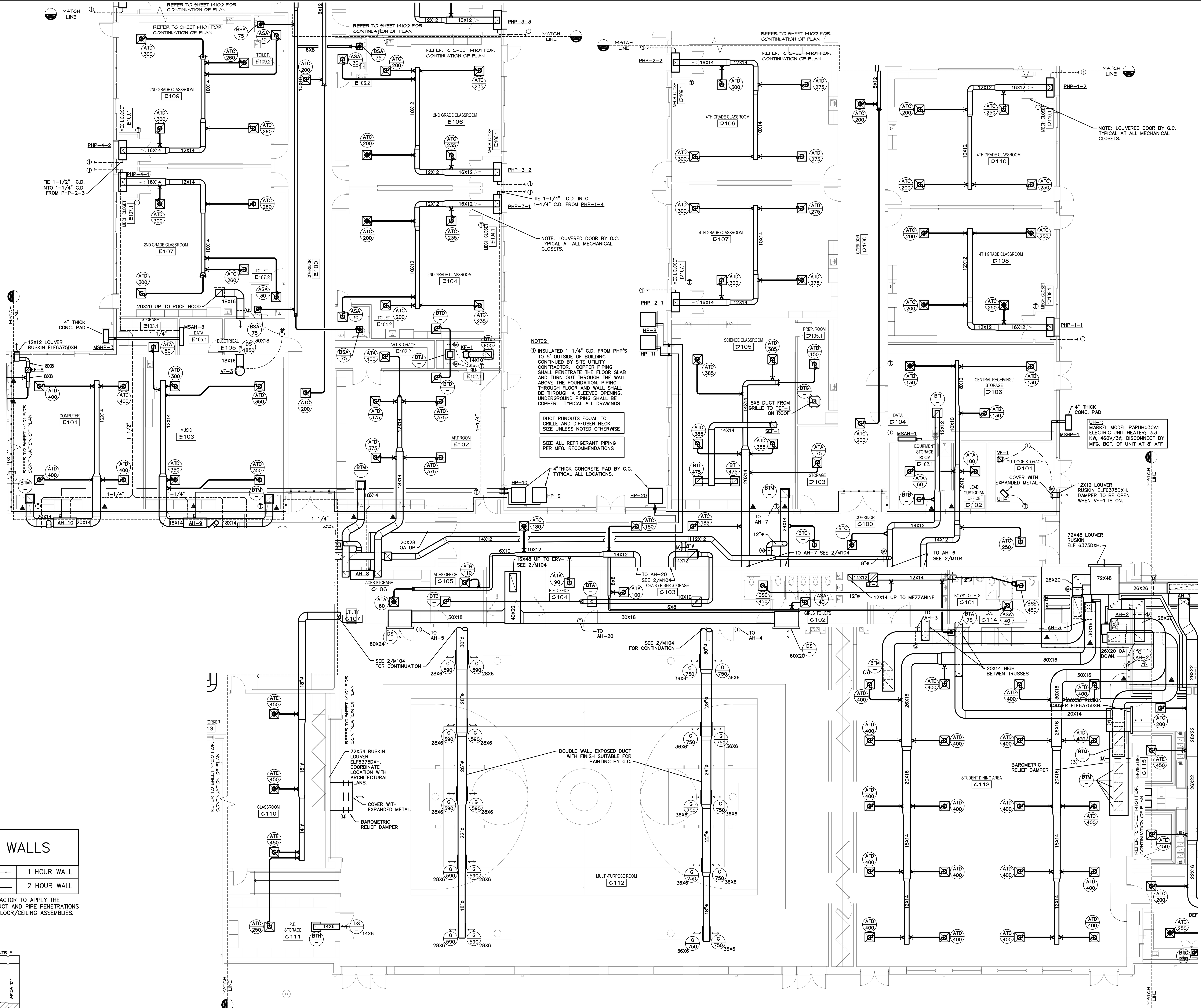
SCHEDULES AND DETAILS

ISSUE DATE: 04.30.2019
DRAWN BY: MHK
CHECKED BY: JCC
PROJECT: 1821

REVISION SCHEDULE

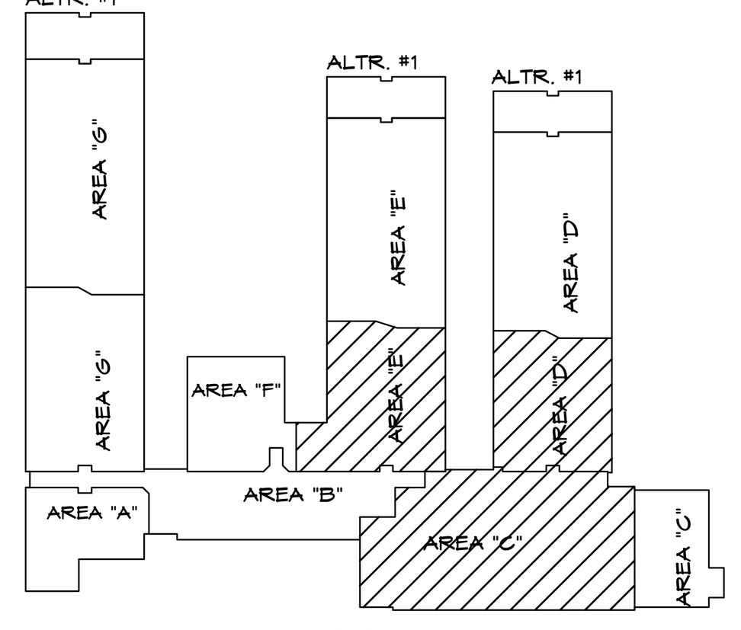
#	DATE	REFERENCE
1	8.22.19	ADDENDUM #1

P302



FIRE RATED WALLS	
	1 HOUR WALL
	2 HOUR WALL

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO APPLY THE PROPER FIRE-SAFING DETAIL FOR ALL DUCT AND PIPE PENETRATIONS THRU RATED & NON-RATED WALL AND FLOOR/CEILING ASSEMBLIES.



1 M101 FLOOR PLAN
SCALE: 1/8" = 1'-0"

CONTRACTOR TO VERIFY ALL DIMENSIONS.

McKNIGHT-SMITH WARD • GRIFFIN ENGINEERS, INCORPORATED
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STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

FLOOR PLAN - AREAS C,D, & E

ISSUE DATE: 04.30.2019
DRAWN BY: MHK
CHECKED BY: JCG
PROJECT: 1821

REVISION SCHEDULE

	DATE	REFERENCE
1	8.22.19	ADDENDUM #1

M101

MECHANICAL EQUIPMENT LEGEND

SYMBOL: SINGLE LINE	SYMBOL: DOUBLE LINE	DESCRIPTION
LOW PRESSURE DUCTWORK		
10 X 12	10 X 12	DUCT SECTION–1ST FIGURE WIDTH, 2ND DEPTH
		SQUARE TO ROUND TRANS.
		FLEX DUCTWORK
		ELBOW W/TURNING VANES
		LONG RADIUS ELBOW
EXH		EXHAUST DUCT SECTION
SA		SUPPLY DUCT SECTION
OA		OUTSIDE AIR DUCT SECTION
RA		RETURN/RELIEF AIR DUCT SECTION
N/A		EXPOSED DUCT
		CONICAL DUCT TAKE–OFF
		RECTANGULAR–TO–ROUND TAKE–OFF WITH DAMPER
		RECTANGULAR–TO–ROUND TAKE–OFF WITHOUT DAMPER
		RECTANGULAR TAKE–OFF
		FIRE DAMPER "A" OR "B"
MISCELLANEOUS		
T	T	THERMOSTAT
CO2	CO2	CARBON DIOXIDE SENSOR
S	S	SMOKE DETECTOR
— CD —	— CD —	CONDENSATE DRAIN
B.D.	B.D.	BACKDRAFT DAMPER
M	M	MOTOR OPERATED DAMPER
- - -	- - -	DAMPER
$	$	MANUAL SWITCH

GRILLE & DIFFUSER SCHEDULE

SYM	TYPE	USE	CFM RANGE	NECK SIZE	OVER-ALL SIZE	DMPR	FINISH	FRAME	PRICE MODEL NO	REMARKS
A--	LOUVER FACE	SUPPLY 4-WAY	SEE PLANS & RMK 5	RMK 5	RMK 4	OBD	OFF WHITE	RMK 3	SMDA	1-6
BT-	PERF.	RETURN/ EXHAUST	SEE PLANS & RMK 6	RMK 7	RMK 4	RMK 9	OFF WHITE	RMK 3	PDDR	1-4, 7-10
BS-	PERF.	RETURN/ EXHAUST	SEE PLANS & RMK 6	RMK 7	RMK 4	RMK 9	OFF WHITE	RMK 3	PDDR	1-4, 7-10
C-	SIDEWALL	SUPPLY	SEE PLANS	SEE PLANS	RMK 4	OBD	RMK 12	SEE PLANS	520D	1-4, 11-13
D-	SIDEWALL	RETURN/ EXHAUST	SEE PLANS	SEE PLANS	RMK 4	RMK 9	RMK 12	SEE PLANS	530	1-4, 9, 12, 13

REMARKS

1. EQUALS: METALAIRE, TITUS, KRUEGER, TUTTLE & BAILEY, NAIL-OR, CARNES. SCHEDULE IS GENERAL, SOME MAY NOT BE USED. PAINT ALL INSIDE VISIBLE SURFACES FLAT BLACK.
2. SYMBOL EXPLANATION:
   XXX/CFM = SYMBOL, FRAME (RMK 3), NECK (RMK 5,7)/CFM
3. FRAME TYPES: T = T-BAR
   S = FLUSH SURF. MTD. E = DUCT MOUNTED: V-BEVELED
   TYPE 1 FRAME. DROP SURF. (TYPE "A" DIFFUSER)
   G = TEGULAR. D = DROPPED FRAME
   NOTE: VERIFY FRAME/CEILING COMPATIBILITY.
4. OVERALL SIZE: LAY-IN = 2'x2', OTHER GRILLES = NECK + 2"+/-.
5. LOUVER FACE SUPPLY NECK SIZES

NO.	ROUND NK SIZE	CFM	NO.	SQUARE NK SIZE	CFM
A	6"	100	H	6x6	125
B	8"	175	I	9x9	280
C	10"	275	J	12x12	500
D	12"	400	K	15x15	780
E	14"	535	L	18x18	1125
F	16"	700	M	21x21	1530
G	18"	885	N	24x24	2000

NOTE: VERIFY CFM / NECK SIZE.

6. ADJUSTABLE: HORIZONTAL/VERTICAL. "PIANO HINGED" TYPE VANES.
7. "B" & "E" EXH/RETURN NECK SIZES ("E" = SQ. NK. ONLY)

NO.	ROUND NK SIZE	CFM	NO.	SQUARE NK SIZE	CFM
A	6"	100	G	8x8	220
B	8"	175	H	10x10	345
C	10"	275	I	12x12	500
D	12"	400	J	14x14	680
E	14"	535	K	16x16	885
F	16"	700	L	18x18	1125
NOTE: VERIFY			M	22x22	1680
CFM / NECK SIZE.			N	22x46	2600

8. NO NECK SIZE INDICATES NON-DUCTED, LAY-IN PANEL.
9. OBD IF USED AS EXHAUST.
10. ALL ALUM. CONSTRUCTION (INCLUDING BACKPAN) IF SHOWN ON PLANS.
11. VOLUME EXTRACTOR WHERE SHOWN ON PLANS.
12. SURFACE MTD: PAINT TO MATCH WALL.
13. VERTICAL FRONT BLADES.

SPLIT SYSTEM HEAT PUMP SCHEDULE

Unit Tag	Nom. Tons	SEER (EER)	CFM	OA	ESP	Air Handling Unit: Fan Motor HP	Fan Motor Volts	Fan Motor Phase	Electric Heating Coil kW	Steps	Volts	Phase	EAT	LAT	MCA	MOCP	Model
AH/HP-1	15	(10.6)	5500	1250	0.7	3	460	3	49.84	2	460	3	70	98.6	81	90	TWE180
AH/HP-2	10	(11)	4000	1830	0.6	2	460	3	24.92	2	460	3	70	89.7	35	35	TWE120
AH/HP-3	10	(11)	4000	1830	0.6	2	460	3	24.92	2	460	3	70	89.7	35	35	TWE120
AH/HP-4	20	(10.6)	7500	3160	0.75	5	460	3	49.84	2	460	3	70	91	83	90	TWE240
AH/HP-5	20	(10.6)	7500	3160	0.75		460	3	49.84	2	460	3	70	91	83	90	TWE240
AH/HP-6	2	14	800	115	0.6	1/3	208	1	5.76	1	208	1	70	92.7	38	40	GAM5B0A24
AH/HP-7	4	14	1600	450	0.5	3/4	208	1	10.8	1	208	3	70	91.3	44	45	GAM5B0C48
AH/HP-8	4	14	1600	460	0.5	3/4	208	1	10.8	1	208	3	70	91.3	44	45	GAM5B0C48
AH/HP-9	3.5	14	1400	350	0.4	1/2	208	1	10.8	1	208	3	70	94.4	42	45	GAM5B0C42
AH/HP-10	4	14	1600	350	0.5	3/4	208	1	10.8	1	208	3	70	91.3	44	45	GAM5B0C48
AH/HP-11	3.5	14	1400	255	0.4	1/2	208	1	10.8	1	208	3	70	94.4	42	45	GAM5B0C42
AH/HP-12	3	14	1200	100	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-13	3	14	1200	210	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-14	2	14	800	170	0.6	1/3	208	1	5.76	1	208	1	70	92.7	38	40	GAM5B0A24
AH/HP-15	5	14	1950	120	0.4	1	208	1	10.8	1	208	3	70	87.5	46	50	GAM5B0C60
AH/HP-16	2	14	800	105	0.6	1/3	208	1	5.76	1	208	1	70	92.7	38	40	GAM5B0A24
AH/HP-17	3	14	1200	260	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-18	5	14	1950	480	0.4	1	208	1	10.8	1	208	3	70	87.5	46	50	GAM5B0C60
AH/HP-19	5	14	1980	480	0.4	1	208	1	10.8	1	208	3	70	87.2	46	50	GAM5B0C60
AH/HP-20	2	14	800	135	0.6	1/3	208	1	5.76	1	208	1	70	92.7	38	40	GAM5B0A24
AH/HP-21	3	14	1200	250	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-22	3	14	1200	205	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-23	3	14	1200	250	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-24	3	14	1200	205	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-25	3	14	1200	250	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-26	3	14	1200	205	0.4	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-27	4	14	1600	180	0.5	3/4	208	1	10.8	1	208	3	70	91.3	44	45	GAM5B0C48
AH/HP-28	2.5	14	1000	245	0.5	1/3	208	1	7.2	1	208	3	70	92.7	28	30	GAM5B0B30
AH/HP-29	4	14	1600	420	0.7	3/4	208	1	10.8	1	208	3	70	91.3	44	45	GAM5B0C48
AH/HP-30	3	14	1200	240	0.5	1/2	208	1	10.8	1	208	3	70	98.4	42	45	GAM5B0B36
AH/HP-31	4	14	1600	270	0.5	3/4	208	1	10.8	1	208	3	70	91.3	44	45	GAM5B0C48
AH/HP-32	2.5	14	1000	250	0.5	1/3	208	1	7.2	1	208	3	70	92.7	28	30	GAM5B0B30

Unit Tag	DX Coil Performance: EAT	MBH Total	MBH Sens.	Heating Performance: EAT	LAT	Capacity MBH@47 F	Electrical Data (Outdoor Unit): Fan No.	Fan FLA	Compressor No.	LRA	RLA	Volts	Phase	MCA	MOCP	Model	Remarks
AH/HP-1	80/70	183	134.4	70	98.4	168.5	2	2.5	2	100	12.6	460	3	33.4	40	TWA180	1 - 3
AH/HP-2	80/67	124	99.3	70	93.4	100.9	1	2.5	2	52	7.8	460	3	20	25	TWA120	1 - 3
AH/HP-3	80/67	124	99.3	70	93.4	100.9	1	2.5	2	52	7.8	460	3	20	25	TWA120	1 - 3
AH/HP-4	80/70	255	190	70	100	245.5	2	2.5	2	125	18	460	3	46	60	TWA240	1 - 3
AH/HP-5	80/70	255	190	70	100	245.5	2	2.5	2	125	18	460	3	46	60	TWA240	1 - 3
AH/HP-6	80/67	24	16.7	70	96.4	22.8	1	0.64	1	62.9	10.9	208	1	14	25	4TWR4024	1 - 4
AH/HP-7	80/67	47.5	35.1	70	96.3	45.5	1	0.6	1	41	6.2	460	3	8	15	4TWA4048	1 - 4
AH/HP-8	80/67	47.5	35.1	70	96.3	45.5	1	0.6	1	41	6.2	460	3	8	15	4TWA4048	1 - 4
AH/HP-9	80/67	42	30.8	70	96.8	40.5	1	0.6	1	41	6.1	460	3	8	15	4TWA4042	1 - 4
AH/HP-10	80/67	47.5	35.1	70	96.3	45.5	1	0.6	1	41	6.2	460	3	8	15	4TWA4048	1 - 4
AH/HP-11	80/67	42	30.8	70	96.8	40.5	1	0.6	1	41	6.1	460	3	8	15	4TWA4042	1 - 4
AH/HP-12	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-13	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-14	80/67	24	16.7	70	96.4	22.8	1	0.64	1	62.9	10.9	208	1	14	25	4TWR4024	1 - 4
AH/HP-15	80/67	59	42.3	70	97	57	1	0.6	1	52	7.8	460	3	10	15	4TWA4060	1 - 4
AH/HP-16	80/67	24	16.7	70	96.4	22.8	1	0.64	1	62.9	10.9	208	1	14	25	4TWR4024	1 - 4
AH/HP-17	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-18	80/67	59	42.3	70	97	57	1	0.6	1	52	7.8	460	3	10	15	4TWA4060	1 - 4
AH/HP-19	80/67	59	42.3	70	97	57	1	0.6	1	52	7.8	460	3	10	15	4TWA4060	1 - 4
AH/HP-20	80/67	24	16.7	70	96.4	22.8	1	0.64	1	62.9	10.9	208	1	14	25	4TWR4024	1 - 4
AH/HP-21	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-22	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-23	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-24	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-25	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-26	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-27	80/67	47.5	35.1	70	96.3	45.5	1	0.6	1	41	6.2	460	3	8	15	4TWA4048	1 - 4
AH/HP-28	80/67	30.2	21.5	70	97.2	29.4	1	0.92	1	68.2	11.3	208	1	15	25	4TWB4030	1 - 4
AH/HP-29	80/67	47.5	35.1	70	96.3	45.5	1	0.6	1	41	6.2	460	3	8	15	4TWA4048	1 - 4
AH/HP-30	80/67	34	25.7	70	96.8	34.8	1	0.6	1	38	5.8	460	3	8	15	4TWA4036	1 - 4
AH/HP-31	80/67	47.5	35.1	70	96.3	45.5	1	0.6	1	41	6.2	460	3	8	15	4TWA4048	1 - 4
AH/HP-32	80/67	30.2	21.5	70	97.2	29.4	1	0.92	1	68.2	11.3	208	1	15	25	4TWB4030	1 - 4

1. MODEL NUMBERS BASED ON TRANE. EQUALS BY CARRIER AND LENNOX.
2. CONTRACTOR SHALL VERIFY SERVICE CLEARANCES FOR ALL SUBSTITUTIONS.
3. SINGLE POINT ELECTRICAL CONNECTION AT AIR HANDLING UNIT.
4. FOR LINE SETS BETWEEN 50 AND 175 FEET, INCLUDE THE FOLLOWING:
   CRANKCASE HEATER
   COMPRESSOR START ASSIST CAPACITOR AND RELAY
   LIQUID - LINE SOLENOID VALVE OR HARD SHUTOFF TXV

MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT METHOD OF COMPLIANCE

[Prescriptive] Energy Cost Budget

Thermal Zone Onslow County 3A

Exterior Design Conditions

Winter Dry Bulb: 23
Summer Dry Bulb: 94

Interior Design Conditions

Winter Dry Bulb: 70
Summer Dry Bulb: 75
Relative Humidity: 50%

Building Heating Load: 1620 mbh

Building Cooling Load: 245.3 tons

Mechanical Space Conditioning System

Unitary:
Description of Unit: vertical heat pump units
split system heat pumps
mini-split units
Heat Output of Unit: 2817 mbh
Cooling Output of Unit: 247 tons

List Equipment Efficiencies:

Equipment Schedules with Motors (Mechanical Systems)
Motor Horsepower: Specs Require Compliance w/ NC Energy Code.
Number of Phases: Specs Require Compliance w/ NC Energy Code.
Minimum Efficiency: Specs Require Compliance w/ NC Energy Code.
Motor Type: Specs Require Compliance w/ NC Energy Code.
Number of Poles: Specs Require Compliance w/ NC Energy Code.

Designer Statement:
To the best of my knowledge and belief, the design of this building complies with the mechanical systems, service systems and equipment requirements of the 2012 NC Energy Code. Compliance with Section 506 shall be by "Reduced Lighting Power Density" (506.2.2).

FAN SCHEDULE

Unit Tag	CFM	ESP (in.)	Fan RPM	Sones (dBA)	Drive	HP (W)	Volts	Phs	Type	GREENHECK Model No.	Rmks.
EF-1	75	0.3	756	1.1	DIRECT	(80)	115	1	C	SP-B110	1-6, 14
EF-2	825	0.35	1638	14.5	DIRECT	1/4	115	1	IL	SQ-99-VG	1-5, 7
EF-3	900	0.4	1366	7.5	DIRECT	1/4	115	1	IL	SQ-100-VG	1-5, 7
EF-4	1350	0.5	1463	11.3	BELT	1/3	115	1	IL	BSQ-120-3	1,2,4,5,7
EF-5	1950	0.5	1252	12.7	BELT	1/2	115	1	IL	BSQ-140-5	1,2,4,5,7
EF-6	(TAG NOT USED)			-	-	-	-	-	-	-	-
EF-7	(TAG NOT USED)			-	-	-	-	-	-	-	-
EF-8	150	0.35	1651	5.2	DIRECT	1/10	115	1	IL	SQ-70-VG	1-5, 7
DEF-1	500	0.3	1688	8.4	DIRECT	1/10	115	1	RE	G-085-VG	1-5, 8
PEF-1	150	0.25	1712	4.6	DIRECT	1/10	115	1	RE	G-060-VG	1-5, 10
SEF-1	950	0.3	1473	10.5	DIRECT	1/4	115	1	RE	G-099-VG	1-5, 9
KF-1	600	0.3	1551	7.4	DIRECT	1/10	115	1	RE	G-090-VG	1-5, 11
VF-1	1250	0.4	1736	15.1	BELT	1/2	115	1	IL	BSQ-100-5	1,2,4,5,13
VF-2	2200	0.4	1324	13.5	BELT	1/2	115	1	IL	BSQ-140-5	1,2,4,5,13
VF-3, VF-4	1850	0.4	1461	15.0	BELT	1/3	115	1	RE	GB-131-3	1,2,4,5,13

1. EQUALS BY PENN, ILG, LOREN COOK.
2. TYPES: IL = INLINE, C = CEILING, RE = ROOF EXHAUSTER, SW = SIDEWALL EXHAUSTER.
3. 'VARIGREEN' MOTOR.
4. VERIFY FAN INLET/OUTLET SIZE, TRANSITION TO FIRST DUCT SIZE IF NECESSARY.
5. DISCONNECT SWITCH (OR PLUG) BY MFGR. FOR ALL SINGLE PHASE MOTORS (U.N.O.).
6. INTERLOCK WITH LIGHT SWITCH.
7. INTERLOCK WITH BAS.
8. INTERLOCK WITH DISHWASHER OPERATION.
9. INTERLOCK WITH WALL SWITCH.
10. CONTINUOUS OPERATION. FAN SHALL HAVE SPARK-PROOF HOUSING.
11. INTERLOCK WITH TSTAT.
12. SOLID STATE SPEED CONTROL.
13. INTERLOCK WITH TSTAT AND TIMED WALL SWITCH.
14. TAG IS USED ON PLAN MULTIPLE TIMES. CONTRACTOR RESPONSIBLE FOR CORRECT QUANTITY.

MINI-SPLIT SYSTEM SCHEDULE

Unit Tag	CFM High	CFM Low	Fan Motor: FLA	Volts	Phase	Cooling Performance: EAT	MBH Total	Efficiency SEER	Heating Performance: EAT	Capacity MBH	Outdoor Unit: Unit Tag	Fan No.	Fan FLA(ea)	Compressor No.	LRA	RLA	MCA	MOCP	Volts	Phase	Model (Outdoor Unit)	Model (Indoor Unit)	Remarks
MSAH-1	380	290	0.33	208/230	1	80/67	18	15.3	70	19	MSHP-1	1	0.35	1	14	12	13	20	208/230	1	PUZ-A18NHA4	PKA-A18HA4	1-5
MSAH-2	380	290	0.33	208/230	1	80/67	18	15.3	70	19	MSHP-2	1	0.35	1	14	12	13	20	208/230	1	PUZ-A18NHA4	PKA-A18HA4	1-5
MSAH-3	380	290	0.33	208/230	1	80/67	18	15.3	70	19	MSHP-3	1	0.35	1	14	12	13	20	208/230	1	PUZ-A18NHA4	PKA-A18HA4	1-5
MSAH-4	380	290	0.33	208/230	1	80/67	18	15.3	70	19	MSHP-4	1	0.35	1	14	12	13	20	208/230	1	PUZ-A18NHA4	PKA-A18HA4	1-5
MSAH-5	380	290	0.33	208/230	1	80/67	18	15.3	70	19	MSHP-5	1	0.35	1	14	12	13	20	208/230	1	PUZ-A18NHA4	PKA-A18HA4	1-5
MSAH-6	380	290	0.33	208/230	1	80/67	18	15.3	70	19	MSHP-6	1	0.35	1	14	12	13	20	208/230	1	PUZ-A18NHA4	PKA-A18HA4	1-5
MSAH-7	775	635	0.36	208/230	1	80/67	24	21.4	-	-	MSAC-1	1	0.4	1	11	7	19	26	208/230	1	PUY-A24NHA7	PKA-A24KA7	1 - 6
MSAH-8	775	635	0.36	208/230	1	80/67	24	21.4	-	-	MSAC-2	1	0.4	1	11	7	19	26	208/230	1	PUY-A24NHA7	PKA-A24KA7	1 - 6

1. MODELS BY MITSUBISHI. EQUALS BY LG, SANYO.
2. MOUNT INDOOR SECTION TIGHT TO BOTTOM OF CEILING AND WALL.
3. INDOOR UNIT IS POWERED FROM OUTDOOR UNIT. M.C. SHALL COORDINATE POWER REQUIREMENTS FOR ALL SUBSTITUTIONS.
4. REFRIGERANT LINES AND ACCESSORIES PER SPECS AND AS RECOMMENDED BY UNIT MFG.
5. PROVIDE FACTORY CONDENSATE PUMP.
6. COOLING ONLY UNIT.

ENERGY RECOVERY VENTILATOR SCHEDULE

UNIT	O.A./ S.A. CFM	ESP INTAKE SIDE	R.A./ E.A. CFM	ESP DISCH. SIDE	INTAKE FAN MOTOR: HP	VOLTS	PHASE	DISCHARGE FAN MOTOR: HP	VOLTS	PHASE	PERFORMANCE: SEASON	O.A. EAT	S.A. LAT	EFFICIENCY %	UNIT ELECTRICAL: FLA	MCA	MOCP	VOLT/PHS	MODEL	WEIGHT (LBS)	REMARKS
ERV-1	9980	0.5	9200	0.5	15	460	3	15	460	3	SUMMER	95/78	82.8/68.9	68	42.5	47.6	60	460/3	FV-9000	1950	1 - 10

1. MODEL BY SEMCO. EQUALS BY GREENHECK, VENMAR AND APPROVED EQUALS.
2. SINGLE POINT CONNECTION TO UNIT.
3. CONSTANT VOLUME FANS.
4. PROVIDE OA DAMPER, EA DAMPER.
5. PROVIDE ROTATION SENSOR.
6. INTERLOCK WITH AIR HANDLING UNITS.
7. FILTERS MERV 8.
8. VERIFY UNIT DIMENSIONS. UNIT MUST FIT IN ALLOTED SPACE WITH RECOMMENDED CLEARANCES MAINTAINED.
9. VERTICAL CONFIGURATION.
10. STOP/JOG ECONOMIZER WHEEL CONTROL.

FLY FAN SCHEDULE

UNIT	UNIT WIDTH (IN.)	MAX NOZZLE FPM	MAX NOZZLE CFM	VOLTAGE/ PHASE	HP PER MOTER	AMP DRAW	NUMBER OF MOTORS	WEIGHT (LBS)	BERNER MODEL NO.	REMARKS
FF-1	48	3274	1360	115 / 1	1/5	3.4	1	42	SLC07-1048A	1-4

1. MODEL NUMBERS BASED ON BERNER. EQUALS BY MARS AIR SYSTEMS AND POWERED AIRE.
2. PROVIDE DOOR LIMIT SWITCH. SWITCH TO BE MOUNTED SO THE AIR CURTAIN TURNS ON AS THE DOOR BEGINS TO OPEN.
3. PROVIDE ADJUSTABLE TIME RELAY. MINUMUM MOUNTING HEIGHT EQUALS 7'-0" AFF.
4. CABINET FINISH SELECTED BY ARCHITECT PRIOR TO ORDERING.

VERTICAL INTERIOR HEAT PUMP SCHEDULE

Unit Tag	Qty	EER	Nom. Tons	Evaporator Fan (remark 1): SA CFM	OA CFM	ESP	HP	Cooling Performance: EAT	MBH Total	MBH Sens.	Amb. Temp.	Heating Performance: MBH @ 47 F	EAT (F)	C.O.P. @47 F	Electric Heating Coil: KW Total	KW/ Step	Steps	Volts	Phs	Compressor: No.	Volt	Phs	LRA	RLA	Condenser Fan: No.	Volt	Phs	FLA (ea)	Filter Area (sf)	Unit Electrical: Volt	Phs.	# of Conn.	MCA	MOP MFS	Bard I/Tec	Weight Lbs.	Remarks
PHP-1	6	11.7	2.5	900	450	0.3	1/3	80/67	27.8	20.5	95	26.6	70	3.6	9	9	1	460	3	1	460	3	28	4.2	1	460	3	1.7	4.0	460	3	1	22	25	I30H1DC09RP1	1150	1-12
PHP-2	6	12	3	1150	450	0.3	1/3	80/67	36	27.3	95	32.8	70	3.7	9	9	1	460	3	1	460	3	38	4.9	1	460	3	2.6	4.0	460	3	1	24	25	I36H1DC09RP1	1200	1-12
PHP-3	6	11.7	2.5	900	450	0.3	1/3	80/67	27.8	20.5	95	26.6	70	3.6	9	9	1	460	3	1	460	3	28	4.2	1	460	3	1.7	4.0	460	3	1	22	25	I30H1DC09RP1	1150	1-12
PHP-4	6	12	3	1150	450	0.3	1/3	80/67	36	27.3	95	32.8	70	3.7	9	9	1	460	3	1	460	3	38	4.9	1	460	3	2.6	4.0	460	3	1	24	25	I36H1DC09RP1	1200	1-12
PHP-5	7	11.7	2.5	900	450	0.3	1/3	80/67	27.8	20.5	95	26.6	70	3.6	9	9	1	460	3	1	460	3	28	4.2	1	460	3	1.7	4.0	460	3	1	22	25	I30H1DC09RP1	1150	1-12
PHP-6	7	12	3	1150	450	0.3	1/3	80/67	36	27.3	95	32.8	70	3.7	9	9	1	460	3	1	460	3	38	4.9	1	460	3	2.6	4.0	460	3	1	24	25	I36H1DC09RP1	1200	1-12

1. MFR'S FAN DATA INCLUDES WET COIL, CLEAN FLTRS, AND UNIT CASING. ESP IS PRESSURE DROP EXTERNAL TO UNIT. ALL UNITS SHALL BE PROVIDED WITH ENERGY RECOVERY.
2. DISCONNECT FURNISHED AND INSTALLED BY E.C.
3. HEATING/COOLING T'STAT/HUMIDISTAT BY MFR. MODEL THOC
4. LOUVER BY MC, COLOR SELECTED BY ARCHITECT.
5. ONE (460/3) ELECTRICAL CONNECTION TO UNIT
6. CONDENSATE DRAIN KIT W/TRAP BY MFR.
7. ACCESS DOOR ATTACHED W/SCREWS (NOT HINGED).
8. LOW AMBIENT.
9. HOT GAS REHEAT.
10. MODELS BY BARD OR APPROVED EQUAL BASED ON PRE-APPROVAL OF SUBMITTAL.
11. REQUIRED STARTUP BY MANUFACTURER'S TECH. SERVICE REP.
12. PROVIDE 5 YEAR LABOR WARRANTY.

1

McKNIGHT·SMITH
WARD · GRIFFIN
ENGINEERS, INCORPORATED
PO Box 240826 · 4223 South Boulevard
Charlotte, NC F-0595
704/527-2112 18-219

NORTH CAROLINA PROFESSIONAL ENGINEER 17250 J. CRAIG CHAMPION 08-22-19

PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 F: (704) 847-9853

ISSUE DATE: 04.30.2019
DRAWN BY: MHK
CHECKED BY: JCC
PROJECT: 1821

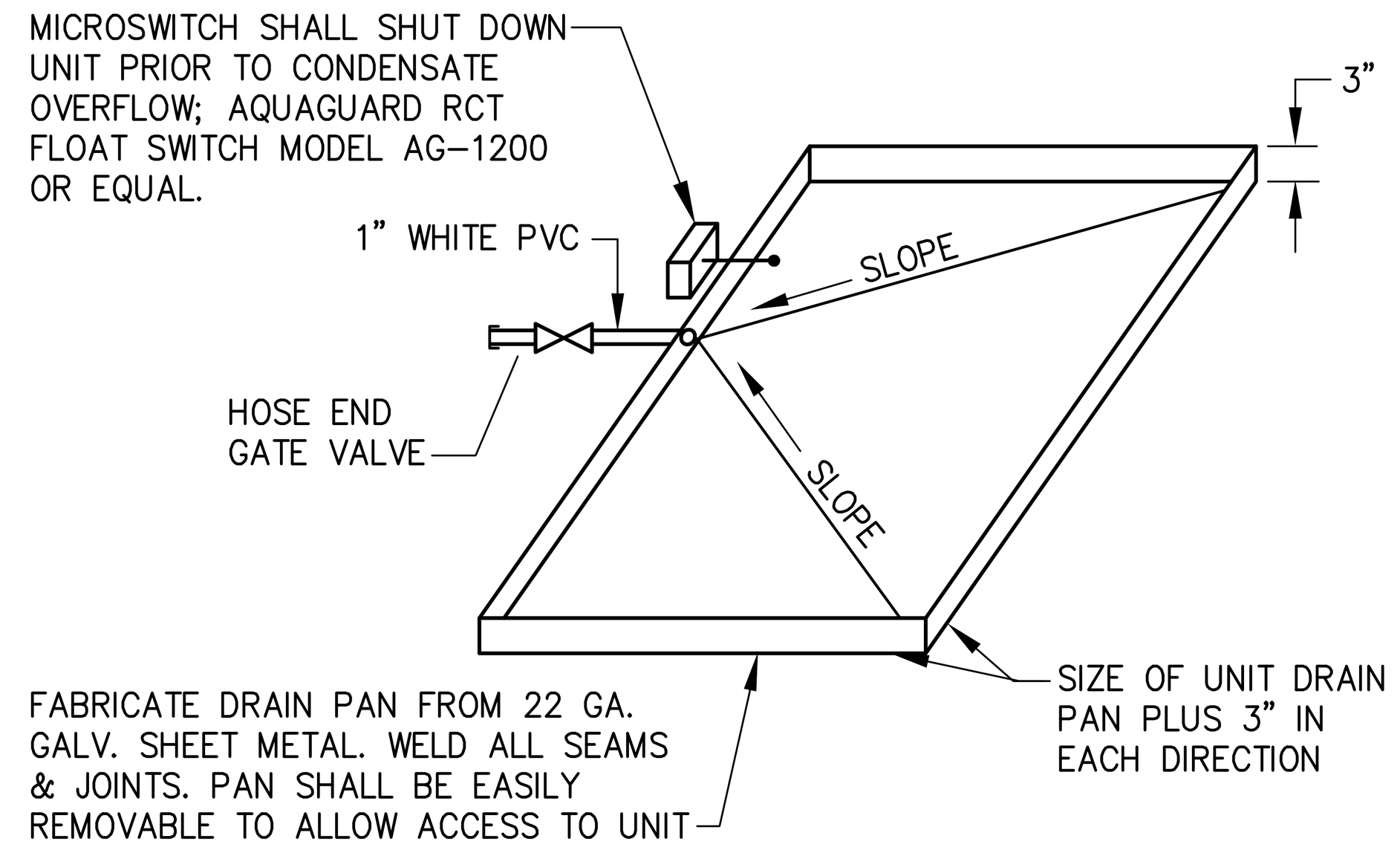
STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

SCHEDULES & LEGEND

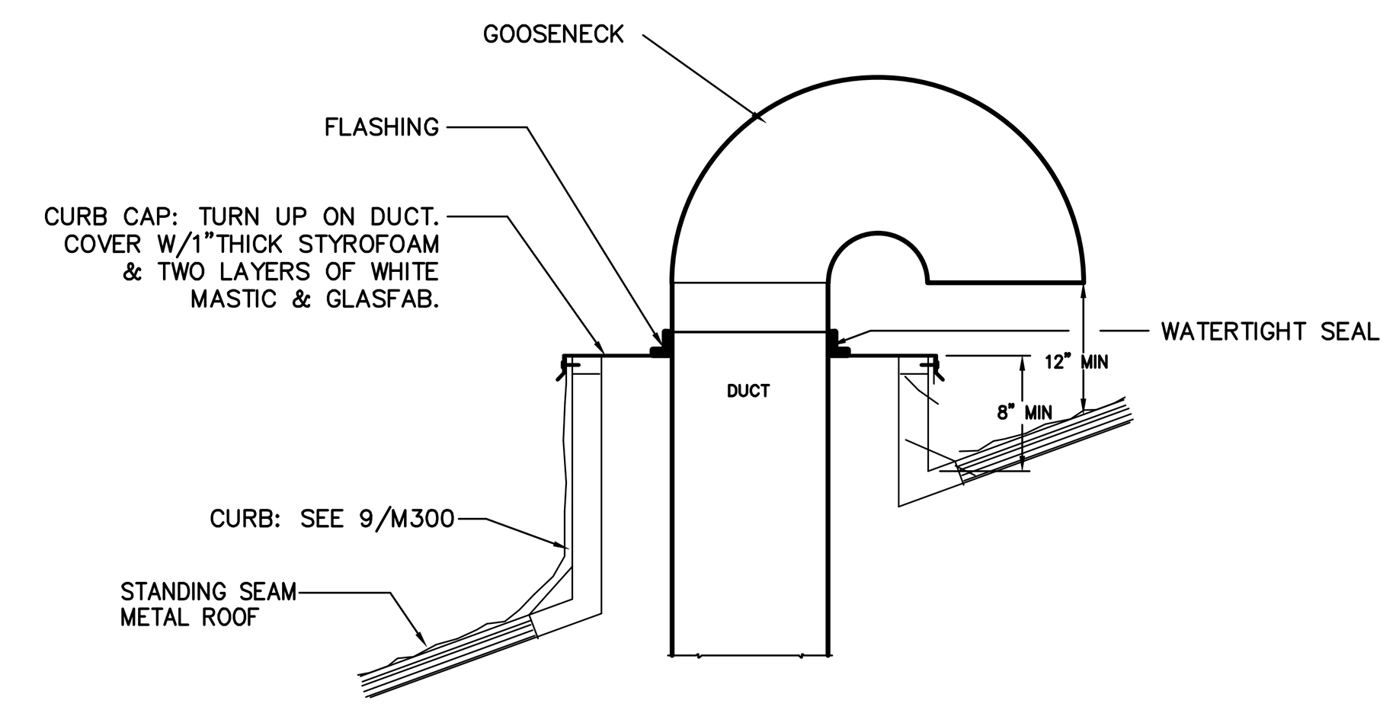
REVISION SCHEDULE

	DATE	REFERENCE
1	8.22.19	ADDENDUM #1

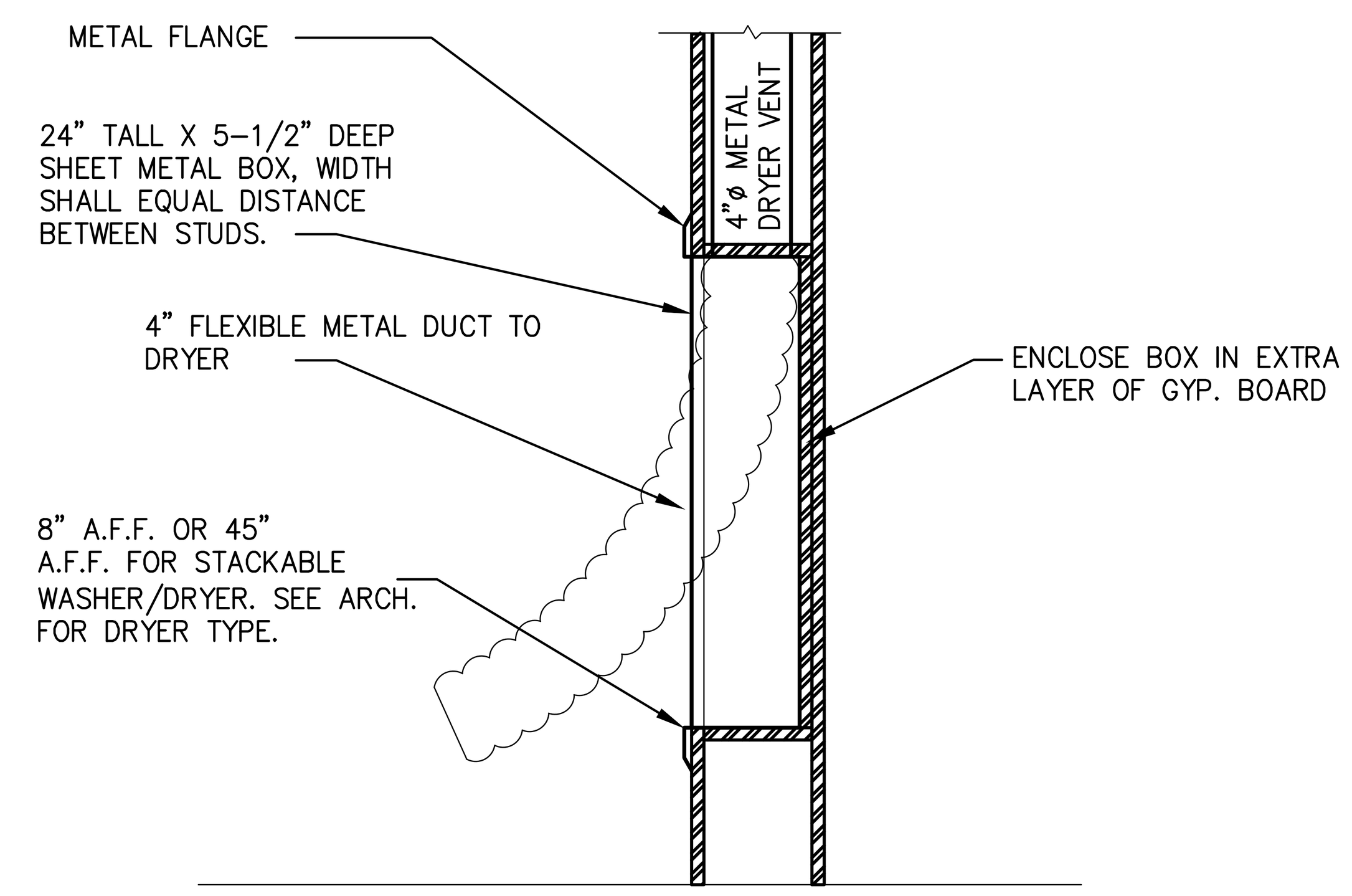
M200



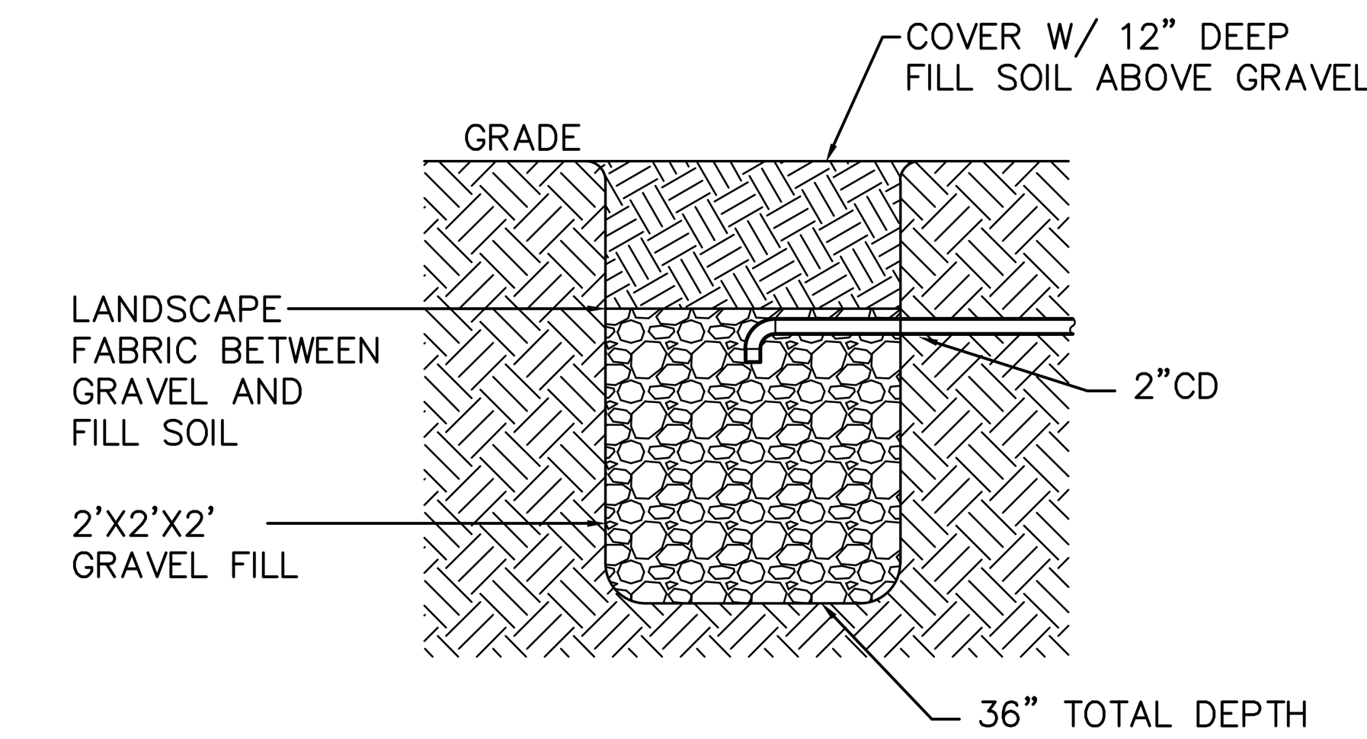
14 M300 AUXILIARY DRAIN PAN DETAIL
NTS



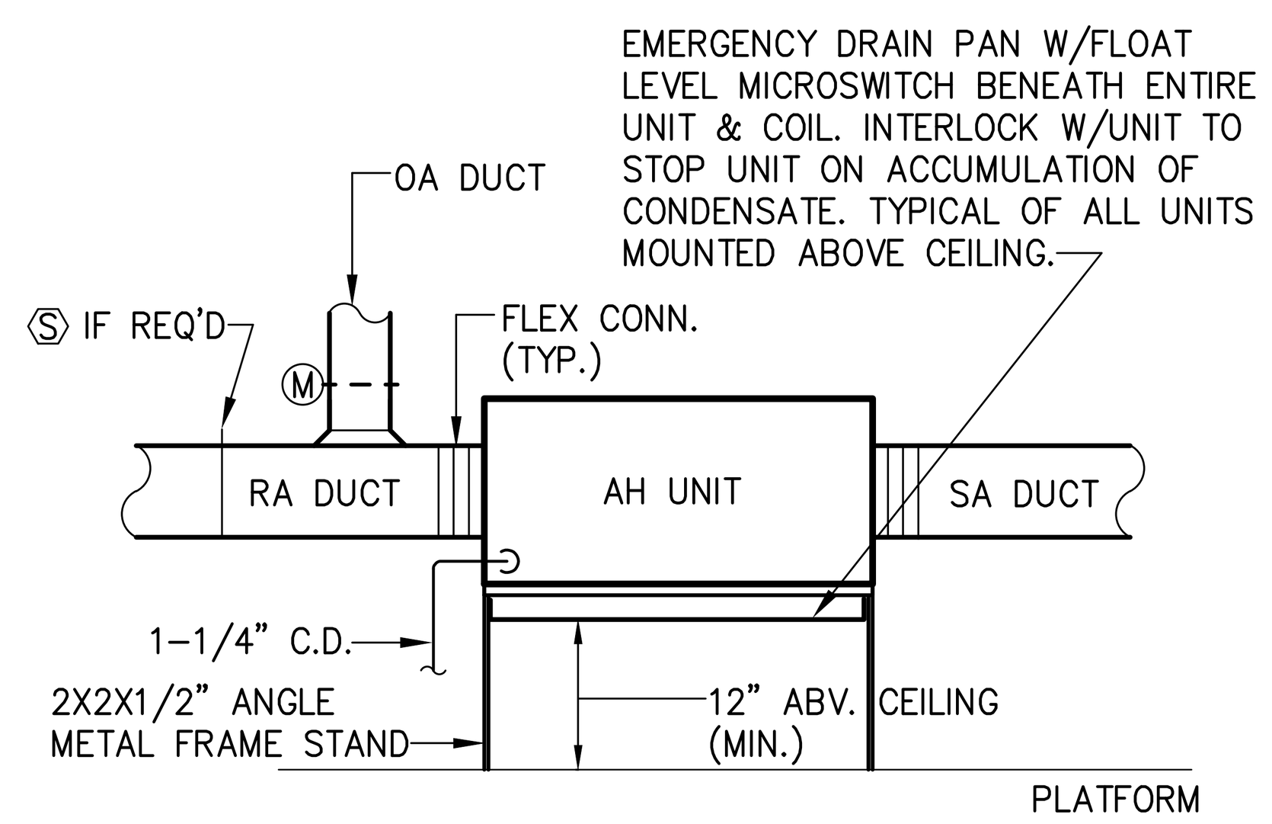
15 M300 GOOSENECK DETAIL
NTS
NOTE: M.C. & G.C. TO COORDINATE SIZE & LOCATION OF ROOF OPENING.



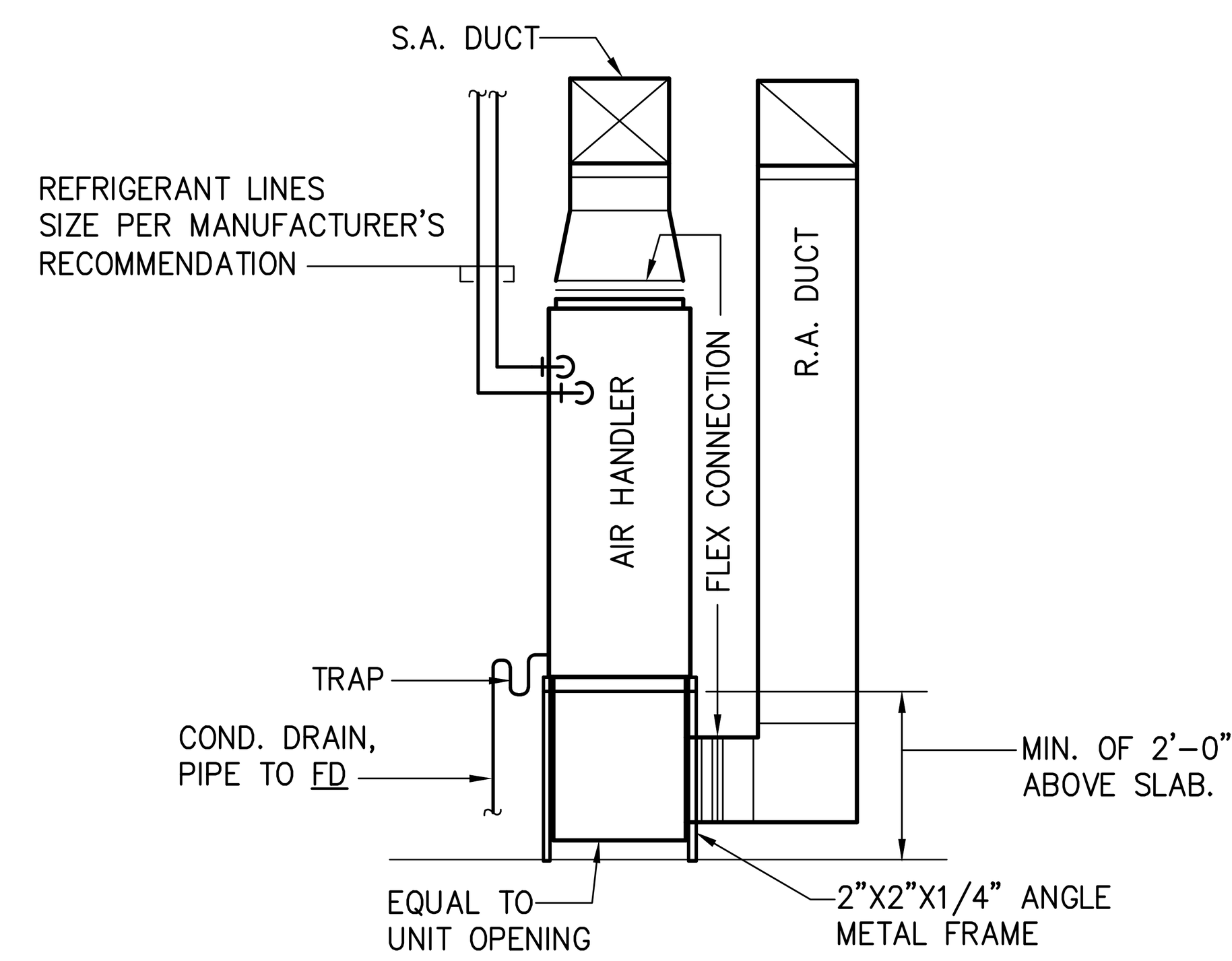
16 M300 DRYER VENT BOX DETAIL
NTS



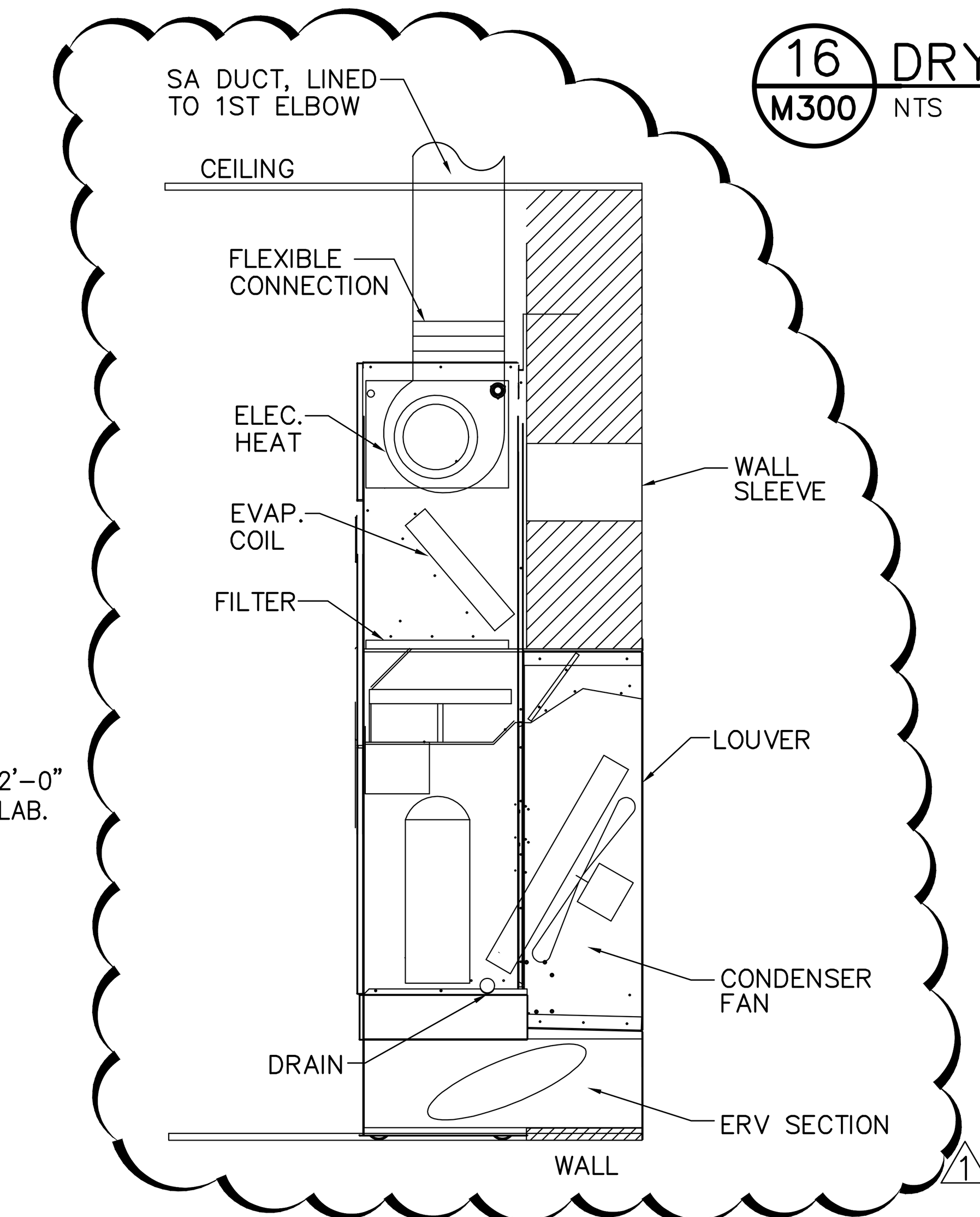
17 M300 DRYWELL DETAIL
NTS



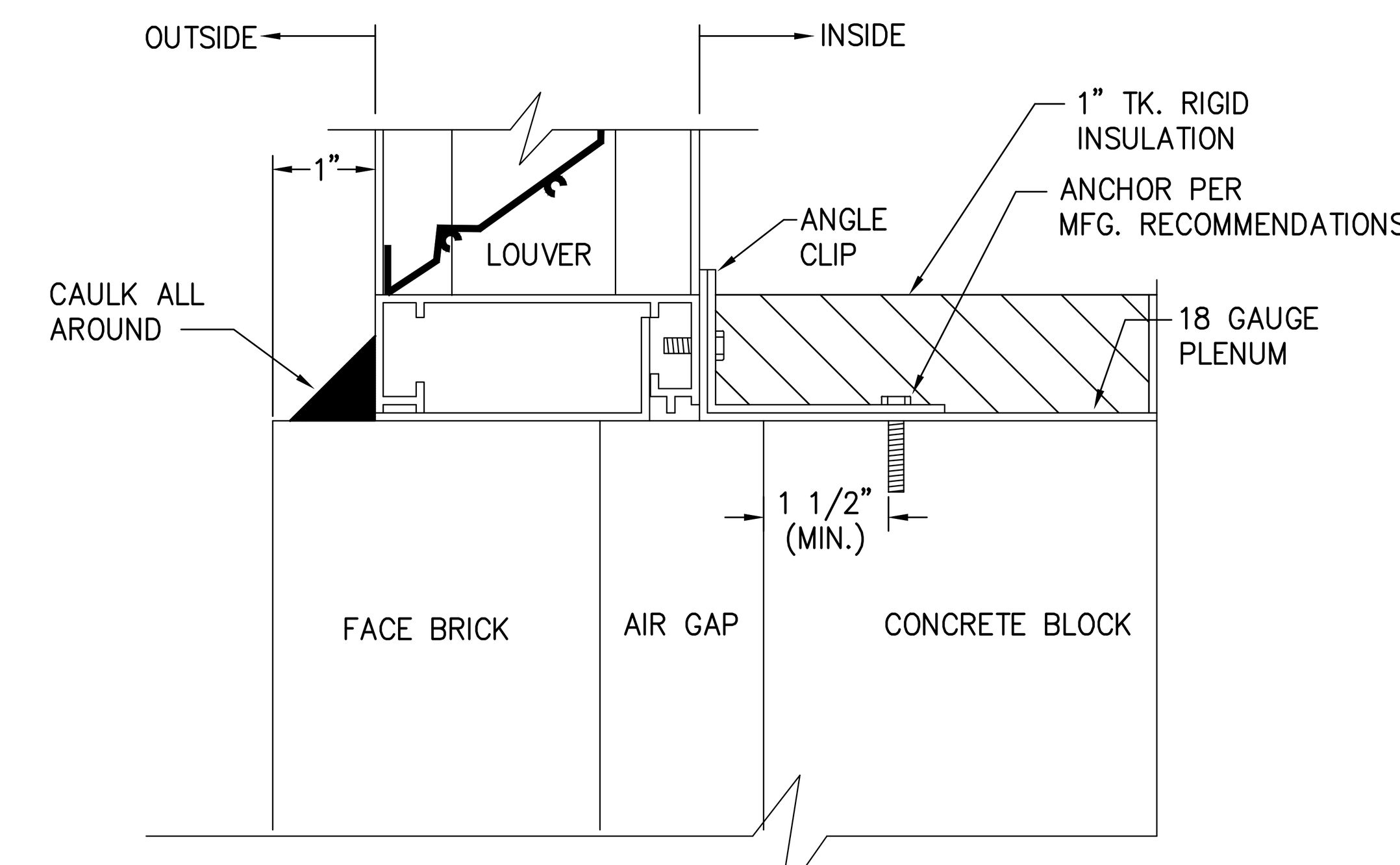
10 M300 SECTION AT AHU
NTS



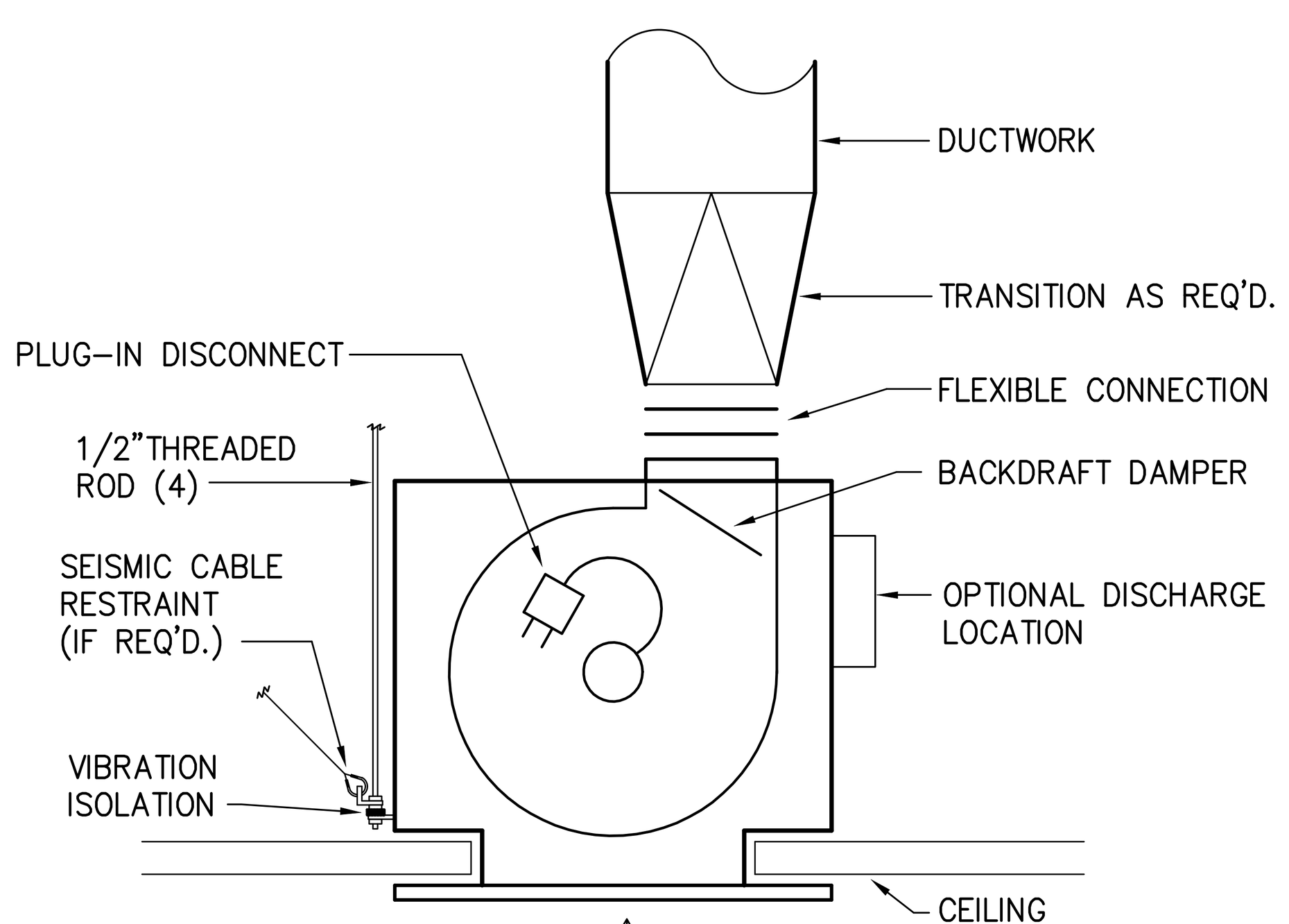
11 M300 SECTION @ VERTICAL AIR HANDLING UNIT
NTS



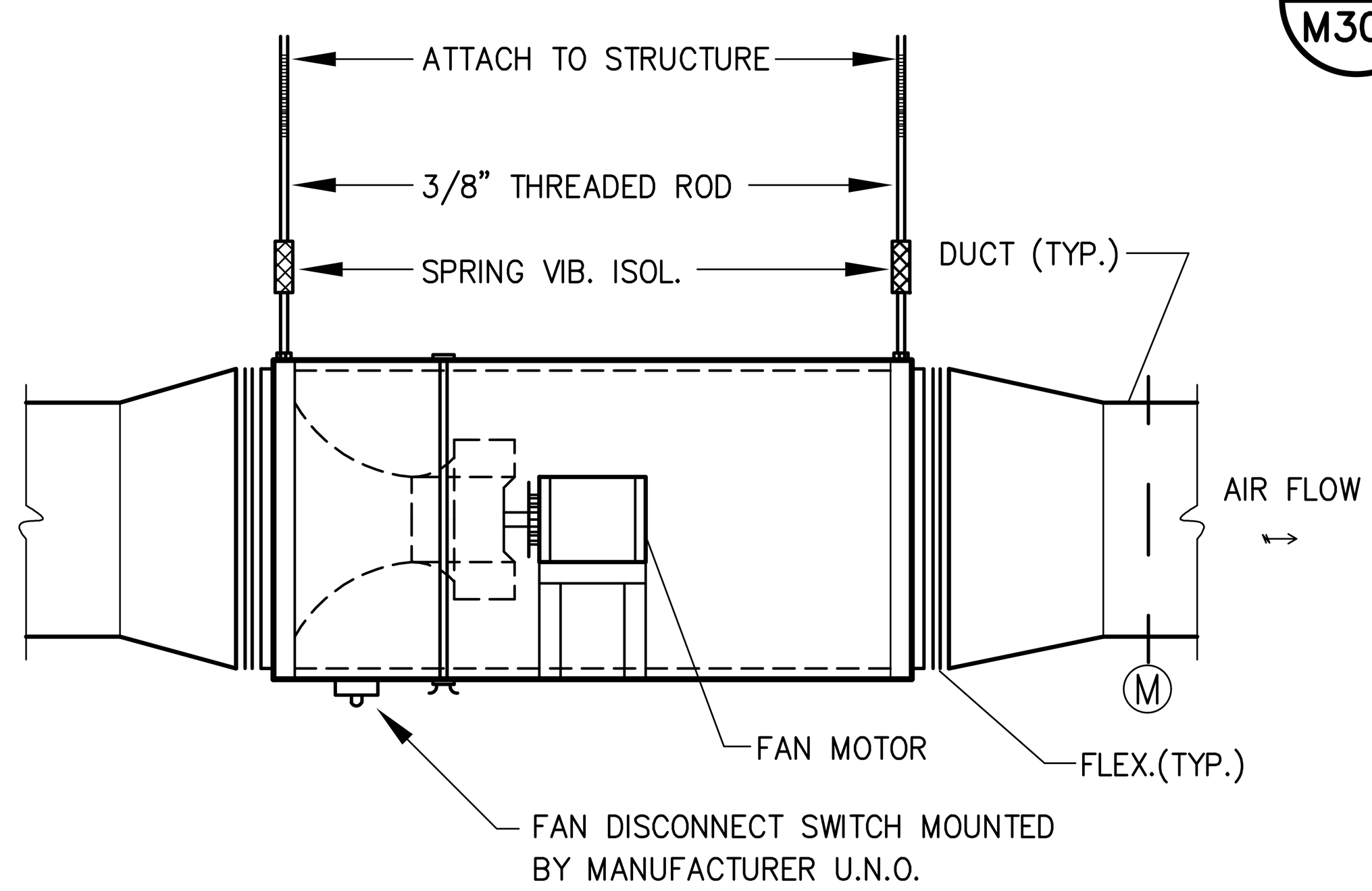
12 M300 SECTION AT PHP UNIT
NTS



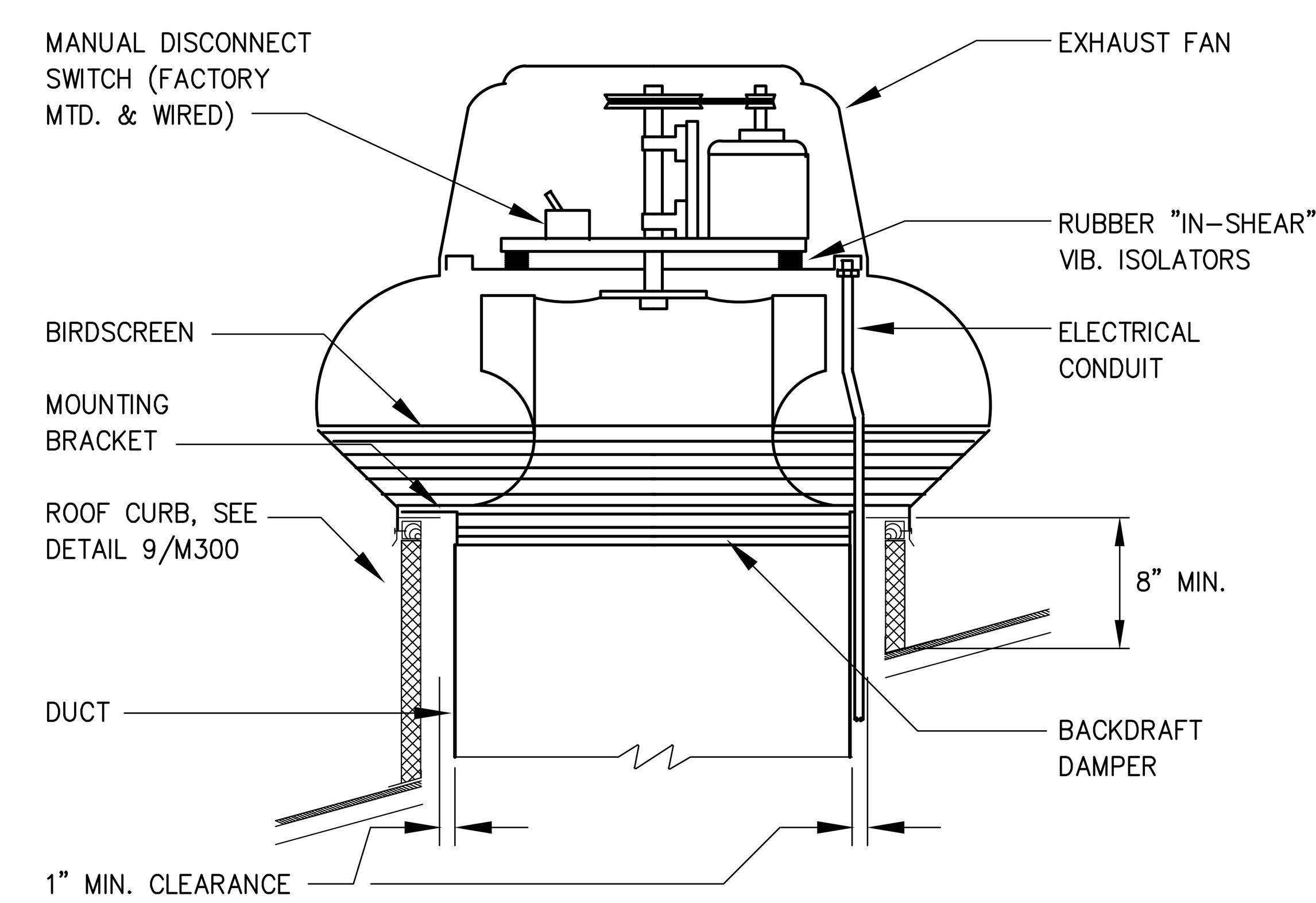
13 M300 LOUVER ATTACHMENT DETAIL
NTS



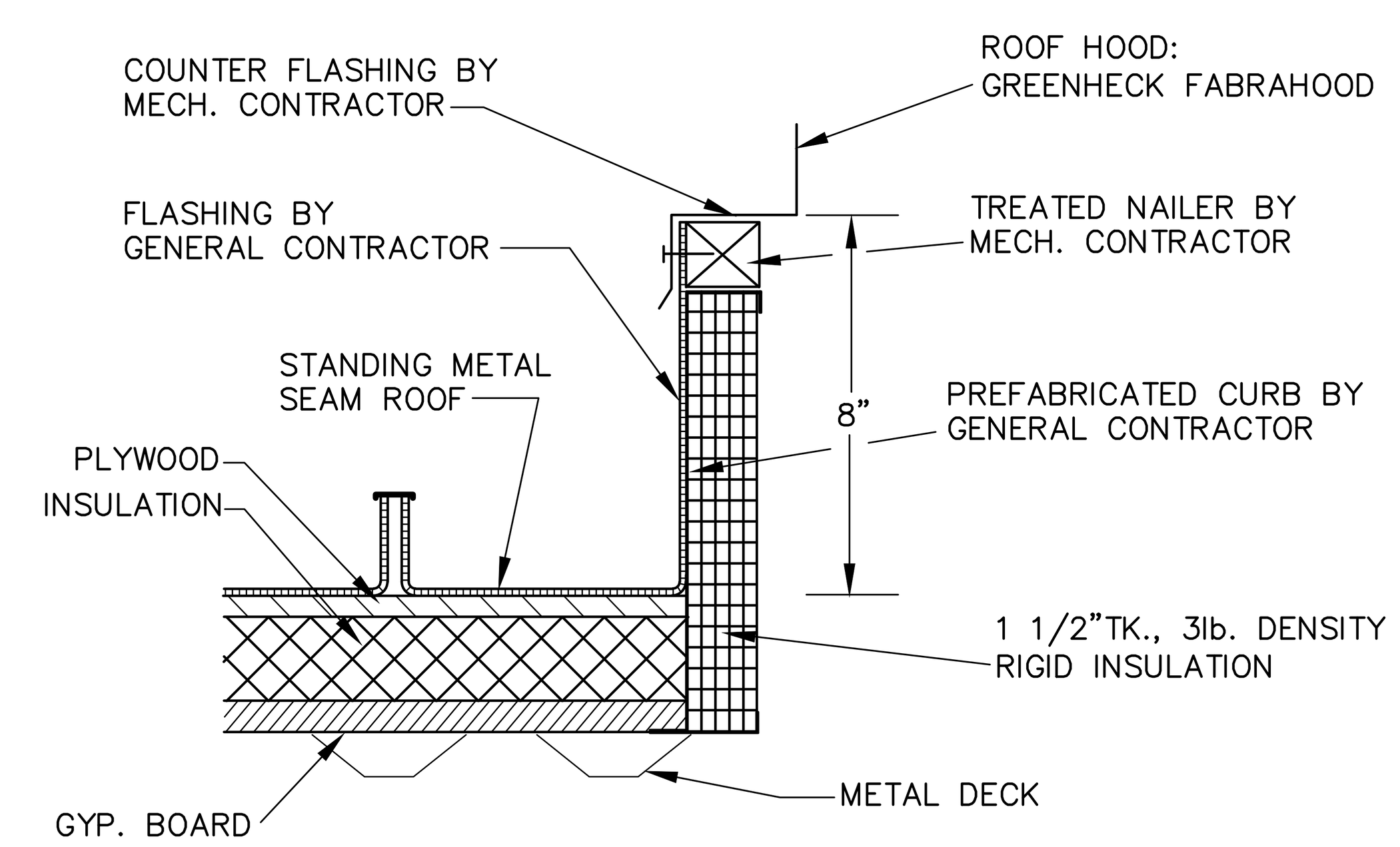
6 M300 CEILING EXHAUST FAN DETAIL
NTS



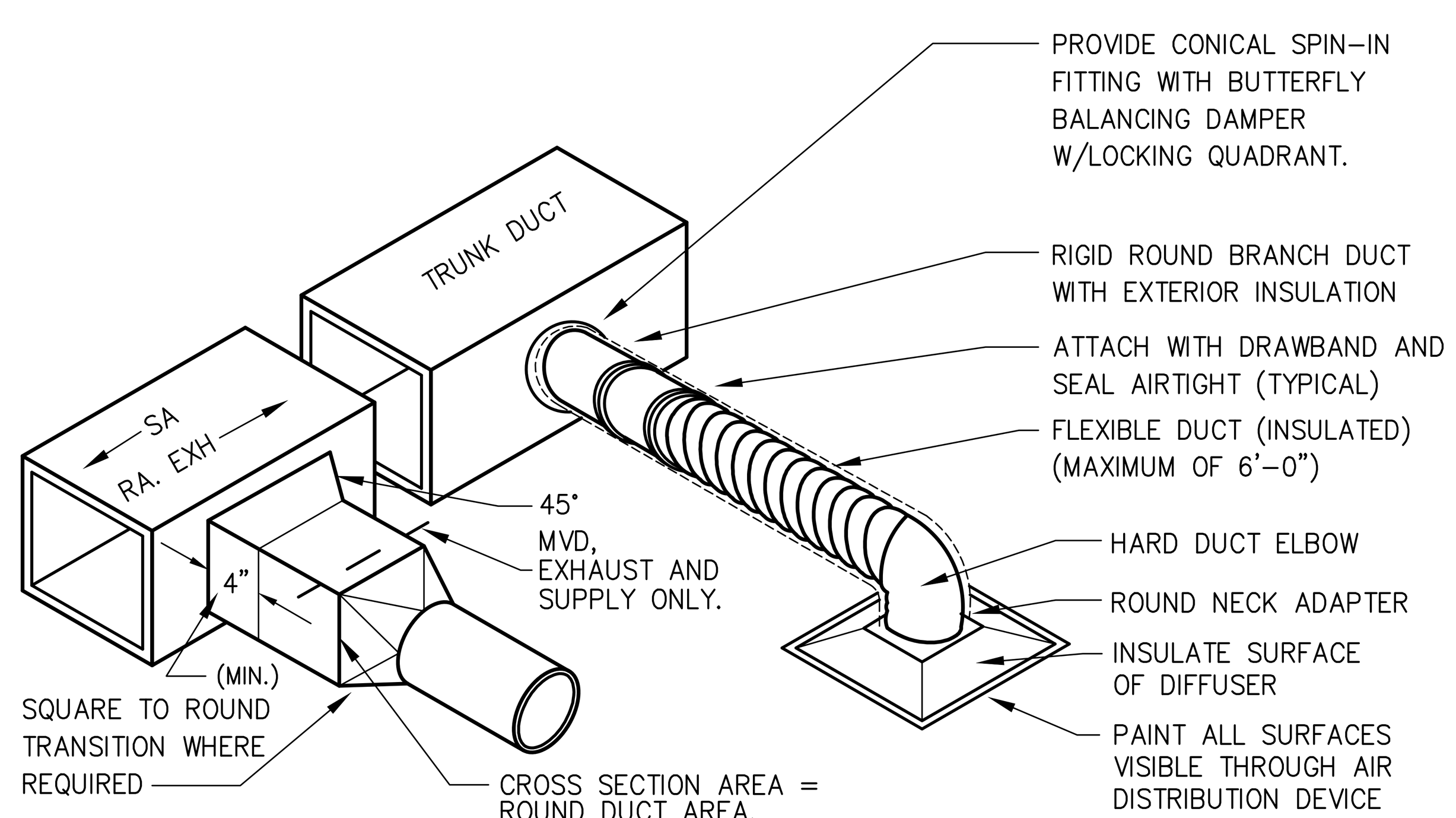
7 M300 INLINE FAN DETAIL
NTS



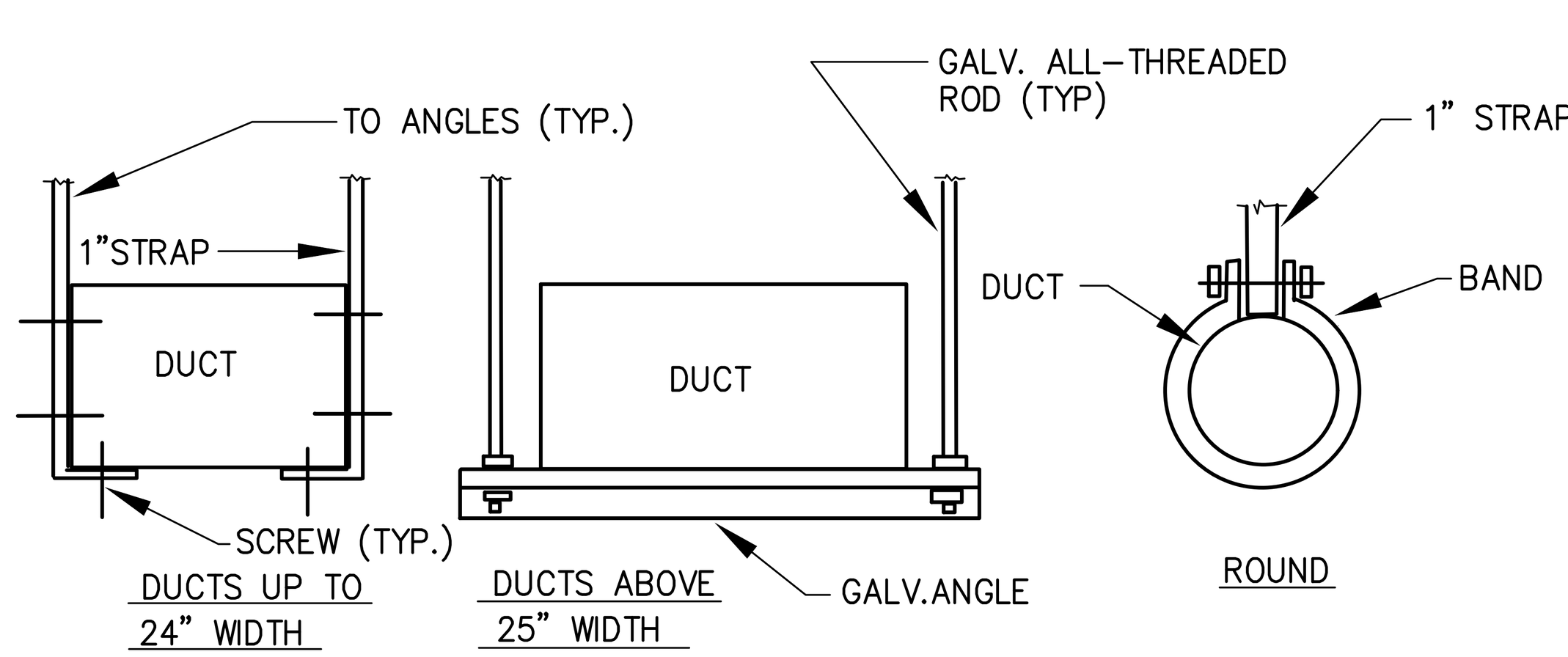
8 M300 ROOF MTD. EXHAUST FAN DETAIL
NTS



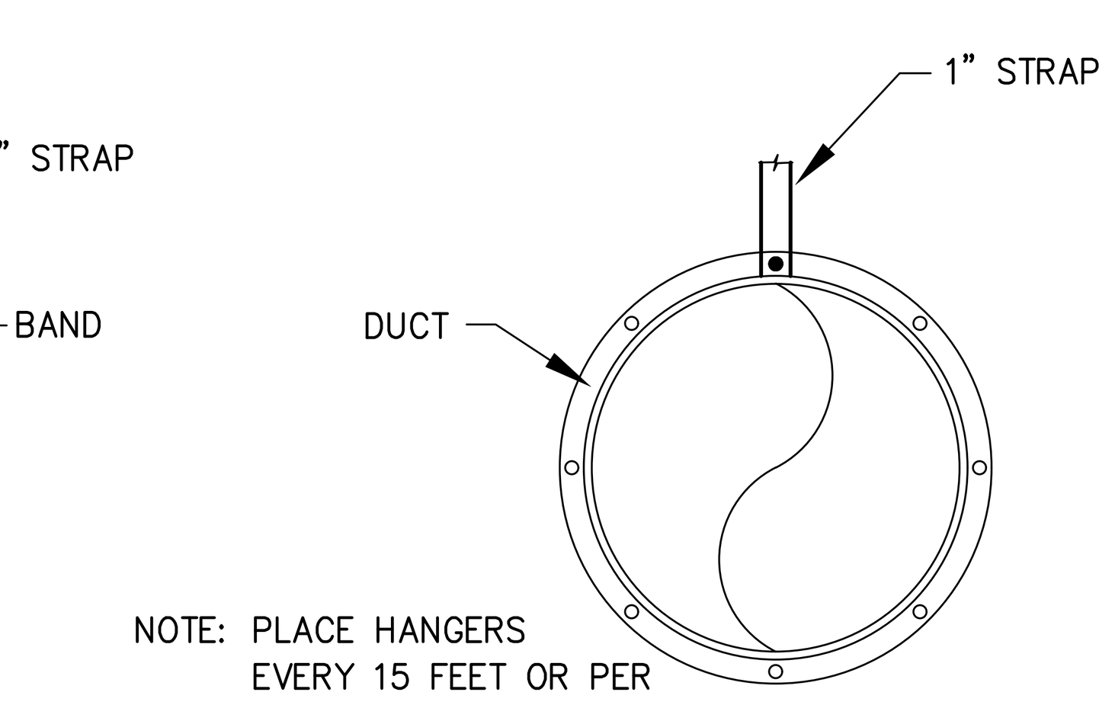
9 M300 STANDING METAL SEAM ROOF CURB DETAIL
NTS



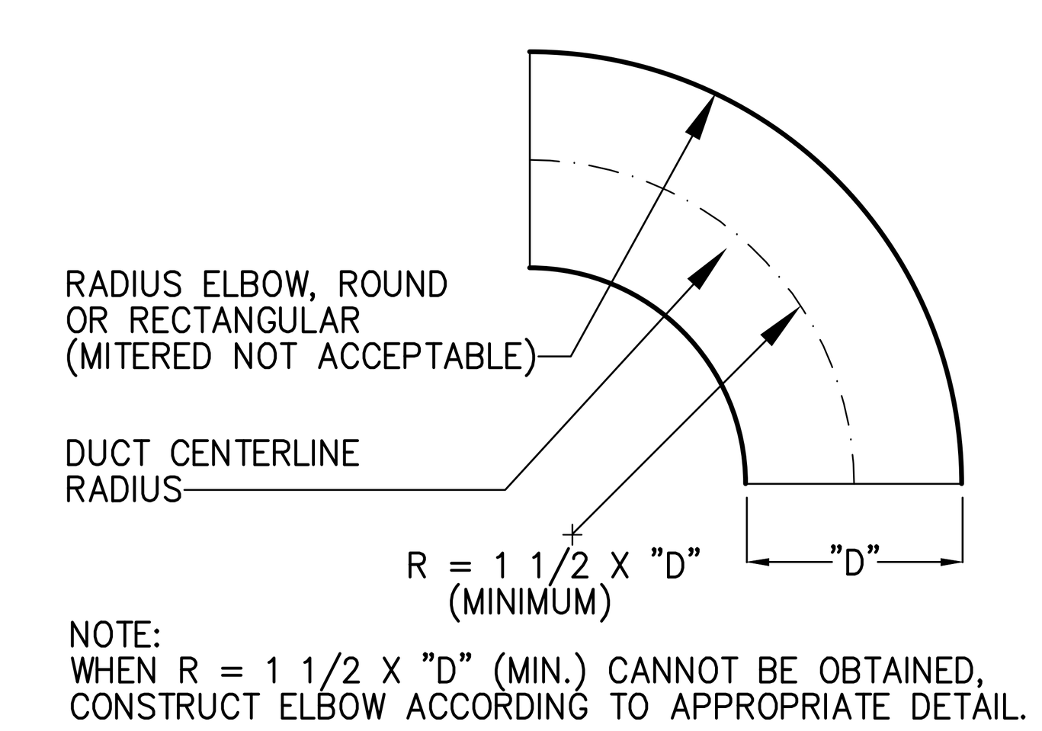
1 M300 DUCT TAKE-OFF DETAIL
NTS



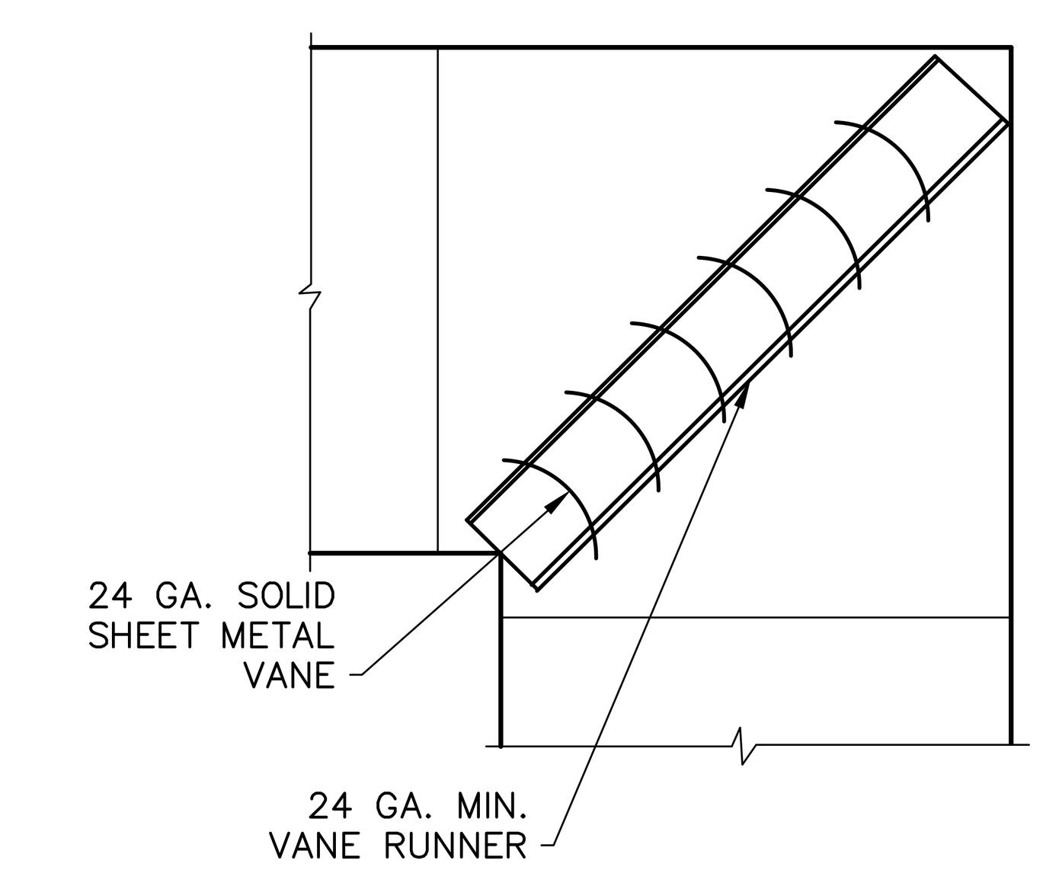
2 M300 DUCTWORK HANGER DETAILS
NTS



3 M300 ROUND DUCT HANGER DETAIL
NTS



4 M300 RADIUS ELBOW DETAIL
NTS



5 M300 TURNING VANE DETAIL
NTS
PERMITTED ONLY WHERE RADIUS ELL WILL NOT FIT.

McKNIGHT-SMITH WARD · GRIFFIN ENGINEERS, INCORPORATED

PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 F: (704) 847-9853

STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

DETAILS

ISSUE DATE: 04.30.2019
DRAWN BY: MHK
CHECKED BY: JCG
PROJECT: 1821

REVISION SCHEDULE

	DATE	REFERENCE
1	8.22.19	ADDENDUM #1

M300

Progressive Design Collaborative, Ltd
3101 Poplarwood Court, Suite 320
Raleigh, North Carolina 27604
919-790-9989

ADDENDUM 01 – ELECTRICAL

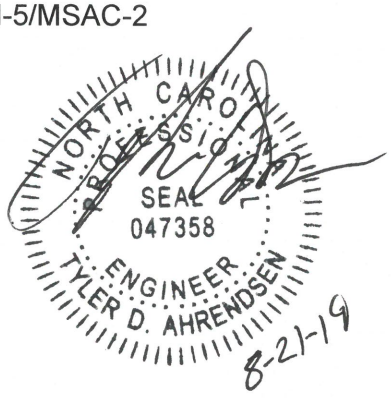
DATE: August 21, 2019

PROJECT: Stump Sound Elementary School
PDC Project No. 19003

This Addendum, applicable to the work designed below, shall be understood to be and is a change to the bid documents and shall be part of and included in the contract for the above referenced project. All General, Supplementary and Special Conditions, etc., as originally specified or as modified below shall apply to these items.

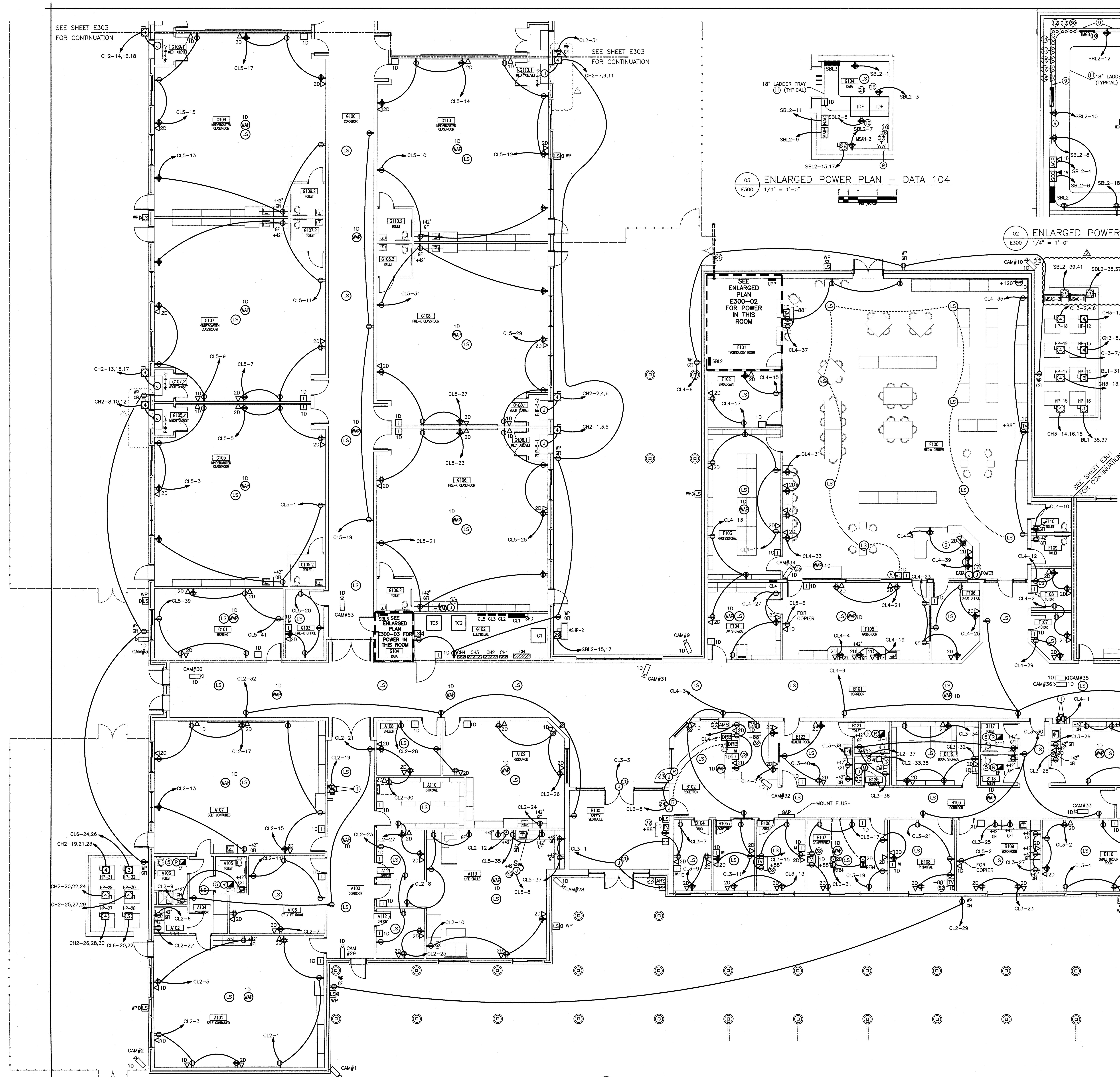
Changes to Electrical Drawings:

1. Drawing E300
   a. Added: MSAC-1, MSAC-2, MSAH-4 and MSAH-5 and all associated conduit, disconnects and wiring.
2. Drawing E301
   a. Revised: Location for HP20 and its associated conduit, wiring and disconnect.
3. Drawing E304
   a. Deleted: HP20 and its associated conduit, disconnect and wiring from service yard,
4. Drawing E605
   a. Added Circuits for MSAH-4/MSAC-1 and MSAH-5/MSAC-2



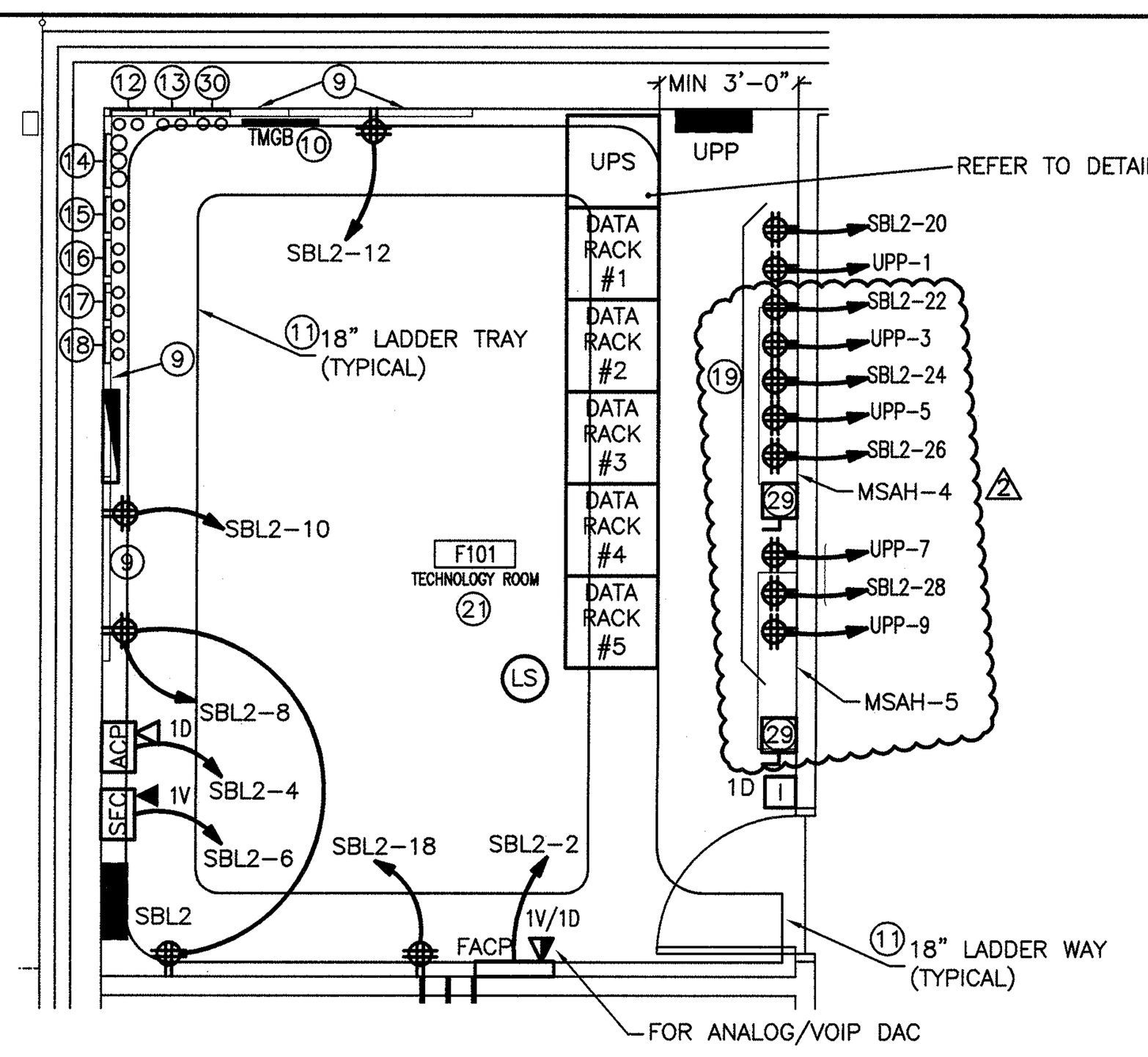
END OF ADDENDUM 01 – ELECTRICAL

Attachments: Drawings: (E300, E301, E304 and E605)

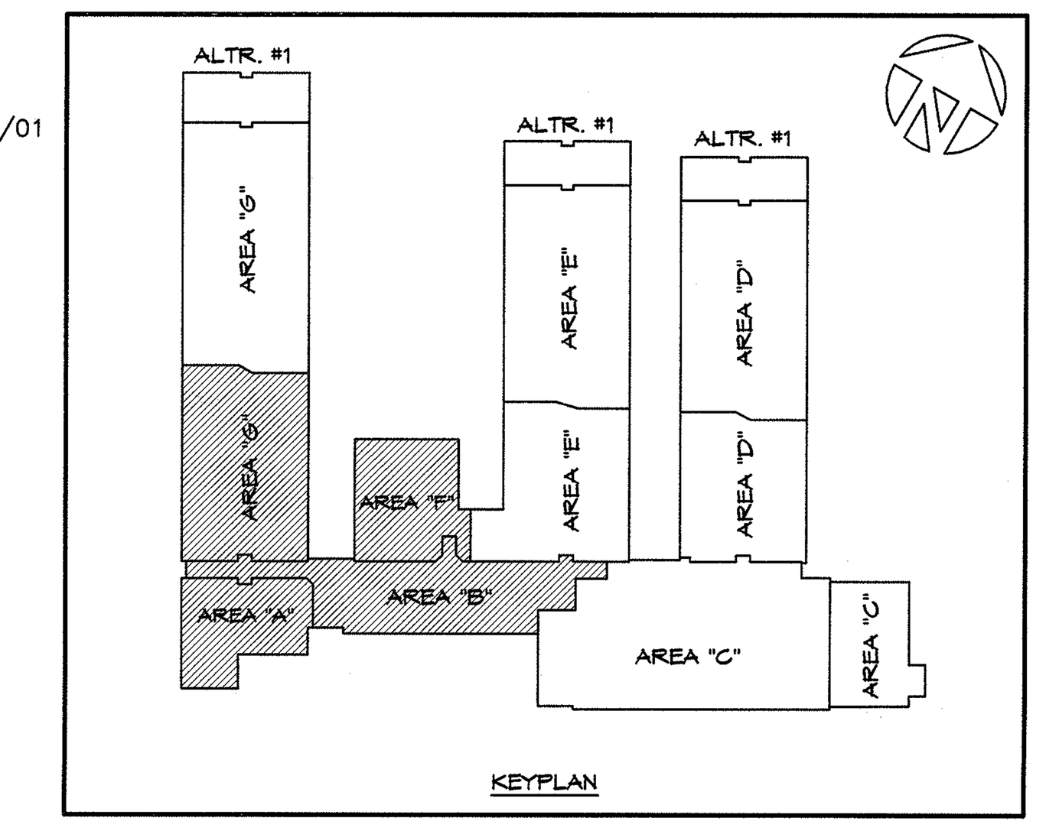


01 PARTIAL POWER PLAN – AREAS A, B, AND PARTIAL F & G
E300 1/8" = 1'-0"

03 ENLARGED POWER PLAN – DATA 104
E300 1/4" = 1'-0"



02 ENLARGED POWER PLAN – TECHNOLOGY 101
E300 1/4" = 1'-0"



NOTES: (AS INDICATED ON THESE PLANS BY A NUMBER IN A ◯)

1. COORDINATE RECEPTACLE FOR WATER COOLER WITH PLUMBING CONTRACTOR SO THAT CORD DOES NOT SHOW. PROVIDE GFCI BREAKER IN PANEL.
2. PROVIDE DATA DROPS @ MEDIA CIRCULATION COUNTER ABOVE COUNTER HEIGHT. COORDINATE ROUH-IN LOCATIONS WITH ARCHITECT/OWNER.
3. 240 VOLT, 30 AMP, 2 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL OR PLUMBING CONTRACTOR.
4. 600 VOLT, 30 AMP, 3 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.
5. ELECTRICAL CONTRACTOR SHALL PROVIDE R1B RELAY FOR EXHAUST FAN. WIRE INTO 277 VOLT LIGHTING CIRCUIT. NOTE: WHEN LIGHT SWITCH IS TURNED "ON", EXHAUST FAN OPERATES. COORDINATE CLOSELY WITH MECHANICAL CONTRACTOR.
6. VOLUME CONTROL SHALL BE WIRED TO SPEAKERS IN MEDIA CENTER.
7. FEED CIRCULATION COUNTER FROM CONDUITS AND OUTLET BOXES CONCEALED IN WALL. PROVIDE MINIMUM 1 1/4" CONDUIT FOR DATA FEED.
8. NOT USED
9. 4'-0" x 8'-0" x 3/4" FIRE RETARDANT PLYWOOD BACKBOARDS AROUND ROOM. COORDINATE FINAL PLACEMENT WITH OWNERS 'IT' DEPARTMENT.
10. TELECOMMUNICATIONS GROUND. REFER TO DETAIL E102-04.
11. 18" LADDER CABLE TRAY IN DATA CLOSETS BY TELECOM CONTRACTOR.
12. (2)-3" CONDUIT UNDERGROUND TO DATA CLOSET 104.
13. (2)-3" CONDUIT UNDERGROUND TO DATA CLOSET 115.1.
14. (3)-4" CONDUITS UNDERGROUND TO PROPERTY LINE.
15. (2)-3" CONDUIT UNDERGROUND TO DATA CLOSET E132.
16. (2)-3" CONDUIT UNDERGROUND TO DATA CLOSET E123.1.
17. (2)-3" CONDUIT UNDERGROUND TO DATA CLOSET 104.
18. (2)-3" CONDUIT UNDERGROUND TO DATA CLOSET D121.1.
19. COORDINATE LOCATIONS OF QUAD RECEPTACLES FOR RACKS WITH OWNER'S IT DEPARTMENT.
20. 120VAC JUNCTION BOX FOR POWER TO HANDICAP POWERED ACTUATORS. ALL CONDUIT, WIRING AND FINAL CONNECTIONS TO MOTORS AND PUSHPADS BY ELECTRICAL CONTRACTOR.
21. SEE E500 FOR CABLE TRAY LAYOUT AND CONDUIT SLEEVES.
22. REFER TO DETAIL E105-06 FOR AIPHONE SYSTEM INSTALLATION.
23. ROUTE CONDUIT CONCEALED FROM CAMERA TO TECHNOLOGY ROOM 101.
24. PROVIDE DOOR RELEASE PUSH BUTTON FOR RECEPTIONS/CORRIDOR DOOR. COORDINATE WITH DOOR HARDWARE PROVIDER. SECURITY CONTRACTOR SHALL PROVIDE BUTTON AT RECEPTIONS DESK, RELAY, ETC FOR A COMPLETE DOOR RELEASE SYSTEM. ALL CONDUIT AND 120 VOLT WIRING BY ELECTRICAL CONTRACTOR.
25. PROVIDE (2)-2" CONDUIT SPARES FOR (FUTURE COMMUNICATIONS). STUB CONDUITS 10'-0" FROM BUILDING FACE. CAP CONDUITS AND LOCATE ON AS-BUILT PLANS.
26. COORDINATE LOCATION FOR UNDER COUNTER DISHWASHER AND ASSOCIATED SWITCH ABOVE COUNTER WITH GENERAL CONTRACTOR.
27. (2)-3" CONDUITS UNDERGROUND TO TECHNOLOGY ROOM 101. PROVIDE PULL CORDS IN CONDUITS.
28. PROVIDE DATA DROPS @ RECEPTIONS COUNTER ABOVE COUNTER HEIGHT. COORDINATE WITH ARCHITECT / OWNER PRIOR TO ROUGH-IN.
29. PROVIDE 240 VOLT, 30 AMP, 2 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. NOTE: INDOOR UNIT IS POWERED BY ASSOCIATED OUTDOOR UNIT. REFER TO MECHANICAL SCHEDULES.
30. PROVIDE 120VAC POWER FOR MOTORIZED DAMPERS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. WIRE TO CIRCUIT CL5-16.
31. PROVIDE 120 VOLT MOTOR RATED TOGGLE DISCONNECT SWITCH FOR RECIRCULATION PUMP. COORDINATE EXACT LOCATION WITH PLUMBING CONTRACTOR.
32. COORDINATE WITH ARCHITECT/OWNER FOR EXACT PLACEMENT OF OUTLETS FOR FLAT PANEL MONITORS.

CONTRACTOR TO VERIFY ALL DIMENSIONS.

pdc
Progressive Design Collaborative, ltd.
3101 Poplarwood Court, Suite 320
Raleigh, North Carolina 27604
919 790 9989
License# C-0183

PDC Project #19003

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 047358 TYLER D. AHRENDSEN 8-21-19

BID SET SEALED BY ROBERT A CLARK, SEAL 045439. TYLER D. AHRENDSEN IS SIGNING FOR CURRENT REVISION.

PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 FAX: (704) 847-9853
701 EAST BAY STREET, SUITE 302
CHARLESTON, SOUTH CAROLINA 29403
PH: (843) 872-5345 FAX: (843) 872-5374

STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

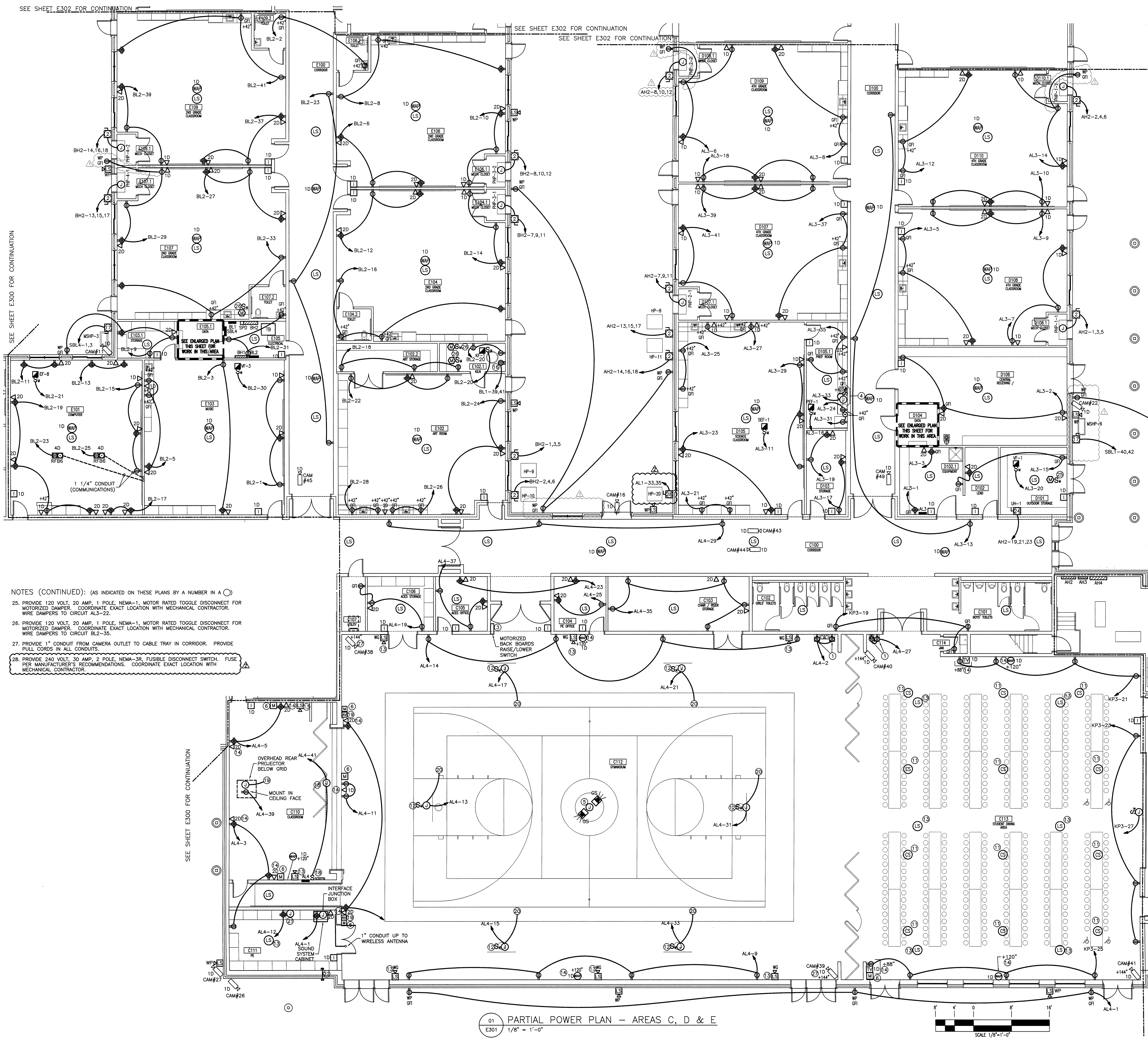
PARTIAL POWER PLAN
AREAS A, B, F & G

ISSUE DATE: 04.30.2019
DRAWN BY: JPT
CHECKED BY: RAC
PROJECT: 1821

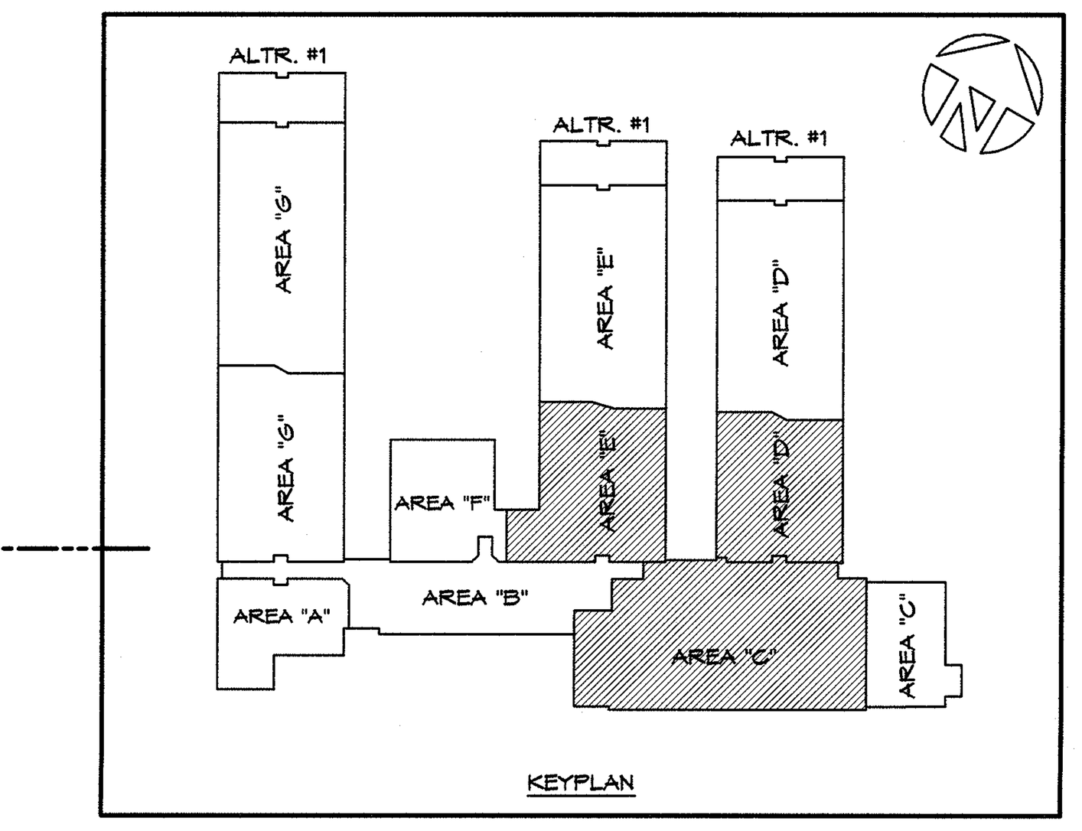
REVISION SCHEDULE

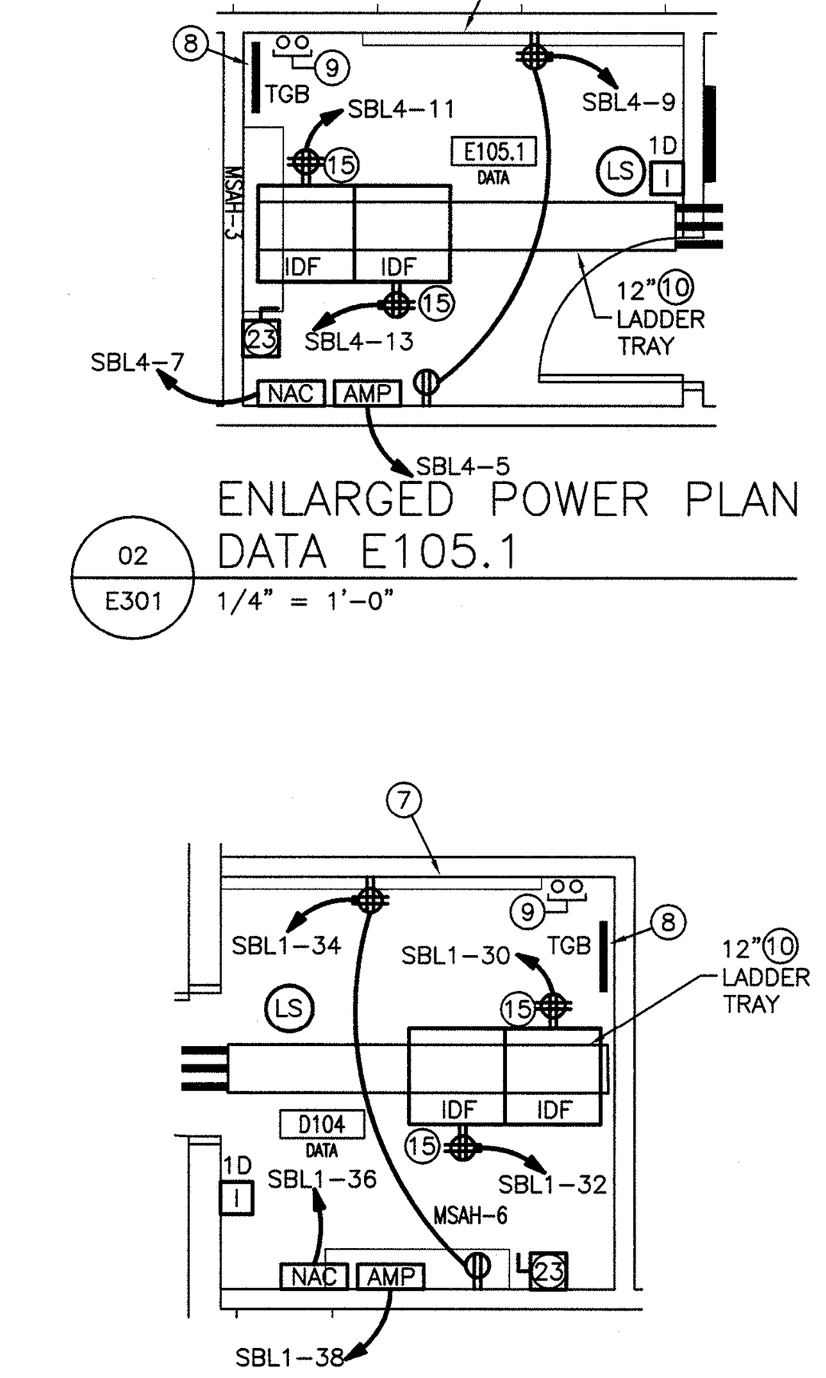
#	DATE	REFERENCE
1	06/25/19	DPI COMMENTS
2	08/22/19	ADDENDUM 1

E300



01 PARTIAL POWER PLAN – AREAS C, D & E
E301 1/8" = 1'-0"





02 ENLARGED POWER PLAN DATA E105.1
E301 1/4" = 1'-0"

03 ENLARGED POWER PLAN DATA D104
E301 1/4" = 1'-0"

NOTES: (AS INDICATED ON THESE PLANS BY A NUMBER IN A ◯)

1. COORDINATE RECEPTACLE FOR WATER COOLER WITH PLUMBING CONTRACTOR SO THAT CORD DOES NOT SHOW. PROVIDE GFCI CIRCUIT BREAKER IN PANEL.
2. 600 VOLT, 30 AMP, 3 POLE, NEMA–3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.
3. KEYED SWITCHES FOR MOTORIZED BACKBOARDS PROVIDED BY BACKBOARDS PROVIDED BY BACKBOARD SUPPLIER AND INSTALLED BY ELECTRICAL CONTRACTOR.
4. COORDINATE EXACT LOCATION FOR DISHWASHER POWER AND ASSOCIATED SWITCH WITH GENERAL CONTRACTOR.
5. ROUTE 1 1/2" CONDUIT FROM SPEAKERS TO SOUND SYSTEM INTERFACE JUNCTION BOX IN ROOM C111. COORDINATE WITH SOUND CONTRACTOR.
6. ROUTE 1" CONDUIT FROM MICROPHONE OUTLETS TO SOUND SYSTEM INTERFACE JUNCTION BOX. COORDINATE WITH SOUND CONTRACTOR.
7. 4'–0" x 8'–0" x 3/4" FIRE RETARDANT PLYWOOD BACKBOARD. COORDINATE FINAL PLACEMENT WITH OWNERS 'IT' DEPARTMENT.
8. TELECOMMUNICATIONS GROUND. REFER TO DETAIL E102–04.
9. TWO(2) 3" CONDUIT UNDERGROUND TO TECHNOLOGY ROOM F101. PROVIDE PULLCORDS IN CONDUIT.
10. LADDER CABLE TRAY IN DATA CLOSETS BY TELECOM CONTRACTOR.
11. PROVIDE 1" CONDUIT BETWEEN SPEAKERS AND THEN HOME RUN 2" CONDUIT FROM LAST SPEAKER TO SOUND SYSTEM INTERFACE JUNCTION BOX.
12. PROVIDE 120VAC 20A MOTOR RATED TOGGLE DISCONNECT FOR LOCAL DISCONNECT FOR BACKBOARDS.
13. PROVIDE 3/4" CONDUIT FROM SPEAKER OUTLETS TO CABLE TRAY IN CORRIDOR.
14. PROVIDE 1" CONDUIT FROM DATA OR TV OUTLETS TO CABLE TRAY IN CORRIDOR.
15. COORDINATE LOCATIONS OF QUAD RECEPTACLES FOR RACKS WITH OWNER PRIOR TO ROUGH–IN.
16. COORDINATE REQUIREMENTS FOR KILN WITH OWNER PRIOR TO ROUGH–IN.
17. PROVIDE 240 VOLT, 30 AMP, 2 POLE, NEMA–3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. NOTE: INTERIOR UNIT POWERED BY ASSOCIATED OUTDOOR UNIT. REFER TO MECHANICAL SCHEDULES.
18. COORDINATE LOCATION OF PROJECTION SCREEN AND ASSOCIATED SWITCH WITH GENERAL CONTRACTOR AND ARCHITECT.
19. PROVIDE AND INSTALL JUNCTION BOX WITH (2)–1 1/4" CONDUITS FROM PROJECTOR LOCATION TO THE TWO AV CONTROL POINT LOCATIONS AS SHOWN. THE DIVISION 27 CONTRACTOR SHALL PROVIDE AND INSTALL HDMI AND VGA BETWEEN CONTROL POINT AND PROJECTOR. ALSO PROVIDE 3.5 MINI AUDIO AND MICROPHONE WIRING FROM MICROPHONE LOCATIONS TO SOUND RACK. COORDINATE CLOSELY WITH OWNER PRIOR TO ANY ROUGH–IN AND CABLING INSTALLATION.
20. PROVIDE 3/4" CONDUITS AND ASSOCIATED WIRING FOR MOTORIZED BACK BOARDS POWER/CONTROLS TO SWITCH LOCATION. COORDINATE WITH EQUIPMENT SUPPLIER AND ARCHITECT PRIOR TO ROUGH–IN.
21. PROVIDE 1–1/2"C AND A 8" X 8" X 6" FLUSH MOUNTED J–BOX WITH SCREW COVER. CONDUIT SHALL HAVE 90 DEGREE SWEEPING RADIUS ELBOW TO ABOVE ACCESSIBLE LAY–IN CEILING. THIS INFRASTRUCTURE IS FOR OWNER PROVIDED HAM RADIO SYSTEM.
22. PROVIDE 2"C FROM ABOVE ACCESSIBLE LAY–IN CEILING TO EXTERIOR OF BUILDING FOR OWNER PROVIDED HAM RADIO SYSTEM WIRING AND ANTENNA. COORDINATE WITH OWNER PRIOR TO ROUGH–IN.
23. PROVIDE 240 VOLT, 30 AMP, 2 POLE, NEMA–1, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. NOTE: INTERIOR UNIT POWERED BY ASSOCIATED OUTDOOR UNIT. REFER TO MECHANICAL SCHEDULES.
24. PROVIDE 600 VOLT, 30 AMP, 3 POLE, NEMA–1, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.

NOTES (CONTINUED): (AS INDICATED ON THESE PLANS BY A NUMBER IN A ◯)

25. PROVIDE 120 VOLT, 20 AMP, 1 POLE, NEMA–1, MOTOR RATED TOGGLE DISCONNECT FOR MOTORIZED DAMPER. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. WIRE DAMPERS TO CIRCUIT AL3–22.
26. PROVIDE 120 VOLT, 20 AMP, 1 POLE, NEMA–1, MOTOR RATED TOGGLE DISCONNECT FOR MOTORIZED DAMPER. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. WIRE DAMPERS TO CIRCUIT BL2–35.
27. PROVIDE 1" CONDUIT FROM CAMERA OUTLET TO CABLE TRAY IN CORRIDOR. PROVIDE PULL CORDS IN ALL CONDUITS.
28. PROVIDE 240 VOLT, 30 AMP, 2 POLE, NEMA–3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. △2

CONTRACTOR TO VERIFY ALL DIMENSIONS.

pdc
Progressive Design Collaborative, ltd.
3101 Poplarwood Court, Suite 320
Raleigh, North Carolina 27604
919 790 9989
License# C-0183

PDC Project #19003

NORTH CAROLINA PROFESSIONAL SEAL 047358 ENGINEER TYLER D. AHRENDSEN 8-21-19

BID SET SEALED BY ROBERT A CLARK, SEAL 045439. TYLER D. AHRENDSEN IS SIGNING FOR CURRENT REVISION.

PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 FAX: (704) 847-9853
701 EAST BAY STREET, SUITE 302
CHARLESTON, SOUTH CAROLINA 29403
PH: (843) 872-5345 FAX: (843) 872-5374

ISSUE DATE: 04.30.2019
DRAWN BY: JPT
CHECKED BY: RAC
PROJECT: 1821

STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

PARTIAL POWER PLAN AREAS C, D & E

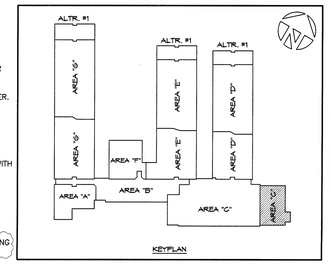
REVISION SCHEDULE

#	DATE	REFERENCE
1	06/25/19	DPI COMMENTS
2	08/22/19	ADDENDUM 1

E301

NOTES: (AS INDICATED ON THIS PLAN BY A NUMBER IN A ◯)

1. ELECTRICAL CONTRACTOR SHALL PROVIDE CONTROL WIRING FOR FREEZER DEFROST. COORDINATE REQUIREMENTS WITH FOOD SERVICE EQUIPMENT SUPPLIER.
2. EQUIPMENT SERVED BY GFCI BREAKER.
3. PROVIDE 240VAC, 20 AMP, MOTOR RATED TOGGLE DISCONNECT SWITCH FOR ICE MACHINE. COORDINATE LOCATION WITH FOOD SERVICE EQUIPMENT SUPPLIER.
4. PROVIDE 1 1/4" CONDUIT (SPARE) TO PANEL 'KP3' FOR FUTURE USE.
5. COORDINATE MOUNTING HEIGHT OF OUTLETS FOR TIME CLOCK WITH OWNER.
6. REFER TO HOOD CONTROL & WIRING DIAGRAM ON DRAWING E305.
7. STUB-OUT ABOVE LAY-IN CEILING IN KITCHEN.
8. 240 VOLT, 30 AMP, 2 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH FOR FREEZER EVAPORATOR. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH FOOD SERVICE EQUIPMENT SUPPLIER.
9. 120 VOLT, 20 AMP, MOTOR RATED TOGGLE DISCONNECT SWITCH FOR COOLER EVAPORATOR. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH FOOD SERVICE EQUIPMENT SUPPLIER.
10. SEE DRAWING E301 FOR CONTINUATION.
11. 120VAC POWER FOR HEAT TRACE. COORDINATE LOCATION WITH PLUMBING CONTRACTOR.
12. 240 VOLT, 60 AMP, 3 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH FOR CONDENSING UNIT. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH ARCHITECT.
13. 240 VOLT, 30 AMP, 3 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH FOR CONDENSING UNIT. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH ARCHITECT.
14. PROVIDE PHENOLIC LABEL AT EQUIPMENT INDICATING CIRCUIT. THE CIRCUIT BREAKERS IN PANELS KP1 OR KP3 SHALL BE CAPABLE OF BEING LOCKED IN OFF POSITION.
15. PROVIDE RIB RELAY TO TIE 120 VOLT EXHAUST FAN INTO 277 VOLT LIGHTING CIRCUIT. FAN SHALL OPERATE WHEN LIGHT IN ON.
16. 120 VOLT, 20 AMP, MOTOR RATED TOGGLE DISCONNECT SWITCH FOR MOTORIZED DAMPER. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR. WIRE DAMPERS TO CIRCUIT KP3-17.
17. 240 VOLT, 30 AMP, 2 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.
18. 600 VOLT, 30 AMP, 3 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.
19. 600 VOLT, 60 AMP, 3 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.
20. 600 VOLT, 100 AMP, 3 POLE, NEMA-1, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.
21. 600 VOLT, 60 AMP, 3 POLE, NEMA-1, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.
22. 120 VOLT, 20 AMP, NEMA-1, MOTOR RATED TOGGLE DISCONNECT SWITCH FOR GAS WATER HEATER. COORDINATE EXACT LOCATION WITH PLUMBING CONTRACTOR.
23. COORDINATE WIRELESS OUTLET LOCATION FOR FREEZER WITH KITCHEN EQUIPMENT SUPPLIER.
24. 240 VOLT, 30 AMP, 3 POLE, NEMA-3R, FUSIBLE DISCONNECT SWITCH. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH KITCHEN EQUIPMENT SUPPLIER.
25. 240 VOLT, 30 AMP, 2 POLE, NEMA-1, FUSIBLE DISCONNECT SWITCH FOR RECIRCULATION PUMP. FUSE PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE EXACT LOCATION WITH PLUMBING CONTRACTOR.
26. 120 VOLT, 20 AMP, MOTOR RATED TOGGLE DISCONNECT SWITCH FOR VENTILATION FAN. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.
27. REFER TO ALTERNATE #4 POWER RISER ON DRAWING E601.
28. PROVIDE 1 1/4" CONDUIT FOR GENERATOR CONTROLS. COORDINATE ROUGH-IN AND WIRING WITH GENERATOR PROVIDER.



CONTRACTOR TO VERIFY ALL DIMENSIONS.

GENERAL NOTES:

A. FOOD SERVICE EQUIPMENT CONTRACTOR SHALL COORDINATE WITH PLUMBING, MECHANICAL AND ELECTRICAL DRAWINGS AND VERIFY WITH MANUFACTURER'S SHOP DRAWINGS FOR EQUIPMENT UTILITY REQUIREMENTS.

B. LIGHTING IN WALK-IN COOLER & FREEZER MUST BE A MINIMUM OF 10ft CANDLES 30 INCHES OFF THE FLOOR IN ALL AREAS OF THE WALK-IN UNITS.

C. FOOD PREP AREAS SHALL BE A MINIMUM OF 50ft CANDLES.

D. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL REQUIRED CORDS AND PLUGS TO MATCH EQUIPMENT AS REQUIRED.

E. ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL REQUIRED DISCONNECTS, STARTERS, CONDUIT/WIRING, FIRE ALARM, SHUNT TRIP, CONTROLS, ETC. CONNECTIONS FOR A FUNCTIONAL UDS, KITCHEN HOOD, FREEZERS, COOLERS, ETC. REFER TO HOOD/UDS/ALL KITCHEN RELATED SHOP DRAWINGS.

F. ALL RECEPTACLES SHALL BE TAMPER RESISTANT.

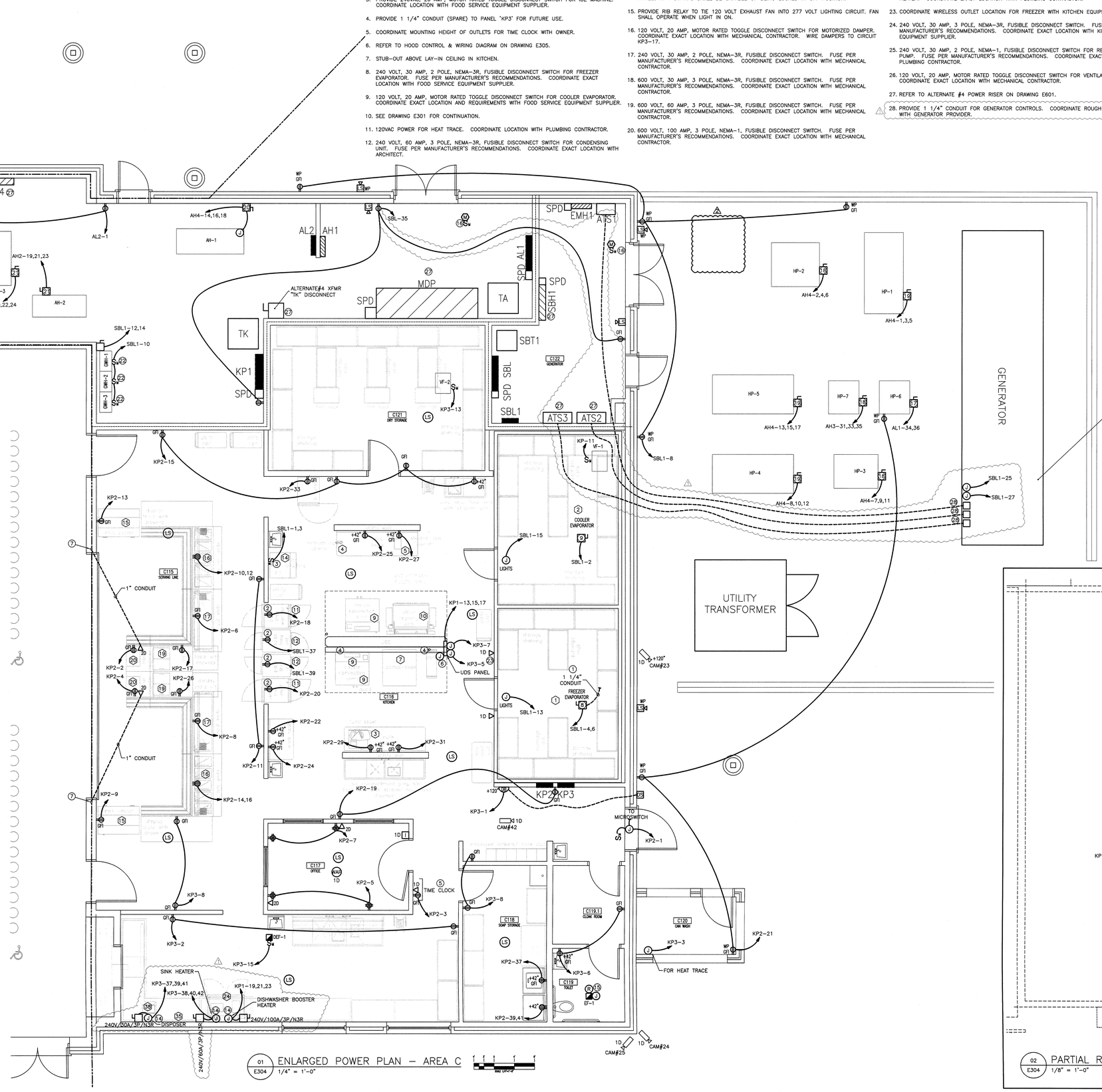
G. ALL 125V RECEPTACLES IN KITCHEN WHETHER SHOWN ON PLANS OR NOT SHALL BE GFCI PROTECTED.

H. REFER TO DRAWING E305 FOR FOOD SERVICE EQUIPMENT SCHEDULE AND ADDITIONAL NOTES.

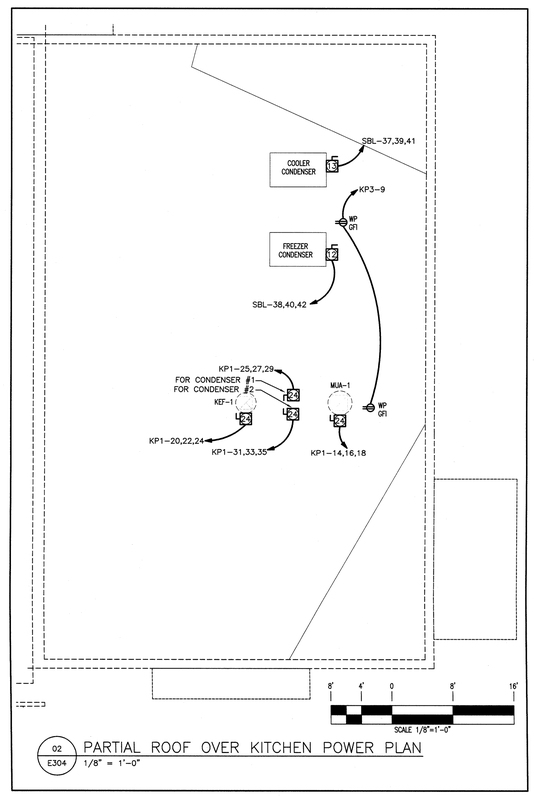
I. THE ELECTRICAL CONTRACTOR SHALL VERIFY FOOD SERVICE DRAWINGS AND CUT SHEETS FOR THE ACTUAL EQUIPMENT PROVIDED PRIOR TO ORDERING BREAKERS AND PERFORMING ROUGH-IN.

BASE BID GENERATOR: 200KW/250KVA (GAS/LP) 277/480V

ALTERNATE #4 GENERATOR: 810KW/1013KVA DIESEL WITH SUB-BASE 277/480V



01 E304 ENLARGED POWER PLAN – AREA C
1/4" = 1'-0"



02 E304 PARTIAL ROOF OVER KITCHEN POWER PLAN
1/8" = 1'-0"

pdc
Progressive Design Collaborative, ltd.
3101 Poplarwood Court, Suite 300
Raleigh, North Carolina 27604
919 790 0980
License# C-0183

PDC Project #19003

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 047358 TYLER D. AHRENSEN 8-22-19

BID SET SEALED BY ROBERT A CLARK, SEAL 045439. TYLER D. AHRENDSEN IS SIGNING FOR CURRENT REVISION.

PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 FAX: (704) 847-9853

701 EAST BAY STREET, SUITE 302
CHARLESTON, SOUTH CAROLINA 29403
PH: (843) 872-5345 FAX: (843) 872-5374

ISSUE DATE: 04.30.2019
ISSUED BY: JPT
CHECKED BY: RAC
PROJECT: 1821

STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

ENLARGED POWER PLAN AREA C

REVISION SCHEDULE

	DATE	REFERENCE
1	06/25/19	DPI COMMENTS
2	08/22/19	ADDENDUM 1

E304

Project #: 190002
Sheet: E304
Plotted By: Ally
Plotted: August 21, 2019 @ 11:37 AM

PANEL MDP (ALTERNATE #4)

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	S	4.691	PANEL AH1	SEE POWER RISER				125	4.691			60	6	6	10	1"	SPD		O	2
3	S	3.748								3.748									O	4
5	S	4.017									4.017								O	6
7	S	63.702	PANEL AH2	SEE POWER RISER				400	116.23			300	SEE POWER RISER				TRANSFORMER TA (AL1)	52.532	S	8
9	S	63.702								114.89								51.188	S	10
11	S	63.702									114.16							50.456	S	12
13	S	37.672	PANEL AH3	SEE POWER RISER				250	144.50			450	SEE POWER RISER				ATS-3 (KP1)	106.832	S	14
15	S	37.672								145.80								108.124	S	16
17	S	37.672									143.16							105.492	S	18
19	O		SPACE						37.30			225	SEE POWER RISER				TRANSFORMER TB (BL1)	37.304	S	20
21	O									38.87								38.870	S	22
23	O										38.35							38.354	S	24
25	S	9.756	PANEL BH1	SEE POWER RISER				225	43.596			175	SEE POWER RISER				TRANSFORMER TC2 (CL6)	33.840	S	26
27	S	7.351								39.655								32.304	S	28
29	S	6.548									38.588							32.040	S	30
31	S	93.626	PANEL BH2	SEE POWER RISER				500	146.75			300	SEE POWER RISER				TRANSFORMER TC3 (CL7)	53.120	S	32
33	S	93.626								145.95								52.320	S	34
35	S	93.626									141.47							47.840	S	36
37	S	205.758	PANEL CH	SEE POWER RISER				1000	212.68			125	SEE POWER RISER				ATS-1 (EMH1)	6.918	S	38
39	S	193.452								198.84								5.392	S	40
41	S	193.755									199.35							5.592	S	42
43	S	190.205	ATS-2 (SBH1)	SEE POWER RISER				1000	190.21			225					SPARE		O	44
45	S	181.720								181.72									O	46
47	S	185.554									185.55								O	48
49	O		SPARE					225	0.000			400					SPARE		O	50
51	O									0.000									O	52
53	O										0.000								O	54
55	O		SPACE						0.000								SPACE		O	56
57	O									0.000									O	58
59	O										0.000								O	60

LOAD TOTAL: 895.96 869.47 864.65

480Y/277 V 3 PHASE 4 WIRE
MAINS: MCB 3000 A MCB (NOTE 1)
65000 AIC X SE LABEL

ELECTRICAL/MECHANICAL C123

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	518.46	51%	264.23
(M) MOTOR	0.00	100%	0.00
(H) HVAC	1827.9	100%	1827.9
(L) LIGHTING	84.71	125%	105.89
(O) OTHER	322.47	100%	322.47
(K) KITCHEN EQUIP	280.32	80%	224.25
TOTAL	3033.8	90%	2744.7

FED FROM: UTILITY TRANSFORMER
MOUNT: FLOOR
NEMA: 1

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1. PROVIDE WITH ARC FAULT REDUCTION.
2.
3.
4.

PANEL TOTALS				
PHASE A	810.575	KVA	2926.3	AMP
PHASE B	786.612	KVA	2839.8	AMP
PHASE C	782.250	KVA	2824.0	AMP

PANEL SBH1 (ALTERNATE #4)

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	S	40.140	TRANSFORMER SBT1 (SBL)	SEE POWER RISER				225	41.891			20	12	12	12	3/4"	LTS - C103-109, C114, EXTERIOR, MEZZ C	1.751	L	2
3	S	30.574								31.234		20	12	12	12	3/4"	LTS - C100-C102	0.660	L	4
5	S	33.160									35.608	20	12	12	12	3/4"	LTS - C113	2.448	L	6
7	O		SPD	3/4"	10	10	10	30	0.588			20	12	12	12	3/4"	LTS - C110, C111	0.588	L	8
9	O									2.592		20	12	12	12	3/4"	LTS - C112	2.592	L	10
11	O										2.592	20	12	12	12	3/4"	LTS - C112	2.592	L	12
13	S	145.536	PANEL AH4	SEE POWER RISER				700	147.73			20	12	12	12	3/4"	LTS - EXTERIOR	2.190	L	14
15	S	145.536								147.89		20	12	12	12	3/4"	LTS - C115-C123	2.358	L	16
17	S	145.536									147.35	20	12	12	12	3/4"	LTS - EXTERIOR, CANOPY	1.818	L	18
19	O		SPACE						0.000			20					SPARE		O	20
21	O									0.000		20					SPARE		O	22
23	O										0.000	20					SPARE		O	24
25	O		SPACE						0.000			20					SPARE		O	26
27	O		SPACE							0.000		20					SPARE		O	28
29	O		SPACE								0.000	20					SPARE		O	30
31	O		SPACE						0.000								SPACE		O	32
33	O		SPACE							0.000							SPACE		O	34
35	O		SPACE								0.000						SPACE		O	36
37	O		SPACE						0.000								SPACE		O	38
39	O		SPACE							0.000							SPACE		O	40
41	O		SPACE								0.000						SPACE		O	42

LOAD TOTAL: 190.21 181.72 185.55

480Y/277 V 3 PHASE 4 WIRE
MAINS: MCB 1000 A MCB
42000 AIC SE LABEL

GENERATOR C122

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	9.00	100%	9.00
(M) MOTOR	0.00	100%	0.00
(H) HVAC	454.08	100%	454.08
(L) LIGHTING	17.00	125%	21.25
(O) OTHER	59.20	100%	59.20
(K) KITCHEN EQUIP	18.20	70%	12.74
TOTAL	557.48	100%	556.27

FED FROM: ATS-2
MOUNT: SURFACE
NEMA: 1

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1.
2.
3.
4.

PANEL TOTALS				
PHASE A	189.792	KVA	685.2	AMP
PHASE B	181.325	KVA	654.6	AMP
PHASE C	185.151	KVA	668.4	AMP

PANEL AH4 (ALTERNATE #4)

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	H	9.252	HP-1	1"	8	8	10	40	14.792			25	10	10	10	3/4"	HP-2	5.540	H	2
3	H	9.252								14.792								5.540	H	4
5	H	9.252									14.792							5.540	H	6
7	H	5.540	HP-3	3/4"	10	10	10	25	18.282			60	6	6	10	1"	HP-4	12.742	H	8
9	H	5.540								18.282								12.742	H	10
11	H	5.540									18.282							12.742	H	12
13	H	12.742	HP-5	1"	6	6	10	60	35.179			90	3	3	8	1 1/2"	AH-1	22.437	H	14
15	H	12.742								35.179								22.437	H	16
17	H	12.742									35.179							22.437	H	18
19	H	9.695	AH-2	1"	8	8	10	35	19.390			35	8	8	10	1"	AH-3	9.695	H	20
21	H	9.695								19.390								9.695	H	22
23	H	9.695									19.390							9.695	H	24
25	H	11.911	ERV-1	1"	6	6	10	60	34.902			90	3	3	8	1 1/2"	AH-5	22.991	H	26
27	H	11.911								34.902								22.991	H	28
29	H	11.911									34.902							22.991	H	30
31	H	22.991	AH-4	1 1/2"	3	3	8	90	22.991			30					SPARE		O	32
33	H	22.991								22.991									O	34
35	H	22.991									22.991								O	36
37	O		SPARE					60	0.000			60					SPARE		O	38
39	O									0.000									O	40
41	O										0.000								O	42

LOAD TOTAL: 145.54 145.54 145.54

480Y/277 V 3 PHASE 4 WIRE
MAINS: MCB 800 A MCB
65000 AIC SE LABEL

ELECTRICAL/MECHANICAL C123

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	0.00	100%	0.00
(M) MOTOR	0.00	100%	0.00
(H) HVAC	436.61	100%	436.61
(L) LIGHTING	0.00	125%	0.00
(O) OTHER	0.00	100%	0.00
(K) KITCHEN EQUIP	0.00	100%	0.00
TOTAL	436.61	100%	436.61

FED FROM: PANEL SBH1
MOUNT: SURFACE
NEMA: 1

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1.
2.
3.
4.

PANEL TOTALS				
PHASE A	145.536	KVA	525.4	AMP
PHASE B	145.536	KVA	525.4	AMP
PHASE C	145.536	KVA	525.4	AMP

PANEL SBL3

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	H	1.456	MSAH-1/MSHP-1	1"	8	8	10	20	2.656			20	8	8	8	1"	ACCESS CONTROL POWER	1.200	O	2
3	H	1.456								2.656		20	10	10	10	3/4"	ACCESS CONTROL POWER	1.200	O	4
5	R	0.540	RECEPT - G115.2	3/4"	12	12	12	20			1.740	20	8	8	8	1"	ACCESS CONTROL POWER	1.200	O	6
7	O	0.900	DATA RACK - G115.2	3/4"	12	12	12	20	2.100			20	8	8	8	1"	ACCESS CONTROL POWER	1.200	O	8
9	O	0.900	DATA RACK - G115.2	3/4"	12	12	12	20		2.100		20	8	8	8	1"	ACCESS CONTROL POWER	1.200	O	10
11	R	0.600	RECEPT - G115.2	3/4"	12	12	12	20			1.800	20	8	8	8	1"	ACCESS CONTROL POWER	1.200	O	12
13	O		SPARE					20	0.000			20					SPARE		O	14
15	O		SPARE					20		0.000		20					SPARE		O	16
17	O		SPARE					20			0.000	20					SPARE		O	18
19	O		SPARE					20	0.000								SPACE		O	20
21	O		SPARE					20		0.000							SPACE		O	22
23	O		SPARE					20			0.000						SPACE		O	24

LOAD TOTAL: 4.76 4.76 3.54

208Y/120 V 3 PHASE 4 WIRE
MAINS: MCB 125 A MCB
22000 AIC SE LABEL

DATA G104

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	1.14	100%	1.14
(M) MOTOR	0.00	100%	0.00
(H) HVAC	2.91	100%	2.91
(L) LIGHTING	0.00	125%	0.00
(O) OTHER	9.00	100%	9.00
(K) KITCHEN EQUIP	0.00	100%	0.00
TOTAL	13.05	100%	13.05

FED FROM: PANEL SBL
MOUNT: SURFACE
NEMA: 1

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1.
2.
3.
4.

PANEL TOTALS				
PHASE A	4.756	KVA	39.6	AMP
PHASE B	4.756	KVA	39.6	AMP
PHASE C	3.540	KVA	29.5	AMP

PANEL SBL4

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	H	1.456	MSAH-3/MSHP-3	3/4"	10	10	10	20	2.912			20	8	8	10	1"	MSAH-5/MSHP-5	1.456	H	2
3	H	1.456								2.912								1.456	H	4
5	O	0.600	F/A AMPLIFIER CABINET (NOTE 1)	3/4"	12	12	12	20			1.200	20	12	12	12	3/4"	RECEPT - D115.2	0.600	R	6
7	O	0.800	FIRE ALARM NAC PANEL (NOTE 1)	3/4"	12	12	12	20	1.520			20	12	12	12	3/4"	RECEPT - D115.2	0.720	R	8
9	R	0.540	RECEPT - E105.1	3/4"	12	12	12	20		1.440		20	12	12	12	3/4"	DATA - 115.2	0.900	O	10
11	O	0.900	DATA - E105.1	3/4"	12	12	12	20			1.800	20	12	12	12	3/4"	DATA - 115.2	0.900	O	12
13	O	0.900	DATA - E105.1	3/4"	12	12	12	20	2.100			20	12	12	12	3/4"	ACCESS CONTROL PANEL	1.200	O	14
15	O		SPARE					20		0.000		20					SPARE		O	16
17	O		SPARE					20			0.000	20					SPARE		O	18
19	O		SPARE					20	0.000			20					SPARE		O	20
21	O		SPARE					20		0.000		20					SPARE		O	22
23	O		SPARE					20			0.000	20					SPARE		O	24

LOAD TOTAL: 6.53 4.35 3.00

208Y/120 V 3 PHASE 4 WIRE
MAINS: MCB 125 A MCB
22000 AIC SE LABEL

ELEC E105

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	1.86	100%	1.86
(M) MOTOR	0.00	100%	0.00
(H) HVAC	5.82	100%	5.82
(L) LIGHTING	0.00	125%	0.00
(O) OTHER	6.20	100%	6.20
(K) KITCHEN EQUIP	0.00	100%	0.00
TOTAL	13.88	100%	13.88

FED FROM: PANEL SBL
MOUNT: SURFACE
NEMA: 1

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1. PROVDE RED BREAKER LOCK TO PREVENT ACCIDENTAL TURN OFF.
2.
3.
4.

PANEL TOTALS				
PHASE A	6.532	KVA	54.4	AMP
PHASE B	4.352	KVA	36.3	AMP
PHASE C	3.000	KVA	25.0	AMP

PANEL SBH1 (BASE BID)

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	S	40.140	TRANSFORMER SBT1 (SBL)	SEE POWER RISER				225	41.891			20	12	12	12	3/4"	LTS - C103-109, C114, EXTERIOR, MEZZ C	1.751	L	2
3	S	30.574								31.234		20	12	12	12	3/4"	LTS - C100-C102	0.660	L	4
5	S	33.160									35.608	20	12	12	12	3/4"	LTS - C113	2.448	L	6
7	O		SPD	3/4"	10	10	10	30	0.588			20	12	12	12	3/4"	LTS - C110, C111	0.588	L	8
9	O									2.592		20	12	12	12	3/4"	LTS - C112	2.592	L	10
11	O										2.592	20	12	12	12	3/4"	LTS - C112	2.592	L	12
13	O		SPACE						2.190			20	12	12	12	3/4"	LTS - EXTERIOR	2.190	L	14
15	O									2.358		20	12	12	12	3/4"	LTS - C115-C123	2.358	L	16
17	O										1.818	20	12	12	12	3/4"	LTS - EXTERIOR, CANOPY	1.818	L	18
19	O		SPACE						0.000			20					SPARE		O	20
21	O		SPACE							0.000		20					SPARE		O	22
23	O		SPACE								0.000	20					SPARE		O	24
25	O		SPACE						0.000			20					SPARE		O	26
27	O		SPACE							0.000		20					SPARE		O	28
29	O		SPACE								0.000	20					SPARE		O	30
31	O		SPACE						0.000								SPACE		O	32
33	O		SPACE							0.000							SPACE		O	34
35	O		SPACE								0.000						SPACE		O	36
37	O		SPACE						0.000								SPACE		O	38
39	O		SPACE							0.000							SPACE		O	40
41	O		SPACE								0.000						SPACE		O	42

LOAD TOTAL: 44.67 36.18 40.02

480Y/277 V 3 PHASE 4 WIRE
MAINS: MCB 300 A MCB
42000 AIC SE LABEL

GENERATOR C122

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	9.00	100%	9.00
(M) MOTOR	0.00	100%	0.00
(H) HVAC	17.47	100%	17.47
(L) LIGHTING	17.00	125%	21.25
(O) OTHER	59.20	100%	59.20
(K) KITCHEN EQUIP	18.20	80%	14.56
TOTAL	120.87	101%	121.48

FED FROM: ATS-2
MOUNT: SURFACE
NEMA: 1

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1.
2.
3.
4.

PANEL TOTALS				
PHASE A	44.894	KVA	162.1	AMP
PHASE B	36.366	KVA	131.3	AMP
PHASE C	40.220	KVA	145.2	AMP

PANEL SBL

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	S	13.796	PANEL SBL1	SEE POWER RISER				225	24.292			225	SEE POWER RISER				PANEL SBL2	10.496	S	2
3	S	10.530								16.906								6.376	S	4
5	S	12.700									22.300							9.600	S	6
7	S	4.756	PANEL SBL3	SEE POWER RISER				100	4.756			30	10	10	10	3/4"	TVSS		O	8
9	S	4.756								4.756									O	10
11	S	3.540									3.540								O	12
13	S	6.532	PANEL SBL4	SEE POWER RISER				125	6.532								SPACE		O	14
15	S	4.352								4.352									O	16
17	S	3.000									3.000								O	18
19	O		SPARE					100	0.000								SPACE		O	20
21	O									0.000							SPACE		O	22
23	O										0.000						SPACE		O	24
25	O		SPARE						0.000								SPACE		O	26
27	O		SPARE							0.000							SPACE		O	28
29	O		SPARE								0.000						SPACE		O	30
31	O	0.600	RESERVED FOR HVAC CONTROLS	3/4"	10	10	10	20	0.600			20					SPARE		O	32
33	O	0.600	RESERVED FOR HVAC CONTROLS	3/4"	10	10	10	20		0.600		20					SPARE		O	34
35	R	0.360	RECEPT - C123					20			0.360	20					SPARE		O	36
37	K	1.440	COOLER CONDENSER	1"	10	10	10	30	3.960			40	8	8	10	1"	FREEZER CONDENSER	2.520	K	38
39	K	1.440								3.960								2.520	K	40
41	K	1.440									3.960							2.520	K	42

LOAD TOTAL: 40.14 30.57 33.16

208Y/120 V 3 PHASE 4 WIRE
MAINS: MCB 500 A MCB
42000 AIC SE LABEL

GENERATOR C122

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	9.00	100%	9.00
(M) MOTOR	0.00	100%	0.00
(H) HVAC	17.47	100%	17.47
(L) LIGHTING	0.00	125%	0.00
(O) OTHER	59.20	100%	59.20
(K) KITCHEN EQUIP	18.20	80%	14.56
TOTAL	103.87	96%	100.23

FED FROM: SBT1
MOUNT: SURFACE
NEMA: 1
OPTIONAL STANDBY

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1.
2.
3.
4.

PANEL TOTALS				
PHASE A	38.733	KVA	322.8	AMP
PHASE B	29.503	KVA	245.9	AMP
PHASE C	31.998	KVA	266.6	AMP

PANEL SBL1

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	K	0.832	ICE MACHINE	3/4"	10	10	10	20	1.792			20	12	12	12	3/4"	COOLER EVAPORATOR	0.960	O	2
3	K	0.832								1.664		15	10	10	10	3/4"	FREEZER EVAPORATOR	0.832	O	4
5	K	0.864	PASS-THRU REFRIGERATOR	3/4"	10	10	10	20			1.696							0.832	O	6
7	K	0.864							1.584			20	12	12	12	3/4"	RECEPT - EXTERIOR	0.720	R	8
9	K	0.864	PASS-THRU REFRIGERATOR	3/4"	10	10	10	20		1.914		20	12	12	12	3/4"	GWH-1, 2, 3	1.050	O	10
11	K	0.864									2.528	15	12	12	12	3/4"	RECIRCULATION PUMP	1.664	O	12
13	K	0.800	FREEZER LIGHTS	3/4"	12	12	12	20	2.464									1.664	O	14
15	K	0.400	COOLER LIGHTS	3/4"	12	12	12	20		0.400		20					SPARE		O	16
17	O	1.200	ACCESS CONTROL POWER	3/4"	10	10	10	20			1.920	20	12	12	12	3/4"	RECEPT - D115.2	0.720	R	18
19	O	1.200	ACCESS CONTROL POWER	1"	8	8	8	20	1.800			20	12	12	12	3/4"	RECEPT - D115.2	0.600	R	20
21	O	1.200	ACCESS CONTROL POWER	3/4"	10	10	10	20		2.100		20	12	12	12	3/4"	DATA RACK - D115.2	0.900	O	22
23	O	1.200	ACCESS CONTROL POWER	1"	8	8	8	20			2.100	20	12	12	12	3/4"	DATA RACK - D115.2	0.900	O	24
25	O	1.500	GEN-SET HEATER	3/4"	12	12	12	20	2.956			20	8	8	10	1"	MSAH-4/MSHP-4	1.456	H	26
27	O	1.000	GEN-SET BATTERY CHARGER	3/4"	12	12	12	20		2.456								1.456	H	28
29	O	1.500	FL BACKFLOW HTR (NOTE -2)	1"	8	8	8	20			2.400	20	12	12	12	3/4"	DATA - D104	0.900	O	30
31	O	1.500	DOMESTIC BFP HTR (NOTE 2)	1"	8	8	8	20	2.400			20	12	12	12	3/4"	DATA - D104	0.900	O	32
33	O		SPARE					20		0.540		20	12	12	12	3/4"	RECEPT - D104	0.540	R	34
35	O		SPARE					20			0.600	20	12	12	12	3/4"	FIRE ALARM NAC PANEL (NOTE 1)	0.600	O	36
37	O		SPARE					20	0.800			20	12	12	12	3/4"	F/A AMPLIFIER CABINET (NOTE 1)	0.800	O	38
39	O		SPARE					20		1.456		20	8	8	10	1"	MSAH-6/MSHP-6	1.456	H	40
41	O		SPARE					20			1.456							1.456	H	42

LOAD TOTAL: 13.80 10.53 12.70

PANEL
208Y/120 V 3 PHASE 4 WIRE
MAINS: MLO 225 A BUS
42000 AIC SE LABEL

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	2.58	100%	2.58
(M) MOTOR	0.00	100%	0.00
(H) HVAC	5.82	100%	5.82
(L) LIGHTING	0.00	125%	0.00
(O) OTHER	22.30	100%	22.30
(K) KITCHEN EQUIP	6.32	80%	5.06
TOTAL	37.03	97%	35.76

FED FROM: PANEL SBL
MOUNT: SURFACE
NEMA: 1

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1. PROVIDE RED BREAKER LOCK TO PREVENT ACCIDENTAL TURNING OFF OF BREAKER.
2. PROVIDE GFEP BREAKER FOR HEAT TRACE CIRCUIT.
3.
4.

PANEL TOTALS				
PHASE A	13.325	KVA	111.0	AMP
PHASE B	10.171	KVA	84.8	AMP
PHASE C	12.266	KVA	102.2	AMP

PANEL SBL2

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	R	0.360	RECEPT - G104	3/4"	12	12	12	20	1.360			20	12	12	12	3/4'	FACP - F101 (NOTE 1)	1.000	O	2
3	O	0.900	DATA RACK - G104	3/4"	12	12	12	20		1.800		20	12	12	12	3/4"	ACP - F101	0.900	O	4
5	O	0.900	DATA RACK - G104	3/4"	12	12	12	20			1.800	20	12	12	12	3/4"	SEC - F101	0.900	O	6
7	R	0.360	RECEPT - G104	3/4"	12	12	12	20	1.080			20	12	12	12	3/4"	RECEPT - 101	0.720	R	8
9	O	0.600	F/A AMPLIFIER CABINET (NOTE 1)	3/4"	12	12	12	20		0.960		20	12	12	12	3/4"	RECEPT - 101	0.360	R	10
11	O	0.600	FIRE ALARM NAC PANEL (NOTE 1)	3/4"	12	12	12	20			0.960	20	12	12	12	3/4"	RECEPT - 101	0.360	R	12
13	H	1.456	MSAH-2/MSHP-2	1"	8	8	10	20	1.456			20					SPARE		O	14
15	H	1.456								1.816		20	12	12	12	3/4"	RECEPT - 101	0.360	R	16
17	O	0.600	ACCESS CONTROL POWER	3/4"	10	10	10	20			1.140	20	12	12	12	3/4"	RECEPT - 101	0.540	R	18
19	O		SPARE					20	0.900			20	12	12	12	3/4"	DATA RACK - F101	0.900	O	20
21	O		SPARE					20		0.900		20	12	12	12	3/4"	DATA RACK - F101	0.900	O	22
23	O		SPARE					20			0.900	20	12	12	12	3/4"	DATA RACK - F101	0.900	O	24
25	O		SPARE					20	0.900			20	12	12	12	3/4"	DATA RACK - F101	0.900	O	26
27	O		SPARE					20		0.900		20	12	12	12	3/4"	DATA RACK - F101	0.900	O	28
29	O		SPARE					20			3.600	50	6	6	10	1"	UPS	3.600	O	30
31	O		SPARE					20	2.400									2.400	O	32
33	O		SPARE					20		0.000		20					SPARE		O	34
35	H	2.400	MSAH-4/MSAC-1	3/4"	10	10	10	30			2.400	20					SPARE		O	36
37	H	2.400							2.400			20					SPARE		O	38
39	H	2.400	MSAH-5/MSAC-2	3/4"	10	10	10	30		2.400		20					SPARE		O	40
41	H	2.400									2.400	20					SPARE		O	42

LOAD TOTAL: 10.50 8.78 13.20

208Y/120 V 3 PHASE 4 WIRE
MAINS: MCB 225 A MCB
22000 AIC SE LABEL

TECHNOLOGY F101

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	3.06	100%	3.06
(M) MOTOR	0.00	100%	0.00
(H) HVAC	12.51	100%	12.51
(L) LIGHTING	0.00	125%	0.00
(O) OTHER	16.90	100%	16.90
(K) KITCHEN EQUIP	0.00	100%	0.00
TOTAL	32.47	100%	32.47

FED FROM: MDP
MOUNT: SURFACE
NEMA: 1

PROVIDE DOOR WITH LOCK AND HINGED TRIM. PROVIDE COPPER BUSS BARS AND BOLT ON BREAKERS.

NOTES:
1. PROVIDE RED BREAKER LOCK TO PREVENT BREAKER BEING TURNED ACCIDENTALLY OFF.
2.
3.
4.

PANEL TOTALS				
PHASE A	10.496	KVA	87.5	AMP
PHASE B	8.776	KVA	73.1	AMP
PHASE C	13.200	KVA	110.0	AMP

CONTRACTOR TO VERIFY ALL DIMENSIONS.

pdc
Progressive Design Collaborative, Ltd.
3101 Poplarwood Court, Suite 320
Raleigh, North Carolina 27604
919 790 9989
License# C-0183

PDC Project #19003

NORTH CAROLINA PROFESSIONAL SEAL 047358 ENGINEER TYLER D. AHRENDSEN 8-21-19

BID SET SEALED BY ROBERT A CLARK, SEAL 045439. TYLER D. AHRENDSEN IS SIGNING FOR CURRENT REVISION.

PINNACLE ARCHITECTURE
PROFESSIONAL ASSOCIATION
P.O. BOX 187, 630 TEAM ROAD, SUITE 200
MATTHEWS, NORTH CAROLINA 28106
PH: (704) 847-9851 FAX: (704) 847-9853
701 EAST BAY STREET, SUITE 302
CHARLESTON, SOUTH CAROLINA 29403
PH: (843) 872-5345 FAX: (843) 872-5374

ISSUE DATE: 04.30.2019
DRAWN BY: JPT
CHECKED BY: RAC
PROJECT: 1821

STUMP SOUND ELEMENTARY SCHOOL
ONSLOW COUNTY SCHOOLS
STUMP SOUND, NORTH CAROLINA

PANEL SCHEDULES
BASE BID & ALTERNATE #4

REVISION SCHEDULE

#	DATE	REFERENCE
1	06/25/19	DPI COMMENTS
2	08/22/19	ADDENDUM 1

E605