Addendum No. 3
September 20, 2022

CITY OF ROCHESTER, NEW HAMPSHIRE

TARA ESTATES SEWER
PUMP STATION UPGRADE

City of Rochester: Bid 23-01
CWSRF Project Number: CS-330122-19

ADDENDUM NO. 3

To be considered as part of the plans and specifications for the Tara Estates Sewer Pump Station Upgrade:

GENERAL

In general, Addendum 3 is issued to revise the plans and specifications for the replacement of a Propane Standby Engine System provided with the pump package with a Packaged Propane Engine Generator (60KW). Any reference to standby engine shall refer to the engine generator.

SPECIFICATIONS

TABLE OF CONTENTS

DELETE Table of Contents in its entirety and **REPLACE** with the attached Table of Contents.

SECTION A – BIDDING REQUIREMENTS – ADVERTISEMENT FOR BIDS

DELETE the paragraphs:

"2. BID Submission Options-Hardcopy, or Electronically:

a. Submit Hardcopy via USPS, FEDEX, or UPS to:
City of Rochester, NH
Purchasing Agent
31 Wakefield Street
Rochester, NH 03867

Reference **Bid 23-01** on package.

No in-person drop offs will be accepted.

b. Submit Electronically via Email to:
BID23-01@rochesternh.net.onmicrosoft.com

Include in Email subject line: **Bid 23-01**. An automated email confirmation will be generated to bidder once bid has been received. It is bidder's responsibility to ensure proper email submission of bid, and to monitor for the confirmation email."

in Section A, page A-1.1, paragraph 2, and **REPLACE** with the following:

"2. BID Submission Options-Hardcopy, or In-Person:

a. Submit Hardcopy via USPS, FEDEX, or UPS, or in-person to:
City of Rochester, NH
Finance Office
31 Wakefield Street
Rochester, NH 03867

Reference **Bid 23-01** on package.

No electronic submissions will be accepted"

SECTION A – BIDDING REQUIREMENTS – ADVERTISEMENT FOR BIDS

DELETE the paragraph:

"4. Bid Opening Date & Time: **Thursday July 28, 2022 at 2:30pm.** Opening will be conducted virtually via City of Rochester's Government Channel Video on Demand-Live Stream broadcast, which can be accessed using this link: https://rochesternh.viebit.com/?folder=ALL. Select Live Stream top center. Local broadcast will also occur on Atlantic Broadband cable government channel #26."

in Section A, page A-1.1, paragraph 4, and **REPLACE** with the following:

"4. Bid Opening Date & Time: **Thursday October 6, 2022 at 2:30pm.** Opening will be conducted in-person in Council Chambers at City Hall, 31 Wakefield Street."

SECTION A – BIDDING REQUIREMENTS – ADVERTISEMENT FOR BIDS

DELETE the sentence "Questions must be submitted no later than **Thursday July 7, 2022**." in Section A, page A-1.2, paragraph 1, and **REPLACE** with the following:

"Questions must be submitted no later than **Wednesday September 28, 2022**."

SECTION A – BIDDING REQUIREMENTS – ADVERTISEMENT FOR BIDS

DELETE the sentence "The "Building" General Wage Decision (GWD) for Strafford County, NH23, publication date 7/15/2022 applies to this project." in Section A, page A-2.4, paragraph 9, and **REPLACE** with the following:

"The "Building" General Wage Decision (GWD) for Strafford County, NH23, publication date 9/2/2022 applies to this project."

SECTION D – FEDERAL PROVISIONS RULES REGULATIONS AND FORMS – APPLICABLE DOL WAGE DETERMINATIONS

DELETE pages D-20.1 through D-20.6 and replace with the attachment: "Specifications

Section D, pages D-20.1-D-20.7: Applicable DOL Wage Determinations, September 2, 2022."

SECTION 13 34 23.29 PRECAST CONCRETE UTILITY BUILDING

DELETE Section 13 34 23.29 in its entirety and **REPLACE** with the attached Section 13 34 23.29.

SECTION 26 32 13 PACKAGED PROPANE ENGINE GENERATOR 60KW

ADD new attached Section 26 32 13.

SECTION 26 36 00 TRANSFER SWITCHES

ADD new attached Section 26 36 00**.**

SECTION 33 32 13.16 PACKAGED SUCTION LIFT PUMP STATION

DELETE Section 33 32 13.16 in its entirety and REPLACE with the NEW attached **Section 33 32 13 SELF-PRIMING WASTEWATER PUMPING EQUIPMENT**.

SECTION 40 95 13 CONTROL PANELS

DELETE Section 40 95 13 in its entirety and **REPLACE** with the attached Section 40 95 13.

DRAWINGS

ALL DRAWINGS

SHEETS G000 through E501

DELETE G000 through E501 (22 Drawing Sheets) in its entirety and **REPLACE** with the attached G000 through E501 (**23** Drawing Sheets).

QUESTIONS

Question: Electrical drawings show a fused utility disconnect and a MCB panel board. Can the MCB be MLO?

Answer: No, this disconnect is for the utility and ahead of the meter.

Question: In regards to the electrical service, is the utility provider responsible for furnishing and installing the secondary conductors from the utility transformer to the meter socket?

Answer: Utility will be furnishing and installing the secondary conductors. Electrical contractor to install conduits.

CLARIFICATIONS

Generator lead times have been in excess of 8-months. Contractor shall make provisions for temporary standby power until permanent standby power has been installed, started-up and tested. The Owner has an existing 50KW Generator on-site available for use by the Contractor. Contractor shall confirm power requirements and necessary connections for use of the Owners standby power at the site. Temporary standby power shall be provided at no Cost to the Owner for the duration of the project.

ATTACHMENTS

- TABLE OF CONTENTS
- Specifications Section D, pages D-20.1-D-20.7 : Applicable DOL Wage Determinations, September 2, 2022
- SECTION 13 34 23.29 PRECAST CONCRETE UTILITY BUILDING
- SECTION 26 32 13 PACKAGED PROPANE ENGINE GENERATOR 60KW
- SECTION 26 36 00 TRANSFER SWITCHES
- SECTION 33 32 13 SELF-PRIMING WASTEWATER PUMPING EQUIPMENT
- SECTION 40 95 13 CONTROL PANELS
- Drawing Sheets: G000 to E501 (**23** Drawing Sheets)

END OF ADDENDUM

Revised Section D, pages D-20.1-D-20.7
Applicable DOL Wage Determinations, September 2, 2022

"General Decision Number: NH20220023 09/02/2022

Superseded General Decision Number: NH20210023

State: New Hampshire

Construction Type: Building

County: Strafford County in New Hampshire.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be

adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022
1	02/18/2022
2	02/25/2022
3	03/18/2022
4	07/08/2022
5	07/15/2022
6	09/02/2022

* ASBE0006-014 09/01/2022

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR	$ 41.00	33.99

BOIL0029-005 01/01/2021

	Rates	Fringes
BOILERMAKER	$ 38.08	25.70

BRNH0003-001 06/01/2020

	Rates	Fringes
BRICKLAYER	$ 42.55	28.02

ELEC0490-006 06/01/2022

	Rates	Fringes
ELECTRICIAN (Includes Low Voltage Wiring and Alarm Installation)	$ 32.80	21.68

ELEV0004-007 01/01/2021

	Rates	Fringes

ELEVATOR MECHANIC.....$ 63.47 35.83

a. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day and the Friday after Thanksgiving.

b. VACATION: Employer contributes 8% of basic hourly rate for 5 years or more of service; 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

IRON0007-038 03/16/2022

	Rates	Fringes
IRONWORKER, REINFORCING	$ 29.02	24.04

PLUM0131-004 06/06/2022

	Rates	Fringes
PIPEFITTER	$ 38.50	25.05

SUNH2015-009 06/16/2017

	Rates	Fringes
CARPENTER, Includes Acoustical Ceiling Installation, Drywall Hanging, Form Work, and Metal Stud Installation	$ 26.14	12.05
CEMENT MASON/CONCRETE FINISHER	$ 22.04	9.70
DRYWALL FINISHER/TAPER	$ 24.80	0.00
GLAZIER	$ 26.75	3.48
IRONWORKER, STRUCTURAL	$ 24.16	12.42
LABORER: Common or General	$ 17.92	12.72
LABORER: Mason Tender - Brick	$ 16.52	4.74
OPERATOR: Backhoe/Excavator/Trackhoe	$ 24.02	4.25
OPERATOR: Crane	$ 27.42	3.83

OPERATOR: Loader.....$ 22.25 2.13

OPERATOR: Roller.....$ 23.56 3.28

PAINTER (Brush and Roller).....$ 17.13 0.00

PAINTER: Spray.....$ 22.99 3.28

PLUMBER, Includes HVAC Pipe Installation.....$ 24.60 9.40

ROOFER.....$ 19.55 0.00

SHEET METAL WORKER, Includes HVAC Duct Installation.....$ 24.88 5.46

SPRINKLER FITTER (Fire Sprinklers).....$ 31.29 9.78

WATERPROOFER.....$ 26.69 0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses

(29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion

date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division

U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

SPECIFICATIONS

TABLE OF CONTENTS

END OF SECTION

SECTION 13 34 23.29

PRECAST CONCRETE UTILITY BUILDING

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This section of the specification covers all materials, labor, tools and equipment, and operations necessary to furnish and install a precast concrete utility building including door, louvers, HVAC and electrical systems as shown on the contract drawings. The building shall be delivered to the jobsite and installed by the Contractor. The building manufacturer shall provide all lifting cables and hardware needed to off-load and set the building.

B. Building foundation shall be as shown on the drawings and specified in Section 31 00 00, EARTHWORK.

1.02 RELATED WORK:

A. Section 05 50 00, MISCELLANEOUS METALS

B. Division 26, ELECTRICAL WORK

C. Section 31 00 00, EARTHWORK

D. Section 33 32 13, SELF-PRIMING WASTEWATER PUMPING EQUIPMENT

E. DIVISION 40, PROCESS INTEGRATION

1.03 QUALITY ASSURANCE:

A. The precast concrete building manufacturer shall be a firm experienced in this type of work and having a minimum of five (5) years' experience. The structure shall be manufactured in plants having been certified under either the NPCA or PCI Plant Certification Program. The manufacturer shall submit evidence showing that he has successfully completed work of this nature prior to being approved to supply concrete to the project. The building shall be the monolithic or panel type precast concrete utility building as manufactured by United Concrete Products Inc., or an approved equal.

1.04 REFERENCES:

The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI 318 Building Code Requirements for Reinforced Concrete

ACI 512 Recommended Practice for Manufactured Reinforced Concrete Floor and Roof Units.

American National Standard Institute (ANSI)

ANSI A58.1 Standard Building Code Requirements for Minimum Design Loads in Buildings and Other Structures

American Society for Testing and Materials (ASTM)

ASTM A123 Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates and Strip.

ASTM A185 Welded Steel Wire Fabric for Concrete Reinforcement.

ASTM A615 Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

ASTM C33 Concrete Aggregates

ASTM C150 Portland Cement

1.05 DESIGN CRITERIA:

A. The building shall be designed to meet the New Hampshire State Building Code (IBS 2015) or the minimum loadings as required in ASCE 7-10. Refer to the structural drawings for design loading requirements.

B. The building floor and roof shall be designed for minimum outside dimensions (precast exterior) of 12 feet by 22 feet 10 inches without the use of interior supports of any type. The building interior finished height shall be 9 feet minimum. The roof and floor thickness shall be a minimum of 5-inches thick. The wall thickness shall be a minimum of 3.5-inches thick.

C. The roof shall be a gable style with 6/12 pitch. The roof shall overhang all walls a minimum of 12-inches.

D. The building design shall be such that the floor, walls and roof are monolithic and manufactured with end walls attached.

E. The building shall be equipped from the factory with a complete heating and ventilation system per the design and control sequence indicated on the HVAC and electrical drawings and per the criteria specified below.

F. The building shall be equipped from the factory with a complete electrical system per the electrical drawings, Division 26 specifications, and the criteria specified below.

1.06 WARRANTY:

A. The Manufacturer shall warrant the building and its components for one year from the date of Substantial Completion.

B. The precast concrete structure shall be designed to endure and not deteriorate for a period of twenty-five (25) years.

1.07 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Two (2) copies of shop and erection drawings showing all dimensions of precast sections; location openings; the locations, type, size and strength of inserts, embedded angles, steel reinforcement; and all other information necessary to insure proper handling, fabrication, and erection of the building.

B. Two (2) copies of building design calculations and drawings stamped by a registered professional engineer in the State of New Hampshire, for record only.

C. Submit manufacturer's product data and installation instructions for each material and product used.

PART 2 - MATERIALS

2.01 CONCRETE

A. Cement shall be Portland cement Type III. Concrete shall conform to ASTM C150. Admixtures, other than air-entraining and water-reducing admixtures, shall not be permitted unless approved by the Engineer.

B. Concrete shall have a minimum strength of 5000 psi at 28 days.

C. Aggregate shall conform to ASTM C33.

2.02 STEEL REINFORCING

A. Reinforcing steel shall be new billet steel meeting the requirements of ASTM A615 Grade 60. Welded wire fabric shall conform to ASTM A185.

B. Reinforcing steel shall be accurately formed and shall be free from loose rust, scale and contaminants which reduce bond.

C. Reinforcing steel shall be accurately positioned on supports, spacers, hangers, and or other reinforcement and shall be secured in place with wire ties or suitable clips.

2.03 INSERTS:

A. All cast-in-place inserts shall be galvanized and of a type approved by the Engineer. Galvanization shall conform to ASTM A123.

2.04 DOOR AND HARDWARE

A. Non-rated Fiberglass Reinforced Plastic (FRP) Doors shall be as manufactured by one of the following companies or equal:

1. Chem-Pruf Door Company

2. Edgewater Plastics

3. Simon Door Company

4. Tiger Door FRP

B. Materials.

1. All doors shall be made of fiberglass reinforced plastic (FRP) and have a fiberglass content of 25% by weight.

2. The doors shall be flush construction, having no seams or cracks. All mortises shall be molded in at the factory.

3. The doors shall be 1-3/4” thick with a 14 mil (plus or minus 3 mils) color gel coat and have a thermal insulating value ('R' factor) of 12. Secondary painting over pultrusions to achieve color is not acceptable.

4. Stiles and Rails shall be constructed starting from the outside toward the inside, of a gel coat of the color specified followed by a matrix of at least three layers of 1.5 ounces per square foot of fiberglass mat. The stile and rail shall be modeled in one continuous piece to a U-shaped configurations and to the exact dimensions of the door. In this manner there will be no miter joints or disparate materials used to form the one-piece stile and rail. Pultrusions will not be acceptable for stiles and rails.

5. Door plates – All door plates shall be molded in one continuous piece, starting with a 15 to 20 mil gel coat of the color specified, integrally molded with at least two layers of 1.5 ounce per square foot fiberglass mat and layer of 16 ounce per square yard unidirectional glass roving.

6. Reinforcement – Adequate reinforcing and compression members shall be used to accommodate surface hinges, closers, locksets, kickplates, push or pull plates. When engineering considerations dictate, mild steel is buried in the fiberglass matrix to provide enhanced screw holding power. In no case should screws be used into fiberglass matrix to provide holding of hinges, locks or closers or any structural attachment. Thru-bolting is required for attachment of hinges, and closers. When thru-bolting is to occur, a compression member is to be located which will provide memory and resistance to the torquing of thru-bolts. All voids between the door plates shall be completely filled with the equivalent of 4 to 6 lbs. expanded polyurethane foam, having a flame spread of 25 or less per ASTM E-84. A phenolic-coated kraft honeycomb may be substituted for urethane foam where engineering requirements dictate.

    a. Flame spread – All reinforced resins shall contain a halogenated additive or core reactant plus Anitomy Trioxide to achieve a flame spread of 25 or less per ASTM E-84 and shall be self-extinguishing per ASTM D-635.

    b. The color of the door, frame, or transom unit shall be integrally molded in as the part is made.

    c. Frames shall be similar to the doors in construction and materials except the frames shall be solid fiberglass. The stop and frame will be molded all in one piece. The frame shall be integrally gel coated to the Owner's color choice when molded. Mortises will be molded in. It is not permitted to rout in mortises or remove any material from the head or to provide mortises.

    d. The frames shall be installed during the construction of precast concrete walls. Care will be taken to ensure that the surfaces of fiberglass frame is not in any way marred or damaged. Spacers shall remain in place until door is being hung.

    e. Reinforcement for mounting hinges, closers, etc. shall be of mild steel plates strategically located and buried in the resin-glass matrix so they will not be exposed to the elements.

    f. The jamb shall be flat on the backside (against the opening) and uniform in thickness so as to provide a solid, uniform surface against the wall opening. No wood blocks or spacers are permitted.

7. Sizes: Indicated on drawings.

8. Color: As chosen by the Owner from the manufacturer's standard colors.

C. Door Hardware: Door hardware

1. Hardware shall be best grade, entirely free from imperfections in manufacture and finish. Qualities, weights, and sizes specified herein are the minimum that will be accepted. The brand of hardware furnished shall be equivalent to that listed.

2. Hinges shall be permanently factory lubricated. Exterior hinges shall have non-removable, non-corrosive pins. Hinges for doors more than 36-inches wide shall be heavy-gage, with 4 ball bearings. All hinges shall be ball bearing type.

D. A key operated security lock that matches the Owner's standard lockset shall be installed with corrosion resistant handles.

E. The door shall be provided with aluminum threshold, door sweep, lock guard, 6-inch drip cap, non-removable pin hinges, weatherstrip, weatherstop, retaining hooks to hold door open, and a retaining chain and spring to keep the door restrained.

F. Panic bar hardware shall be provided on the interior of the door for emergency egress from the building.

G. All hardware, where applicable, shall be installed at the door manufacturing plant. The hardware manufacturer's warranty shall be included with the hardware installation.

2.05 ALUMINUM WALL LOUVERS

A. Manufacturers: Greenheck, Industrial Louvers, Ruskin, or approved equal.

B. Louvers shall be of drainable extruded aluminum, with frames and blades fabricated from 6063-T5 aluminum alloy of the sizes indicated on the HVAC drawings, depth shall match the depth of the wall. Louver blades shall be the stormproof type. Louvers with gravity operating dampers or motorized operated blades shall be furnished as shown on the drawings or as specified under other sections of these specifications. The head, sill, and jamb members shall be fabricated from identical structural members and shall be provided with an integral caulking slot and retaining head. Extruded sill extensions shall be furnished and installed with the louvers. All fastenings shall be stainless steel or aluminum.

C. The frame and blades of the fixed louvers shall be a minimum thickness of 0.081 inches and shall be provided with reinforcing bosses.

D. All louvers shall have insect screens attached to the interior. Insect screen shall be 16 x 18 mesh aluminum screening, 0.011 diameter. Frames shall be rolled aluminum with mitered corners secured with corner clips. Insect screens shall be manufactured by Construction Specialties, Inc., Cranford, NJ, or an approved equal.

2.06 AUTOMATIC DAMPER WITH NORMALLY OPEN ACTUATOR

A. Damper shall be closed during typical station operation and open automatically upon loss of utility power. See control sequence on drawing H101.

2.07 AIR EXHAUST FANS

A. Exhaust fans shall be manufactured by Loren Cook, Greenheck, Penn Ventilator Co., or an approved equal.

B. Manufacturers of other products comparable in quality and type to those specified will be acceptable if said products are offered by the Contractor with satisfactory data on past performance and other information required, and if approved by the Engineer.

C. General Description:

1. Fan arrangement shall be exhaust
2. Sidewall mounted applications
3. Maximum continuous operating temperature 130° Fahrenheit (54.4° Celsius)
4. Minimum continuous operating temperature -10° Fahrenheit (-23° Celsius)
5. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual unit serial number

D. Propeller:

1. Propeller constructed of cast aluminum tapered airfoil blades and cast aluminum hubs
2. Securely attached to motor shaft with a standard square key, set screw and tapered bushing
3. Statically and dynamically balanced in accordance with AMCA Standard 204-05
4. The propeller and fan inlet will be aligned and shall have precise running tolerances for maximum performance and operating efficiency

E. Electronically Commutated Motor

1. Motor enclosures: Open Drip-Proof
2. Electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors.
3. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.
4. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor or integrated variable frequency drive.

5. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.
6. Motors can achieve up to 95% efficiency (model and horsepower dependent).

F. Drive Frame:

1. Drive frames and fan panels shall be bolted construction
2. Drive frame assemblies and fan panels shall be galvanized steel or painted steel
3. Drive frame shall be formed steel and fan panels shall have pre-punched mounting holes, formed flanges, and a deep formed inserted venturi

G. Disconnect Switches:

1. NEMA rated: 1
2. Positive electrical shut-off
3. Wired from fan motor to junction box

H. Accessories:

A. Dampers:

a. Type: Motorized
b. Prevents outside air from entering back into the building when fan is off
c. Balanced for minimal resistance to flow
d. Galvanized frames with pre-punched mounting holes

B. Dampers Guards:

a. Guard material: Galvanized
b. Shall completely enclose the damper or wall opening on the discharge side of the fan

C. Horizontal Mounting:

a. Allows fan to be mounted in a horizontal configuration

D. Wall Housing:

a. Mounting arrangement: Flush Interior
b. Constructed of galvanized steel or painted steel with heavy gauge mounting flanges and pre-punched mounting holes
c. Housing shall include OSHA approved motor guard
d. Reduces installation time and provides maximum installation flexibility

E. Wall Collar:

a. Constructed of galvanized steel or painted steel with heavy gauge mounting flanges and pre-punched mounting holes

F. Motor Side Guard:

a. Guard type: OSHA Guard

b. Protective guard completely enclose the motor and drive side of the fan

G. Variable Frequency Drive:

a. Factory programed, mounted and wired

b. Input speed control Potentiometer dial

c. Motor: (VFD Rated) compatible with induction and permanent magnet motors

d. LED indication for Power, Run and Fault

H. See drawing H101 for damper and exhaust fan sequence of operation.

2.08 ELECTRIC DAMPERS

A. Dampers, where indicated, shall be multi-blade louver or butterfly type. Dampers shall be constructed of aluminum and be one gauge heavier material than the ducts in which they are installed. Motor-operated louver dampers shall have the blades hung on rods supported in oil impregnated bearings. The edges of the blades shall overlap when closed and make a tight seal.

B. The louvers shall be constructed of aluminum sheets not less than 0.025-inches thick. The edges of the blades shall be provided with felt strips to prevent rattling. The damper blades shall be supported in metal frames.

C. Motor operated dampers shall open away from the source of the air stream to reduce the static pressure that the dampers must overcome during opening.

D. See drawing H101 for damper and exhaust fan sequence of operation.

2.09 UNIT HEATER.

A. Unit heater shall be manufactured by Modine, Sterling HVAC, Reznor., or an approved equal.

B. Unit Heaters: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:

1. Heating: Propane fired.

2. Discharge Louvers: Individually adjustable horizontal and vertical louvers to match cabinet finish.

C. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.

D. Supply Fan: Propeller type with direct drive.

E. Heat Exchanger: Stainless steel welded construction.

F. Gas Burner:

1. Atmospheric type with adjustable combustion air supply,

2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.

3. Electronic pilot ignition, with electric spark igniter.

G. Gas Burner Safety Controls:

1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.

2. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.

H. Requirements:

1. Equipped with intermittent ignition device.

2. Equipped with indoor, separated combustion, power vented.

3. Concentric vent termination kit.

I. Electrical

1. The unit shall be single point power.

J. Controls:

1. The heater control shall be a three-way switch for off-on-constant control. The constant mode shall control the unit heater to maintain a user adjustable temperature or temperature range.

2. See drawing H101 for unit heater sequence of operation.

K. Control Panels

1. Indoor control cabinets located in offices or dry/dust free environments shall be fully enclosed NEMA 1 Type construction with hinged door, and removable sub-panels or electrical sub-assemblies.

2. All control cabinets located in mechanical/electrical rooms shall be NEMA 4.

2.10 ELECTRICAL

A. The building will be equipped with electrical systems as described in these contract documents via an electrical contractor and the building manufacturer. It is the responsibility of the general contractor to coordinate division and installation of work.

B. The building manufacturer shall be responsible for providing, installing, and wiring (including conduit) the MCB, MTS, MDP1, T2, and PPL1 per electrical drawings.

C. The building manufacturer shall be responsible for providing, installing, and wiring (including conduit) all lighting, outlets, switches, HVAC, and controls necessary for a fully functioning building system in accordance with Division 26.

D. Smoke and carbon monoxide detectors shall be installed and powered by building manufacturer. Electrical contractor to wire to pump control panel.

E. The electrical contractor shall be responsible for coordination with electrical utility, building manufacturer, and the installation or electrical connection of items shipped loose including but not limited to: pump control panel, pump skid, generator, and instrumentation devices included in specification section 40 91 00.

F. Electrical contractor shall be responsible for coordination with building manufacturer for location of all necessary electrical penetrations, including but not limited to: portable generator plug (purchased by electrical contractor) and ISB terminal box (supplied by Wilson Controls).

G. New three phase power shall be supplied from the pole mounted transformer to the building via underground service to the electrical meter and disconnect located on the precast building. Electrical meter and disconnect to be provided, installed, and wired by electrical contractor. Electrical contractor to coordinate penetrations with building manufacturer.

2.11 ROUGH CARPENTRY

A. Manufacturers, Dimensional Lumber: CertainTeed Corp., Boardwalk Composite Decking & Railing; or approved equal.

B. Manufacturers, Sheathing: FLAMEDXX, LLC; LP Corporation; or approved equal.

G. Dimensional lumber: Light framing: stud, no.3 or standard grade.

H. Building Wrap: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bound fibers; coated or uncoated; with or without perforation; ASTM E 1677, Type I. Dupont Tyvek Commercial Wrap, or approved equal.

I. Framing Anchors and Fasteners: Non-corrosive, suitable for load and exposure. Provide masonry anchors for attaching wood strapping to precast concrete building. Drywall screws are not acceptable.

2.12 EXTERIOR FINISH CARPENTRY

A. Exterior Standing and Running Trim and Rails

1. Manufacturers: Cement Board Fabricators; Cemplank, Inc.; CertainTeed Corp.; GAF Materials Corporation; James Hardie, Inc.; Nichiha Fiber Cement; Weatherboards' FiberCement Siding; or approved equal.

2. Type: Plain boards.

3. Standard: ASTM C 1186, Type A, Grade II, factory primed.

4. Surface Texture: Smooth.

5. Finish: Shop-applied primer for field finish.

6. Accessories: Non-corrosive fasteners.

2.13 BOARD INSULATION

A. Rigid Insulation:

1. Hunter Panels; ICA/Insulation Corporation of America; Knauf Insulation; or approved equal.

2. Application: Attic space outboard of precast structure.

3. Application: Exterior cavity walls, outboard of sheathing.

4. Type Extruded polystyrene, rigid. (Standard ASTM C 578)

B. VAPOR RETARDER

1. Manufacturer: Thermal Design; or approved equal.

2. Application: Exterior Walls.

3. Application: Under Concrete Slab.

4. Type: Reinforced 2-ply polyethylene, 6 to 10 mils.

2.14 ASPHALT ROOFING SHINGLES

A. Manufacturers: Atlas Roofing Corporation; Celotex Roofing Products; CertainTeed Roofing Products; GAF Materials Corp.; Georgia Pacific Corp.; Owens-Corning Fiberglass; or approved equal.

B. Architectural grade, fiberglass strip shingles.

C. Accessories: Hip and ridge shingles, Underlayment felt, ASTM D 226, Metal flashing and drip edge, mechanically fastened snow guards.

D. Color shall be as required by the owner.

2.15 FIBER-CEMENT SIDING

A. Manufacturers: Cement Board Fabricators; Cemplank, Inc.; CertainTeed Corp.; GAF Materials Corporation; James Hardie, Inc.; Nichiha Fiber Cement; Weatherboards Fiber Cement Siding; or approved equal.

B. Type: Plain boards.

C. Standard: ASTM C 1186, Type A, Grade II, factory primed.

D. Surface Texture: Smooth.

E. Accessories: Non-corrosive fasteners.

F. Color shall be as required by the Owner.

2.16 ROOF ACCESSORIES

A. Provide corrugated plastic ridge vent.

B. Manufacturers: Trimline Building Products, a Division of Diversi-Plast; or approved equal.

C. Heat and Smoke Vent Insurance Requirements: UL and FM approval or acceptance.

2.17 JOINT SEALANTS

A. Exterior Joints in Vertical Surfaces, Urethane:

1. Manufacturers: Pecora Corp.; Sika Corp.; Sonneborn; Tremco; or approved equal.

2. Materials: One-component urethane sealant.

B. Exterior Joints in Horizontal Surfaces, Urethane:

1. Manufacturers: Pecora Corp.; Sandell Construction Solutions; Sika Corp.; Sonneborn; Tremco; or approved equal.

2. Materials: Self-leveling urethane sealant, ASTM C 920.

2.18 FINISHES:

A. The exterior surface of the building body shall receive one (1) coat of Thoroseal concrete sealer.

B. The interior walls and ceiling of the building shall receive one (1) coat of Thoroseal concrete sealer.

C. Color of shingles, siding, and trim pieces shall be as required by the owner. Contractor to provide color catalog for each product to be used.

PART 3 - EXECUTION

3.01 FABRICATION AND ASSEMBLY:

A. The manufacturer shall check and verify all dimensions, elevations, and locations of openings, anchor bolts, inserts and other cast-in items. Any discrepancy or lack of information shall be reported to the Engineer before fabrication.

B. The Contractor shall be responsible for any failure to precast sections to the correct dimensions and for any omissions or inaccuracies in the manufacture. If, in the opinion of the Engineer, proper corrections cannot be made, the section shall be rejected and shall be replaced with a new section at the Contractor's expense.

C. Monolithic buildings shall be entirely assembled by the manufacturer at the plant, sealed, waterproofed, and tested for water tightness.

D. Sectioned buildings shall be post-tensioned together at floor and roof locations per manufacturer’s requirements.

3.02 INSTALLATION:

A. Erection of the building shall be done by experienced workmen, in accordance with the previously mentioned standards.

B. All joints shall be caulked with Tremco Dymonic compound or an approved equal, to maintain a permanent seal under severe weather conditions.

C. All sleeve wall penetrations shall have neoprene gaskets to insure a watertight seal.

D. No field holes or cuts shall be made in any section without the prior approval of the Engineer. All holes shall be cut in accordance with manufacturer recommendations.

E. Interior walls and ceiling shall be prepared by the manufacturer for concrete sealing by removal of all foreign matter, dirt, grease and other surface contaminants.

3.03. MANUFACTURER'S SERVICES:

The services of a factory-trained, qualified manufacturer's service representative shall be provided for not less than one 8-hour day to assist in installation of the precast concrete utility building, to assure that the installation is in accordance with the manufacturer's recommendations.

END OF SECTION

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SECTION 26 32 13

PACKAGED PROPANE ENGINE GENERATOR 60KW

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

A. This Section includes packaged gas-engine generator sets with the following features and accessories:

1. Battery charger.
2. Engine-generator set.
3. Muffler.
4. Exhaust piping external to set.
5. Radiator.
6. Remote stop switch.
7. Starting battery.

B. Related Sections include the following:

1. Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.03 DEFINITIONS:

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

B. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth, expressed in Hertz or cycles per second.

1.04 SUBMITTALS:

A. Product Data: Include the following:

1. Data on features, components, accessories ratings, and performance.
2. Thermal damage curve for generator.
3. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Welding certificates.

D. Manufacturer Seismic Qualification Certification: Submit certification that engine-generator set, batteries, battery racks, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For Installer and manufacturer.

F. Certified summary of prototype-unit test report.

G. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.

H. Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for sensitive loads.

I. Test Reports:

1. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
2. Report of sound generation.
3. Report of exhaust emissions showing compliance with applicable regulations.
4. Field quality-control test reports.

J. Certification of Torsional Vibration Compatibility: Comply with NFPA 110.

K. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Manuals," include the following:

1. List of tools and replacement items recommended to be stored at the Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

L. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE:

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

D. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

E. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged generator sets and are based on the specific system indicated.

F. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX for welding exhaust system piping.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Comply with NFPA 37.

I. Comply with NFPA 70.

J. Comply with NFPA 99.

K. Comply with NFPA 110 requirements for Level 2 emergency power supply system.

L. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

M. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.06 COORDINATION:

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.07 WARRANTY:

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

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

1.08 MAINTENANCE SERVICE:

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization.

Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Maintenance agreements shall include parts and supplies as used in manufacture and installation of original equipment.

1.09 EXTRA MATERIALS:

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

1. Fuses: One for every 10 of each type and rating, but not less than one of each.
2. Indicator Lamps: Two for every six of each type used, but not less than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

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

1. Caterpillar; Engine Div.
2. Kohler Co; Generator Division.
3. Approved equal

2.02 ENGINE-GENERATOR SET:

A. Packaged engine-generator set shall be a coordinated assembly of compatible components.

B. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing.

C. Output Connections: Three phase, Four wire.

D. Safety Standard: Comply with ASME B15.1.

E. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, and model and serial number of component.

F. Fabricate engine-generator-set mounting frame and attachment of components to resist generator-set movement during a seismic event when generator-set mounting frame is anchored to building structure.

G. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components.

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

2.03 GENERATOR-SET PERFORMANCE:

A. Steady-State Voltage Operational Bandwidth: 4 percent of rated output voltage from no load to full load.

B. Steady-State Voltage Modulation Frequency: Less than 1 Hz.

C. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.

D. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.

E. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

F. Transient Frequency Performance: Less than 5 percent variation for a 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.

G. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. The telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

H. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, the system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.

I. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.04 SERVICE CONDITIONS:

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

1. Ambient Temperature: -5 to 104 deg F.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 feet (300 m).

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

None .

2.05 ENGINE:

A. Rated Engine Speed: 1800 rpm.

B. Fuel: Propane.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).

D. Lubrication System: The following items are mounted on engine or skid:

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

E. Engine Fuel System:

1. LP-Gas (Vapor-Withdrawal) System:

a. Carburetor.
b. Secondary Gas Regulators: One for each fuel type.
c. Fuel-Shutoff Solenoid Valves: One for each fuel source.
d. Flexible Fuel Connectors: One for each fuel source.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 2 equipment for heater capacity.

G. Governor: Adjustable isochronous, with speed sensing.

2.06 ENGINE COOLING SYSTEM:

A. Horizontal air discharge. Unit is rated for specified coolant.

1. Radiator Core Tubes: Nonferrous-metal construction other than aluminum.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Fan: Driven by multiple belts from engine shaft or totally enclosed electric motor with sealed bearings.

B. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

C. Radiator: Rated for specified coolant.

D. Description: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

E. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

F. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

G. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

1. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

H. Coolant piping external to engine-generator set. Use ASTM B 88, Type L (ASTM B 88M, Type B) copper tubing with brazed joints, sized as recommended by engine manufacturer. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation and joint construction.

2.07 ENGINE EXHAUST SYSTEM:

A. Muffler: Critical type, sized as recommended by engine manufacturer; sound level measured at a distance of 10 feet (3 m) from exhaust discharge shall be 85 dBA or less.

B. Condensate Drain for Muffler: Schedule 40, black steel pipe connected to muffler drain outlet through a petcock.

C. Connection from Engine to Exhaust System: Flexible section of corrugated stainless-steel pipe.

D. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liner.

E. Exhaust Piping External to Engine: ASTM A 53/A 53M, Schedule 40, welded, black steel, with welded joints and fittings.

2.08 COMBUSTION-AIR INTAKE:

A. Description: Heavy-duty, engine-mounted air cleaner with replaceable dry filter element and "blocked filter" indicator.

2.09 STARTING SYSTEM:

A. Description: electric, with negative ground and including the following items:

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Environmental Conditions" Paragraph in "Service Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: 60 seconds.
4. Battery: Adequate capacity within ambient temperature range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C

to prevent overcharging at high temperatures and undercharging at low temperatures.

c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.

d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.10 CONTROL AND MONITORING:

A. Functional Description: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of the generator set. When mode-selector switch is switched to the on position, the generator set starts. The off position of the same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set.

B. Functional Description: Switching on-off switch on the generator control panel to the on position starts the generator set. The off position of the same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set.

C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

D. Indicating and protective devices and controls shall include those required by NFPA 110 for a Level 2 system, and the following:

E. Indicating and Protective Devices and Controls:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.

8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Start-stop switch.
11. Overspeed shutdown device.
12. Coolant high-temperature shutdown device.
13. Coolant low-level shutdown device.
14. Oil low-pressure shutdown device.
15. Generator overload.

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

G. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 16 Section "Electrical Power Monitoring and Control."

H. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 2 systems. Include necessary contacts and terminals in control and monitoring panel.

I. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.

1. Engine high-temperature shutdown.
2. Lube-oil low-pressure shutdown.
3. Overspeed shutdown.
4. Remote emergency-stop shutdown.
5. Engine high temperature prealarm.
6. Lube-oil low-pressure prealarm.
7. Low coolant level.
8. Overcrank shutdown.
9. Coolant low-temperature alarm.
10. Control switch not in auto position.
11. Battery-charger malfunction alarm.
12. Battery low-voltage alarm.

J. Remote Alarm Annunciator: Comply with NFPA 99. Labeled LED shall identify each alarm event. Common audible signal shall sound for alarm conditions. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

K. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.11 GENERATOR OVERCURRENT AND FAULT PROTECTION:

A. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with NEMA AB 1 and UL 489.

1. Tripping Characteristic: Designed specifically for generator protection.
2. Trip Rating: Matched to generator rating.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

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

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

C. Ground-Fault Indication: Comply with NFPA 70, Article 700-7(d). Integrate ground-fault alarm indication with other generator-set alarm indications.

2.12 GENERATOR, EXCITER, AND VOLTAGE REGULATOR:

A. Comply with NEMA MG 1 and specified performance requirements.

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

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

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

F. Excitation shall use no slip or collector rings, or brushes, and shall be arranged to sustain generator output under short-circuit conditions as specified.

G. Enclosure: Drip proof.

H. Instrument Transformers: Mounted within generator enclosure.

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

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

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

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

L. Sub transient Reactance: 12 percent, maximum.

2.13 FINISHES:

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

2.14 SOURCE QUALITY CONTROL:

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

1. Tests: Comply with NFPA 110, Level 1 energy converters in Paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2.
2. Generator Tests: Comply with IEEE 115.
3. Components and Accessories: Items furnished with installed unit that are not identical to those on tested prototype shall have been factory tested to demonstrate compatibility and reliability.

PART 3 - EXECUTION

3.01 EXAMINATION:

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

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

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

3.02 CONCRETE BASES:

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 Section "Basic Electrical Materials and Methods," and concrete materials and installation requirements are specified in Division 3.

3.03 INSTALLATION:

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

B. Install packaged engine generators level on concrete base.

1. Vibration Isolation: Mount packaged engine generators on rubber pads or restrained spring isolators. Vibration isolation devices and installation requirements shall be per the manufacturers recommendations.

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

D. Install cooling-system piping, accessories, hangers and supports, and anchors for complete installation.

1. Hanger, support, and anchor devices are specified in Division 22 Section "Hangers and Supports." Comply with requirements below for maximum spacing of supports.
2. Install the following pipe attachments:

a. Adjustable steel clevis hangers for individual horizontal piping less than 20-feet long.
b. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
c. Spring hangers to support vertical runs.

3. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

    a. NPS 1 and Smaller: Maximum span, 7-feet; minimum rod size, ¼-inch.
    b. NPS 1-1/2: Maximum span, 9-feet; minimum rod size, 3/8-inch.
    c. NPS 2 and Larger: Maximum span, 10 feet; minimum rod size, 3/8-inch.

4. Support cooling-system piping with pipe hangers spaced horizontally and at each floor vertically. Pipe hangers are specified in Division 22 Section "Hangers and Supports."
5. Restrain cooling-system piping with cable-type bracing assemblies
6. Extend drain piping from heat exchangers to point of disposition.

E. Install exhaust-system piping. Extend to point of termination outside structure. Size piping according to manufacturer's written instructions.

1. Install condensate drain piping for engine exhaust system. Extend drain piping from low points of exhaust system and from muffler to condensate traps and to point of disposition.
2. Restrain exhaust piping and mufflers with cable-type bracing assemblies

F. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.04 CONNECTIONS:

A. Piping installation requirements are specified in Division 22 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

1. Install fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
2. Connect cooling-system water supply and drain piping to gas-engine heat exchangers. Install flexible connectors at connections to engine generator and remote radiator.
3. Connect fuel piping to engines with a gate valve and union.
    a. Natural- and LP-gas piping, valves, and specialties for gas distribution outside the building are specified in Division 33.

4. Connect exhaust-system piping to engines.

B. Ground equipment according to Division 26 Section "Grounding and Bonding."

C. Connect wiring according to Division 26 Section "Conductors and Cables."

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 IDENTIFICATION:

A. Identify system components according Division 26 Section “Electrical Identification."

3.06 FIELD QUALITY CONTROL:

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.15.2.1 and 7.22.1 (except for vibration baseline test). Certify compliance with test parameters.
2. Perform tests recommended by manufacturer.
3. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, the following:

    a. Single-step full-load pickup test.

4. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

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

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

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

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

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

E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

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

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

H. Remove and replace malfunctioning units and reinspect as specified above.

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

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

3.07 STARTUP SERVICE:

A. Engage a factory-authorized service representative to perform startup service.

B. Inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

C. Complete installation and startup checks according to manufacturer's written instructions.

3.08 DEMONSTRATION:

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 01 Section "Project Closeout."

1. Coordinate this training with that for transfer switches.

END OF SECTION

SECTION 26 36 00

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes automatic transfer switches rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Single-Line Diagram: Show connections between transfer switch, power sources, and load.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For transfer switches, accessories, and components, from manufacturer.

B. Source quality control reports.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 99.

D. Comply with NFPA 110.

E. Comply with UL 1008 unless requirements of these Specifications are stricter.

F. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

G. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

H. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

I. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

J. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

K. Neutral Switching: Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

L. Neutral Terminal: Solid and fully rated unless otherwise indicated.

M. Battery Charger: For generator starting batteries.

1. Float type rated 10 A.

2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

N. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed tape or shrinkable sleeve markers at terminations. Color-coding and wire and cable markers are specified in Section 26 05 53 "IDENTIFICATION FOR ELECTRICAL SYSTEMS."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
4. Accessible via front access.

O. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 MOLDED-CASE-TYPE AUTOMATIC TRANSFER SWITCHES

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

1. Caterpillar, Inc.; Electric Power Division.
2. Kohler Power Systems.
3. Approved equal

B. Comply with Level 2 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using contactor-based components are acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Hard-drawn copper, 98 percent conductivity.
6. Main and Neutral Lugs: Mechanical type.
7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

F. Transfer Switches Based on Molded-Case-Switch Components: Comply with UL 489 and UL 869A.

G. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.
2. Under-voltage Sensing for Each Phase of Normal and Alternative Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained under-voltage of standby source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and standby-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Standby Power Supervision: Red light with nameplate engraved "Standby Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to standby power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is unavailable.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

B. Prepare test and inspection reports.

1. For each of the tests required by UL 1008, performed on representative devices, for standby systems. Include results of test for the following conditions:

    a. Overvoltage.
    b. Under-voltage.
    c. Loss of supply voltage.
    d. Reduction of supply voltage.
    e. Alternative supply voltage or frequency is at minimum acceptable values.
    f. Temperature rise.
    g. Dielectric voltage-withstand; before and after short-circuit test.
    h. Overload.
    i. Contact opening.
    j. Endurance.
    k. Short circuit.
    l. Short-time current capability.
    m. Receptacle withstand capability.
    n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch (if furnished): Anchor to floor by bolting.

1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
3. Provide workspace and clearances required by NFPA 70.

B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

C. Identify components according to Section 26 05 53 "IDENTIFICATION FOR ELECTRICAL SYSTEMS."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, control, and communication requirements of transfer switches as recommended by manufacturer.

B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 26 05 26 "GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS."

E. Route and brace conductors according to manufacturer's written instructions. Do not obscure manufacturer's markings and labels.

F. Final connections to equipment shall be made with liquid-tight, flexible metallic conduit no more than 18 inches in length.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual and Mechanical Inspection:

    a. Compare equipment nameplate data with Drawings and Specifications.
    b. Inspect physical and mechanical condition.
    c. Inspect anchorage, alignment, grounding, and required clearances.
    d. Verify that the unit is clean.
    e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    f. Verify that manual transfer warnings are attached and visible.
    g. Verify tightness of all control connections.
    h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

        1) Use of low-resistance ohmmeter.
        2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.

    i. Perform manual transfer operation.
    j. Verify positive mechanical interlocking between normal and alternate sources.
    k. Perform visual and mechanical inspection of surge arresters.
    l. Inspect control power transformers.

        1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
        2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
        3) Verify correct functioning of draw-out disconnecting contacts, grounding contacts, and interlocks.

2. Electrical Tests:

    a. Perform insulation-resistance tests on all control wiring with respect to ground.
    b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
    c. Verify settings and operation of control devices.
    d. Calibrate and set all relays and timers.
    e. Verify phase rotation, phasing, and synchronized operation.
    f. Perform automatic transfer tests.
    g. Verify correct operation and timing of the following functions:

1) Normal source voltage-sensing and frequency-sensing relays.
2) Engine start sequence.
3) Time delay on transfer.
4) Alternative source voltage-sensing and frequency-sensing relays.
5) Automatic transfer operation.
6) Interlocks and limit switch function.
7) Time delay and retransfer on normal power restoration.
8) Engine cool-down and shutdown feature.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

   a. Check for electrical continuity of circuits and for short circuits.
   b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
   c. Verify that manual transfer warnings are properly placed.
   d. Perform manual transfer operation.

4. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.

   a. Simulate power failures of normal source to automatic transfer switches and retransfer from standby source with normal source available.
   b. Simulate loss of phase-to-ground voltage for each phase of normal source.
   c. Verify time-delay settings.
   d. Verify pickup and dropout voltages by data readout or inspection of control settings.
   e. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
   f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

   a. Verify grounding connections and locations and ratings of sensors.

B. Coordinate tests with tests of generator and run them concurrently.

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

D. Transfer switches will be considered defective if they do not pass tests and inspections.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Coordinate this training with that for generator equipment.

END OF SECTION

SECTION 33 32 13

SELF-PRIMING WASTEWATER PUMPING EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specification includes, but is not limited to, furnishing and installing factory built simplex base mounted pump assemblies as indicated on the project drawings, herein specified, as necessary for proper and complete performance.

1.02 RELATED WORK:

A. Precast utility building is included in Division 13.

B. Concrete and concrete reinforcement is included in Division 3.

C. Electrical work except as specified herein is included in Division 26.

D. Painting is included in Division 9.

E. Process integration is included in Division 40.

1.03 SYSTEM DESCRIPTION:

A. Contractor shall furnish and install two factory-built base mounted, pump assemblies. The station shall be complete with all equipment specified herein, factory assembled on steel bases.

B. Principal items of equipment shall include horizontal, self-priming, centrifugal sewage pumps, horizontal v-belt drives, motors, and valves.

C. Factory built pump assembly design, including materials of construction, pump features, valves and piping, and motors shall be in accordance with requirements listed under PART 2 - PRODUCTS of this section.

1.04 QUALITY ASSURANCE:

A. The pumps and pump assembly manufacturer must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.

B. The pump and pump assembly manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices,

technological advances, promoting environmental awareness and continual improvement.

C. Upon request from the engineer, the pump assembly manufacturer shall prove financial stability and ability to produce the station within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.

D. Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. “Reverse-engineered” products fabricated to substantially duplicate the design of original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.

E. The term “pump manufacturer” or “pump assembly manufacturer” shall be defined as the entity which designs, machines, assembles, hydraulically tests and warranties the final product. Any entity that does not meet this definition will not be considered a “pump manufacturer” or “pump assembly manufacturer” and is not an acceptable supplier. For quality control reasons and future pump and parts availability, all major castings of the pump shall be sourced and machined in North America.

F. Pump Performance Certifications

1. All internal passages, impeller vanes, and recirculation ports shall pass a 3" spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance shall not be permitted. Upon request from the engineer, manufacturer’s certified drawings showing size and location of the recirculation port(s) shall be submitted for approval.

    a. Consideration shall be given to the sanitary sewage service anticipated, in which debris is expected to lodge between the suction check valve and its seat, resulting in the loss of the pump suction leg, and siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal, and the pump must be capable of automatic, unattended operation with an air release line installed.

    b. During unattended operation, the pump shall retain adequate liquid in the casing to insure automatic repriming while operating at its rated speed in a completely open system. The need for a suction check valve or external priming device shall not be required.

    c. Pump must reprime 15 vertical feet at the specified speed and impeller diameter. Reprime lift is defined as the static height of the pump suction above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must reprime and deliver full

capacity within five minutes after the pump is energized in the reprime condition. Reprime performance must be confirmed with the following test set-up:

1) A check valve to be installed downstream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.

2) A length of air release pipe shall be installed between pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump assembly fitted with an air release valve.

3) The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a 2 feet minimum horizontal run, a 90 degree elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.

4) Impeller clearances shall be set as recommended in the pump service manual.

5) Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.

6) Liquid to be used for reprime test shall be water.

d. Upon request from the engineer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

G. Certified Pump Performance Test

1. Tests shall be conducted using a dynamometer in accordance with Hydraulic Institute Standards (ANSI/HI) 14.6.3.4 acceptance grade 2B. A minimum of five test points shall be measured. Test point data shall include flow, head, pump shaft input speed and torque. Efficiency and horsepower shall be calculated using the measured test point data. Performance test data evaluation shall be in accordance with ANSI/HI 14.6.3.4.2.

H. Factory System Test

1. All components including the pumps, motors, valves, and piping will be tested as a complete working system at the manufacturer's facility. Tests shall be conducted in accordance with Hydraulic Institute Standards at the specified head and capacity per acceptance grade 2B. Factory operational test shall duplicate actual performance anticipated for the complete station.

2. Upon request from the engineer, the operational test may be witnessed by the engineer, and/or representatives of his choice, at the manufacturer's facility.

I. The manufacturer’s technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.05 REFERENCES:

The latest editions of the following standards form a part of this specification:

A. Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.

1. American National Std. Institute (ANSI) / American Water Works Assoc. (AWWA)

a. ANSI B16.1 Cast iron pipe flanges and flanged fittings.

b. ANSI/AWWA C115/A21.51 Cast/ductile iron pipe with threaded flanges.

c. ANSI 253.1 Safety Color Code for Marking Physical Hazards.

d. ANSI B40.1 Gages, Pressure and Vacuum.

e. AWWA C508 Single Swing Check Valves.

2. American Society for Testing and Materials (ASTM)

a. ASTM A48 Gray Iron Castings.

b. ASTM A126 Valves, Flanges, and Pipe Fittings.

c. ASTM A307 Carbon Steel Bolts and Studs.

d. ASTM A36 Structural Steel.

3. Institute of Electrical and Electronics Engineers (IEEE)

a. ANSI/IEEE Std 100 Standard Dictionary of Electrical Terms.

b. ANSI/IEEE Std 112 Test Procedure for Polyphase Induction Motors.

c. IEEE Std 242 Protection of Industrial and Control Power Systems.

4. National Electric Code (NEC) / National Electrical Manufacturers Assoc. (NEMA)

    a. NEC National Electric Code.

    b. NEC 701 National Electric Code article 701.

    c. NEMA Std MG1 Motors and Generators.

5. Miscellaneous References

    a. TR-16, Guides for the Design of Wastewater Treatment Works.

    b. Env-Wq 700, New Hampshire Code of Administrative Rules, Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities.

    c. RSA 155, New Hampshire Building Code.

    d. Hydraulic Institute Std for Centrifugal, Rotary and Reciprocating Pumps.

    e. NMTBA and JIC Std. National Machine Tool Builders Association and Joint Industrial Council Standards.

1.06 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Product Data

1. Prior to fabrication, pump assembly manufacturer shall submit submittal data in portable document format (.pdf) form and two (2) paper copies for review and approval.

2. Submittal shall include shop drawings, and support data as follows: Catalog cuts sheets reflecting characteristics for major items of equipment, materials of construction, major dimensions, motor and v-belt drive data, pump characteristic curves showing the design duty point capacity (GPM), head (FT), net positive suction head required (NPSHr), and hydraulic brake horsepower (BHP). Electrical components used shall be fully described.

B. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for pump base. Contractor piping connections and station access clearances shall be dimensioned relative to the assembly centerline. Electric motor data shall be provided to extent necessary to validate function and integration of circuits to form a complete working system.

C. Operations Maintenance Manuals

3. Installation shall be in accordance with written instructions provided by the pump assembly manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.

4. Documentation shall be specific to the pump assembly supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:

   a. Functional description of each major component, complete with operating instructions.

   b. Instructions for operating pumps in all modes of operation.

   c. Calibration and adjustment of equipment for initial start-up, replacement of components, or as required for routine maintenance.

   d. Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.

   e. Mechanical layout drawing of the pump base and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves and piping.

5. Operation and maintenance instructions which rely on vendor cut-sheets and literature which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications

1.07 DELIVERY, STORAGE, AND HANDLING:

A. Ship equipment and material complete except where partial disassembly is required by transportation regulations or for protection of components.

B. Receive, store, and safeguard equipment and materials at the job site.

1.08 MANUFACTURER'S WARRANTY:

A. The pump assembly manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

1. All other equipment, apparatus, and parts furnished shall be warranted for sixty (60) months, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O rings, etc. The pump assembly manufacturer shall be solely responsible for warranty of the station and all components.

B. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

C. It is not intended that the station manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.

D. Equipment supplied by others and incorporated into a pump assembly is not covered by this limited warranty. Any warranty applicable to equipment selected or supplied by others will be limited solely to the warranty, if any, provided by the manufacturer of the equipment.

E. This limited warranty shall be valid only when installation is made and use and maintenance is performed in accordance with manufacturer recommendations. A start-up report competed by an authorized manufacturer's representative must be received by manufacturer within thirty (30) days of the initial date the unit is placed into service. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment from the factory, whichever occurs first.

PART 2 – PRODUCTS

2.01 UNITARY RESPONSIBILITY

A. The pump assembly system integrator must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.

B. In order to unify responsibility for proper operation of the complete pumping station, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source). The pumping station must be of standard catalog design, totally warranted by the manufacturer. Under no

circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.

2.02 MANUFACTURER

A. The specifications and project drawings depict equipment and materials manufactured by The Gorman-Rupp Company which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.

B. In event the contractor obtains engineer's approval for equipment other than that manufactured by the Gorman-Rupp Company, the contractor shall, at his own expense, make all resulting changes to the buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating all changes required for the substituted equipment shall be submitted to the engineer prior to acceptance.

C. Manufacturer shall be Gorman-Rupp Company, Vaughan Company, or approved equal.

2.03 PUMP PERFORMANCE

A. Pumps shall be designed to meet the operating conditions provided in the following table:

#	Description	Value	Units
1.	Type of Pump	Self-Priming Centrifugal	
2.	Number of pumps	2	-
3.	Suction Size	4	IN
4.	Discharge Size	4	IN
5.	Motor Starter type	VFD	-
6.	Design Point #1: Flow capacity per pump	400	GPM
7.	Design Point #1: Total dynamic head	84	FT
8.	Min. efficiency at Design Point #1	45.5	%
9.	Design Point #2: Flow capacity per pump	300	GPM
10.	Design Point #2: Total dynamic head	68	FT
11.	Min. efficiency at Design Point #2	42.0	%
12.	Design Point #3: Flow capacity per pump	200	GPM
13.	Design Point #3: Total dynamic head	56	FT
14.	Min. efficiency at Design Point #3	34.5	%
15.	Max. Net Positive Suction Head Required	9.0	FT
16.	Max. re-priming static lift	15.0	FT
17.	Min. passable spherical solid diameter	3	IN
18.	Max. motor size	25	HP
19.	Max. motor speed	1,800	RPM

20.	Available power supply	480 V / 3 PH / 4 W	-

2.04 PUMP DESIGN

A. Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL of this section.

B. The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

C. Materials and Construction Features

1. Pump casing shall be cast iron Class 30 with integral volute scroll. Casing shall incorporate following features:

a. Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.

b. Fill port cover plate, 3 1/2" diameter, shall be opened after loosening a hand nut/clamp bar assembly. In consideration for safety, hand nut threads must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.

c. Casing drain plug shall be at least 1 1/4" NPT to insure complete and rapid draining.

d. Liquid volume and recirculation port design shall be consistent with performance criteria listed under PART 1 - GENERAL of this section.

2. Cover plate assembly shall be cast iron Class 30. Design must incorporate following maintenance features:

a. A lightweight inspection cover plate, retained by acorn nuts, for access to pump interior for removal of stoppages. Designs that require removal of complete cover plate assembly for access to the impeller will not be accepted.

b. Retained by acorn nuts for complete access to pump interior. Back cover plate removal must allow service to the impeller, seal, wear plate or check valve without removing suction or discharge piping. Back cover plate shall incorporate an obstruction free flow path by combining four support posts into a two-point “webbed” plate design for increased durability, reduced clogging, and increased operational efficiency.

c. Aggressive Self-Cleaning Wear Plate

1) A replaceable wear plate secured to the back cover plate by studs and nuts. Wear plate shall be self-cleaning design ensuring that debris is cleared away and does not collect on the impeller vanes.

2) The nature of the conveyed medium poses significant challenges to the continuous operation of the pump. Of particular concern is the clogging of the impeller by debris in the pumped medium including but not limited to long rags, fibers, and like debris which are able to wrap around the impeller vanes, stick to the center of the vanes or hub, or lodge within the spaces between the impeller and the housing.

3) The aggressive self-cleaning wear plate shall have integral laser cut notches and grooves in combination with a "tooth" designed to disturb and dislodge any solids which might otherwise remain on the impeller in dynamic operation. Wear plate is designed to constantly and effectively clear the eye of the impeller without the use of blades or cutters.

d. In consideration for safety, a pressure relief valve shall be supplied in the inspection cover plate. Relief valve shall open at 75-200 PSI.

e. One O-ring of Buna-N material shall seal inspection cover plate to back cover plate.

f. Two O-rings of Buna-N material shall seal back cover plate to pump casing.

g. Pusher bolt capability to assist in removal of inspection cover plate or back cover plate. Pusher bolt threaded holes shall be sized to accept same retaining cap screws as used in rotating assembly.

h. Easy-grip handle shall be mounted to face of inspection cove plate.

3. Rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, seal plate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate following features:

a. Seal plate and bearing housing shall be cast iron Class 30. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil.

1) The bearing cavity shall have an oil level sight gauge and fill plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug

check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.

2) The seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.

3) Double lip seal shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.

b. Impeller shall be ductile iron, two-vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lock screw and conical washer.

c. Shaft shall be AISI 4140 alloy steel unless otherwise specified by the engineer, in which case AISI 17-4 pH stainless steel shall be supplied.

d. Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.

e. Shaft seal shall be cartridge oil lubricated mechanical type. The stationary and rotating seal faces shall be tungsten titanium carbide alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design; an external O-ring secures the stationary seat to the seal plate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be Viton; cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seal shall be warranted in accordance with requirements listed under PART 1 - GENERAL of this section.

f. Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same cap screws as used for retaining rotating assembly.

4. Adjustment of the impeller face clearance (distance between impeller and wear plate) shall be accomplished by external means.

a. Clearances shall be maintained by a four-point external shimless cover plate adjustment system, utilizing a four collar and four adjusting screw design allowing for incremental adjustment of clearances by hand as required. Each of the four points shall be lockable to prevent inadvertent clearance increases or decreases due to equipment vibration or accidental operator contact. The four-

point system also allows for equal clearance gaps at all points between the impeller and wear plate. Requirement of realignment of belts, couplings, etc., shall not be acceptable. Cover plate shall be capable of being removed without disturbing clearance settings. Clearance adjustment systems that utilize less than four points will not be considered.

b. There shall be provisions for additional clearance adjustment in the event that adjustment tolerances have been depleted from the cover plate side of the pump. The removal of stainless steel shims from the rotating assembly side of the pump shall allow for further adjustment as described above

c. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.

5. Suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the cover plate opening, without disturbing the suction piping. Sole function of check valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.

6. Spool flanges shall be one-piece cast iron, class 30 fitted to suction and/or discharge ports. Each spool shall have one 1-1/4" NPT and one 1/4" NPT tapped hole with pipe plugs for mounting gauges or other equipment.

D. Serviceability

1. The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs by incorporating the following features.

a. No special tools shall be required for replacement of any components within the pump.

E. Pump Drain Kit

1. The pump drain kit shall consist of a 10' length of plastic hose with a quick connect female Kamlock fitting on one end of hose and two sets of fittings for pump drains. Each set of fittings for pump drain includes a stainless steel pipe nipple, stainless steel bushing, stainless steel ball valve and an aluminum quick connect male Kamlock fitting.

F. Spare Parts Kit

1. There shall be furnished with the pump assembly the following minimum spare parts:

a. One spare pump mechanical seal (complete), and with it all gaskets, seals, sleeves, O rings, and packing required to be replaced during replacement of the seal.

b. One set of impeller clearance adjustment shims.

c. One set cover plate O ring.

d. One rotating assembly O ring.

2.05 UNIT BASE

A. The unit base shall be comprised of structural steel with a perimeter flange and reinforcements. Perimeter flange and reinforcements shall be designed to prevent flexing or warping under operating conditions. Perimeter flange shall be drilled for hardware used to secure unit base to concrete pad as shown on the contract drawings. Unit base shall contain provisions for lifting the complete pump assembly unit during shipping and installation.

2.06 VALVES AND PIPING

A. Each pump shall be equipped with a full flow type check valve capable of passing a 3" spherical solid. Valve shall be constructed with flanged ends and fitted with an external lever and torsional spring. Valve seat shall be constructed of stainless steel, secured to the body to ensure concentricity, sealed by an O ring, and shall be replaceable. The valve body shall be cast iron incorporating a clean out port large enough to allow removal and/or replacement of the valve clapper without removing valve or piping from the line. Valve clapper shall have a molded neoprene seating surface incorporating low pressure sealing rings. Valve hinge pin and internal hinge arm shall be stainless steel supported on each end in brass bushings. Shaft nut shall have double O rings which shall be shall be easily replaceable without requiring access to interior of valve body. All internal hardware shall be stainless steel. Valve shall be rated at 175 PSI water working pressure, 350 PSI hydrostatic test pressure. Valves other than full flow type or valves mounted in such a manner that prevents the passage of a 3" spherical solid shall not be acceptable.

B. Each pump shall be equipped with a plug valve. Plug valves shall be of the non-lubricated rectangular port; resilient-seated eccentric type with neoprene faced plugs and shall be furnished with flanged joint ends. Flanged valves shall be faced and drilled to ANSI B 16.1 Class 125. Valve bodies and plugs shall made be of ASTM A 126, Class B cast-iron. Valves shall have ports designed to pass spherical solids equal to the pump's capacity. All exposed nuts, bolts, springs, washers, etc., shall be zinc plated. Resilient plug facings shall be neoprene suitable for use with sewage. Valves shall be furnished with corrosion resistant seats, which comply with AWWA Standard C507 and with AWWA Standard C504. Valve shaft seals shall comply with AWWA Standard C507, and with AWWA C504 and shall be

replaceable without valve or gear disassembly. Valves shall provide drip-tight shutoff up to the full pressure rating. All valves shall be hydrostatically pressure tested at 175 psi by the manufacturer. All valves shall be 100% full port design. All valves shall be operated with a single lever actuator providing lift, turn, and reseat action. The lever shall be equipped with a locking device to hold the plug in the desired position.

C. Manufacturer to review contract drawings for piping and valve layout at each station.

D. Automatic Air Release Valves

1. An automatic air release valve shall be furnished for each pump designed to permit the escape of air to the atmosphere during initial priming or unattended repriming cycles. Upon completion of the priming cycle or repriming cycle, the valve shall close to prevent recirculation. Valves shall provide visual indication of valve closure, and shall operate solely on discharge pressure. Valves which require connection to the suction line shall not be acceptable.

2. All valve parts exposed to sewage shall be constructed of cast iron, stainless steel, or similar corrosion resistant materials. Diaphragms, if used, shall be of fabric reinforced neoprene or similar inert material.

3. A cleanout port, three inches in diameter, shall be provided for ease of inspection, cleanout, and service.

4. Valves shall be field adjustable for varying discharge heads.

5. Connection of the air release valves to the station piping shall include stainless steel fittings.

E. Gauge Kit

1. Each pump shall be equipped with a glycerin filled compound gauge to monitor suction pressures, and a glycerin filled pressure gauge to monitor discharge pressures. Gauges shall be a minimum of 4 inches in diameter, and shall be graduated in feet water column. Rated accuracy shall be 1 percent of full-scale reading. Compound gauges shall be graduated 34 feet to +34 feet water column minimum. Pressure gauges shall be graduated 0 to 140 feet water column minimum.

2. Gauges shall be mounted on a resilient panel and frame assembly which shall be firmly secured to pumps or piping. Gauge installations shall be complete with all hoses and stainless steel fittings, and shall include a shutoff valve installed in each gauge inlet at the point of connection to suction and discharge pipes.

F. Piping

1. Flanged header pipe shall be centrifugally cast, ductile iron, complying with ANSI/AWWA A21.51/C115 and class 53 thickness.

2. Flanges shall be cast iron class 125 and Comply with ANSI B16.1.

3. Pipe and flanges shall be threaded and suitable thread sealant applied before assembling flange to pipe.

4. Bolt holes shall be in angular alignment within 1/2o between flanges. Flanges shall be faced with a gasket finish.

G. Supports

1. Contractor must ensure all pipes connected to the pump assembly are supported to prevent piping loads from being transmitted to pumps or station piping. Pump assembly discharge force main piping shall be anchored with thrust blocks where shown on the contract drawings.

2.07 DRIVE UNIT

A. Motors

1. Pump motors shall be 25 HP, 3 phase, 60 hertz, 480 VAC, horizontal ODP, 1800 RPM, NEMA design B with cast iron frame with copper windings, induction type, with class F insulation and 1.15 SF for normal starting torque and low starting current characteristics, suitable for continuous service. The motors shall not overload at the design condition or at any head in the operating range as specified.

2. Motors shall be tested in accordance with provisions of ANSI/IEEE Std 112.

B. Drive Transmission

1. Power to pumps transmitted V-belt drive assemblies. The sheave/belt combination shall provide the speed ratio needed to achieve the specified pump operating conditions.

2. Each drive assembly shall utilize at least two V-belts providing minimum a combined safety factor of 1.5. Single belt drives or systems with a safety factor of less than 1.5 are not acceptable. Computation of safety factors shall be based on performance data published by the drive manufacturer.

3. Precise alignment tolerances of the drive assemblies shall be achieved by means of a belt/sheave laser alignment system resulting in the reduction of vibration, accelerated wear, and premature failure.

4. The pump manufacturer shall submit power transmission calculations which document the following:

    a. Ratio of pump/motor speed.

    b. Pitch diameter of driver and driven sheaves.

    c. Number of belts required per drive.

    d. Theoretical horsepower transmitted per belt, based on vendor's data.

    e. Center distance between pump and motor shafts.

    f. Arc-length correction factor applied to theoretical horsepower transmitted.

    g. Service factor applied to established design horsepower.

    h. Safety factor ratio of power transmitted/brake horsepower required.

C. Belt Guards

1. Pump drive to be enclosed on all sides by a guard constructed of fabricated steel or combination of materials including expanded, perforated, or solid sheet metal. No opening to a rotating member shall exceed 1/2 inch.

2. Guards must be completely removable without interference from any unit component, and shall be securely fastened and braced to the unit base.

3. Metal to be free from burrs and sharp edges. Structural joints shall be continuously welded. Rivet spacing on panels shall not exceed five inches. Tack welds shall not exceed four inch spacing.

4. The guard shall be finished with one coat of gray W.R. non-lift primer and one coat of orange acrylic alkyd W.R. enamel in accordance with section 3, Color Definitions of ANSI 253.1; Safety Color Code for Marking Physical Hazards.

2.09 FINISH

A. Pumps, piping and exposed steel framework shall be cleaned prior to coating using an approved solvent wipe or phosphatizing cleaner. The part must thoroughly dry before paint application. Open joints shall be caulked with an approved polyurethane sealant. Exposed surfaces shall be applied with one coat of Tnemec Series 69 Polymide Epoxy Primer and one finish coat of Series 73 Aliphatic Acrylic Polyurethane for a total dry film thickness of 4-6 mils. Finish coat shall be semi-gloss white for optimum illumination and enhancement. The coating shall be corrosion, moisture, oil, and solvent resistant when completely

dry. The factory finish shall allow for over-coating and touch-up for 6 months after coating. Thereafter, it will generally require sanding to accept a topcoat or touch-up coating.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. Installation of the pump assembly and related appurtenances shall be performed in accordance with written instructions by the manufacture.

B. Contractor shall clean all surface coatings damaged in shipment or installation and touch up in field with the same materials as original coatings.

C. Install, level, align, and lubricate pump assembly as indicated on project drawings.

D. Suction pipe connections are vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.

E. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

F. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.02 FIELD ACCEPTANCE TESTS:

A. After installation, all piping shall be tested for tightness in an approved manner. Piping between the wetwell and the pump chamber shall be pressure tested after backfilling and before any structures are constructed above. Should leaks be found, faulty joints shall be repaired, even to the extent of disassembling and remaking the joints, and all defective pipe and fittings shall be removed and replaced in a manner satisfactory to the Engineer.

B. After installation of the equipment and after completion of the services of the manufacturer's representative as detailed in Section 01 14 00 SPECIAL PROVISIONS, the Contractor shall operate each unit to demonstrate its ability to pump without excessive vibration, motor overloading, or overheating. Each pump shall be operated for a sufficient period of time to permit thorough observation of all pump components.

C. The start-up and testing shall be conducted in accordance with Section 01 75 00 STARTUP AND TESTING FOR SEWER PUMP STATIONS.

1. Coordinate station start-up with manufacturer's technical representative. The representative or factory service technician will inspect the completed installation. He will calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

2. Notify Engineer in writing at least three days in advance. If testing cannot be conducted because of scheduling or lack of service personnel, Engineer's fees for second visit shall be paid by the Contractor

D. Performance tests shall be conducted on the pumping units installed. The tests shall be conducted for the operating point (flow versus head capacity), overall system efficiency, and overall system power requirements. These parameters shall be measured, documented in writing, and delivered to the Engineer.

E. Pump(s) are equipped with Variable Frequency Drives, the pump(s) shall be run at its shutoff head for a period of at least one (1) minute at each VFD speed from 60% to 100% at 10% intervals. The pump shall be run at its maximum rating point for a period of at least thirty (30) minutes.

F. All pumping equipment shall be tested to check for proper operation, proper alignment, faulty equipment, and for excessive vibration. The Contractor shall provide vibration testing by a qualified and independent testing company. This testing of the complete system shall cover all duty conditions outlined in this Section of the Specifications. The vibration testing shall be conducted in the presence of the pump and pump motor field service representatives in accordance with procedures outlined in the applicable sections of the Hydraulic Institute Standards and Section 01 75 13 EQUIPMENT CHECKOUT AND TESTING, of these specifications.

G. In the event vibration exceeds the specified limits and the cause of the vibration is attributable to the pumping equipment, the equipment manufacturers shall make the necessary balancing or alignment adjustments to bring the equipment to within the specified limits.

H. At the discretion and expense of the Owner, an independent vibration analysis may be conducted on the new wastewater pump. The Contractor and manufacturer will be permitted to witness the test.

I. The completed pump and motor installation shall be tested for sound generation in accordance with the Hydraulic Institute Standards for sound measurement from pumping equipment.

J. Any and all alterations, modifications, additions and/or work necessary to rectify defects or non-conformance with this Section of the Specification shall be done in such a manner as to provide for the satisfactory operation of the pumps and pump motors, at no additional cost to the Owner.

K. All defects or defective equipment shall be corrected or replaced promptly at the Contractor's expense.

L. All final adjustments necessary to place the equipment in satisfactory working order shall be made prior to the tests.

M. If sufficient sewage is not available for the test, the Contractor shall provide water for testing. All labor and materials necessary for the test shall be furnished by the Contractor.

END OF SECTION

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SECTION 40 95 13

CONTROL PANELS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Fabricate pump station control panel as described herein and integrate into the Owner's SCADA system. All new panel components shall be furnished and installed in accordance with these specifications and applicable standards and codes.

1. Instrumentation and Controls Supplier:

a. The Contractor's attention is directed to the fact that the instrumentation and controls are an integrated system and as such, shall be furnished by one supplier, who shall provide all of the equipment and appurtenances regardless of manufacture, and be responsible to the Contractor for satisfactory operation of the entire system. Substitutions on functions specified will not be acceptable.

b. The Owner's System Integrator is Wilson Controls, LLC, Lee, NH. The System Integrator shall configure communications between the new PLC/Control Panel and the Owner's existing SCADA system network and shall configure the Owner's existing SCADA system for proper monitoring and control of the new pump station provided in this Contract. The Contractor shall coordinate, schedule and pay for System Integrator to configure communications between the Control Panel and Owner's existing SCADA system.

B. All systems indicated in the Contract Documents shall mean all necessary supervision, labor, equipment, and materials required to provide complete, properly functioning systems.

C. Refer to Electrical and Mechanical Drawings to coordinate material and equipment locations.

D. Work Included

1. Furnish, install, configure, and program instrumentation and control systems as described and specified herein and as shown on the Contract Drawings. Provide connection to control, status indication, and alarm annunciation equipment as described herein.

2. Provide a new Pump Station Control Panel (MCP).

3. Coordinate with the manufacturers of supplied equipment for specific instrumentation and control requirements. Installation and wiring of instrumentation shall be in accordance with the manufacturer's recommendations.

4. Any deviation in instrumentation or electrical materials or methods caused by requirements of the supplied equipment will be provided at no additional cost to the OWNER.

5. Furnish and install all transducers, converters, terminals, transformers, interposing or pilot relays (for both new and existing equipment), signal transmitters, signal splitters/boosters, uninterruptible power supplies, power supply connections and other miscellaneous instrumentation required to make a complete system.

6. Furnish analog signal conditioning isolators between field instruments and control panels to protect analog signals from noise, surges, and ground loops.

7. Furnish and install all vendor or manufacturer cables and appurtenances between primary instruments and the transmitters, receiving instruments or destination terminals. All methods, materials and supplies will meet the requirements of Division 26, Division 33, and Division 40.

8. The General Contractor shall furnish and install all sleeves, bolts, inserts, equipment mounting hardware and other items to be attached to or imbedded in concrete and masonry work.

9. Provide start-up, testing and training for the entire instrumentation and control system including all new instruments and control panels.

10. Upon completion of the project, the Instrumentation System Supplier shall provide one separate 8-hour working day on-site (not including travel time) to be used upon demand of the Owner within the first year's operation. This time shall be used for service calls (not related to warranty or deficiencies in the Contract work), modifications to programming and software configuration.

C. Related Work Specified Elsewhere

1. Section 33 32 13 – Self-Priming Wastewater Pumping Equipment

2. Section 40 91 00 – Field Instruments and Equipment

3. Electrical – Division 26.

D. Related Work by Others

1. Instrumentation signal conduit and wiring, and power conduit and power wiring between panels and remote devices are furnished and installed by electrical subcontractor. The electrical contractor shall mount and power the control panels.

E. Demonstration and final Engineer-witnessed testing

1. The Owner will assume no liability or responsibility for any portions of the installation under this Contract until they are demonstrated and accepted in writing. Final demonstrations shall be made only after the Engineer is satisfied that the work has been completed in accordance with the intent of the Contract Documents.

2. After the Instrumentation and Control System is completed, the Contractor shall request that the Engineer witness a demonstration of the total system operation. If any system or piece of equipment within a system fails to function properly, rectify such defects or inadequacies, and make a final demonstration.

3. All demonstrations shall be scheduled at the convenience of the Engineer and the Owner and shall be scheduled with at least five (5) days written notice.

1.02 QUALITY ASSURANCE:

A. Owner’s standard instrumentation, controls, and SCADA equipment and components shall take precedence over the equipment and components specified in this section (40 95 13) and section 40 91 00.

B. All materials provided under this Contract shall be equal in quality, appearance, and performance to that specified herein and shall be subject to the approval of the Engineer. Verify the availability of all materials proposed to be used in the execution of the work prior to submitting same for the Engineer's approval. The discontinuance of production of any material or product after approval has been granted shall not relieve the Contractor from furnishing an Engineer approved alternate of comparable quality and design without additional cost.

C. Materials and equipment furnished under this Contract shall be standard products of manufacturers regularly engaged in manufacture of such products and shall be manufacturer's latest standard design that complies with Specification requirements. Products shall essentially duplicate material and equipment that have been in satisfactory local use at least three years.

D. The Contractor shall have supplied comparable systems to those specified herein and shall maintain engineering and service departments capable of designing and

maintaining these systems. Provide, for a period of twelve (12) months from the date of final acceptance of the work, all necessary supervision, labor, materials, and equipment, in order to correct any defects in any system due to faulty materials, equipment, installation methods, or workmanship and consequent damage resulting from such defects. This work shall be scheduled during normal working hours and at the convenience of the Owner.

E. Programming standards

1. In addition to creating and maintaining wiring diagrams, I/O schedules and PLC database mapping, the Integrator shall document all work within software programming files.

2. Documentation shall include, but not be limited to rung titles which clearly indicate function; comments for each rung used with references to paper documents; and symbolic addressing of PLC registers.

3. Integrators shall use Contract Documents tag names for instrumentation and equipment PLC symbol addressing when provided on the Drawings and in the Specifications.

4. The PLC programming code and OIT software configuration shall be considered electronic records of the work performed. All changes made in the programming shall be documented electronically with date, integrator name, and description of change.

1.03 SUBMITTALS TO THE ENGINEER

A. Shop Drawings and Samples

1. Submit Shop Drawings in accordance with Section 01 33 23 and as indicated herein.

2. Shop Drawings shall be thoroughly checked by the Contractor for compliance with the Contract Documents. Verify that all equipment and materials proposed to be furnished will fit into available space and maintain specified clearances, and that all equipment is compatible with the system operation. Provide complete equipment panel layout drawings, equipment catalog cuts, schematic wiring diagrams, point to point wiring diagrams for all systems inputting to the PLC system.

3. Shop Drawings Shall Consist of:

a. Project name and location.

b. Contractor's name and contact information.

c. Instrumentation System Supplier name and contact information.

d. Index Sheet - Listing the equipment being submitted using equipment designations, tag identification, and/or symbols, indicated on the Contract Documents together with the proposed manufacturer, style/type, and catalog number.

e. Manufacturer's scale or dimensioned drawings along with standard catalog number.

f. Drawings of panel layouts including interior and exterior components keyed to a bill of materials.

g. Wiring diagrams shall be provided showing the interfacing between field hardware and PLCs, including network switches.

h. Electrical ladder logic drawings which shall illustrate motor branch and liquid level control circuits to extent necessary to validate function and integration of circuits to form a complete working system.

4. All instrumentation and hardware shall be contained in one submission. The OIT graphical screens and PLC programming may be submitted after approval of hardware and software selections.

5. Submissions shall be in the form of individual binders, of the quantity indicated in the General Conditions. Each equipment type shall be separated by index tabs with typewritten titles.

6. Provide samples of instruments, devices, graphics, etc., within ten (10) days upon receipt of request from the Engineer.

B. Maintain properly documented and witnessed test and checkout reports, described in Section 1.01 E and 3.02, and submit these to the Engineer. Test reports should indicate each control panel component tested and checked, with initials or signature, and listing of any problems encountered. Each new or modified I/O point should be tested in the field from instrument through to the PLC and OIT software. Provide the following submittals described in Section 3.02:

1. Start-up checklist and procedure

2. Factory test reports and panel certifications

3. Contractor testing and checkout reports

4. Final start-up schedule and request for Engineer witnessed testing

C. Upon completion of the work and before request for final payment, deliver to the Engineer five (5) bound sets of full and complete directions pertaining to the operation and maintenance of all equipment and systems installed under this Contract. These directions shall be typewritten on 8-1/2" x 11" sheets neatly bound with index tabs, and shall be accompanied by plans, diagrams, etc., of the work installed, parts lists, etc., necessary for the guidance of the Owner in operating, altering or repairing the installation. Operational descriptions should include custom functional descriptions of the controller programming, list of hard-coded timers and set points, list of user-settable timers, control set points, alarm set points, and description of enable/disable functions. The descriptions should describe how to operate in automatic and manual, where applicable.

D. Provide the Owner with a list of local service departments of duly authorized distributors of materials and equipment of the type installed, which will stock the manufacturer's standard parts, etc.

E. At the completion of the installation, provide reproducible Record Drawings electronically on computer disk, accessible in AutoCAD. Also provide five (5) printed sets of each full-size Drawing indicating the final configuration of all systems as they were installed. Symbols, equipment designations, etc., shall be consistent with the Contract Documents. Provide exact locations of all work which has been concealed in concrete, masonry or underground. Submit two (2) sets of fully documented PLC programming for each controller printed and bound in 3-ring binders. Submit four (4) sets of documented programming on electronic disk. Final payment of at least 5% of the value of the work described herein will not be released until as-built drawings and documented programming has been received.

1.04 DELIVERY, STORAGE AND HANDLING:

A. Coordinate material and equipment delivery with the project schedule. Notify the Engineer immediately, in writing, if material or equipment delivery will adversely affect the project schedule, include documentation from equipment suppliers indicating the revised delivery dates and the reason for the delay.

B. Coordinate delivery of equipment directly to other vendors where instrumentation supplied under this section must be installed in panels supplied under other specification sections.

C. Exercise care during loading, transporting, unloading, and handling of materials to prevent damage.

D. Check for defective or damaged materials, and for incomplete equipment shipments within seven (7) days after equipment delivery to the project site.

E. Store materials and equipment on the construction site in enclosures or under protective covering to assure that materials and equipment are kept undamaged, clean, and dry.

F. Replace or repair, to the satisfaction of the Engineer, all materials and equipment that are defective or that have been damaged during installation, at no additional cost to the Owner.

1.05 WARRANTY:

A. The entire Instrumentation and Control System, including programming shall be warranted for one year from substantial completion of the system, as defined in Division 1. The warranty shall include the immediate (within 24 hours) response to emergency calls affecting treatment plant operations including problems and questions regarding equipment, software, and programming.

B. Warranty shall be in accordance with Division 1.

1.06 FUNCTIONAL DESCRIPTION AND EQUIPMENT:

A. General

1. The instrumentation functional descriptions provide a narrative of critical control functions and user display requirements. Any auxiliary devices such as lightning/surge protectors, relays, timers, signal isolators, signal converters etc. which are necessary to perform the functions specified and are not shown shall be provided as incidental to the project for reliable and secure operation of the instrumentation and control system.

2. Adjustments of the process variables, pump setpoints, pump on/off control or operating sequences for all pumps, valves, and related process shall be possible from the PLC via the local operator interface terminal.

B. Process Control System – General

1. All equipment will be able to be operated in Manual or Hand without the PLC operating. The pumps and equipment shall have local control stations or MCC/VFD mounted control stations for HOA, etc. Unless otherwise noted, the pumps and equipment shall be controlled by PLC and OIT in auto and virtual hand with status indicating and alarms lights.

2. All analog signals for process instrumentation shall be monitored for out-of-range or signal failure. When the signal input is below 4 mA, a signal failure alarm shall be annunciated.

3. A disagreement alarm shall be configured for each piece of equipment for which a running status feedback is provided. Configure the disagreement

alarm to annunciate when a pump or other equipment is called to run and no running status feedback is received within a set time delay, adjustable 0 to 60 seconds.

4. The Operator shall be able to enable/disable each alarm at the pump station control panel OIT.

C. Wet Well Level and Pumps

Wet well level is measured using one (1) submersible level transducer. A high-high level float switch in the wet well is used for pump backup level control (see description below).

The variable frequency drives (VFDs) for the three new pumps will have H/O/A selector switches that will allow automatic start/stop control of the pumps from the control system when in the "AUTO" position. Manual operation is performed by placing the selector switch in the "HAND" position. In “HAND” the pump speed will be controlled manually at the VFD. The VFD will provide a 4-20 mA signal to the PLC in proportion to the actual pump speed.

Automatic start/stop operations and speed control of the wet well pumps is based on measured wet well level. At the OIT screen, operators will select the level signal, or average, for use in pump control. Pump control actions are as shown on mechanical drawings.

D. Pump Backup Level Control:

The pump backup level control system shall be capable of functioning during loss of utility power and/or PLC failure. Activation of the high-high level float switch shall trip a relay which shall automatically start the standby pump and run the pump for a pre-set duration, controlled by a timer. After the timer expires, the relay shall reset.

PART 2 – PRODUCTS

2.01 ELECTRICAL CONTROL COMPONENTS:

A. Panel Enclosure:

1. Control Panel materials and fabrication methods must conform to /underwriter Laboratories specification section UL 508A, and applicable referenced specifications noted therein. Pump control panel enclosure shall be constructed, in conformance with applicable section of National Electrical Manufacturer’s Association (NEMA) standards for Type 1 electrical enclosures. Enclosure shall be fabricated of steel having a minimum thickness of not less than 0.075-inch (14 gauge). All seams shall be continuously welded, and shall be free of burrs and voids. Interior

and exterior surfaces shall be coated with a paint finish suitable for the NEMA classification of the enclosure. There shall be no holes through the external walls of the enclosure for mounting the enclosure or any components contained within the enclosure.

2. Provide all required connections, mounting accessories, supports, etc. required for the installation of the Control Panels, unless specified to be provided by Others. Panel enclosure up to 72" x 72" x 16" shall be mounted on floor stands and secured to pump base.

3. Enclosure shall be equipped with a door mounted on a continuous steel hinge and sealed around its perimeter. Door shall be held closed with clamps that are quick and easy to operate. The doors shall accommodate the mounting of switches and indicators.

4. Enclosure shall be furnished with removable back panel, fabricated of steel having a thickness of not less than 0.106-inch (12 gauge), which shall be secured to the enclosure with collar studs. Such panel shall be of adequate size to accommodate all basic components.

5. The exterior and interior components of the control panel shall be "finger-safe" and free from the danger of electrical shock when in normal operating position. If a component required within the panel by these specifications cannot be made "finger-safe", obtain approval of its use from the Engineer and provide a clear warning label near the device.

6. All control components shall be securely fastened to a removable back panel with screws and lock washers. Switches, indicators and instruments shall be mounted through the control panel door. All control devices and instruments shall be secured to the sub-plate with machine screws and lock washers. Mounting holes shall be drilled and tapped; Self tapping screws shall not be used to mount any components. All connections from the back panel to door mounted or remote devices shall be made through terminal blocks. All control devices shall be clearly labeled to indicate function.

7. All pump controls, interlocks, contacts, relays, power supplies and other miscellaneous equipment required to make a complete system in accordance with the intent of this section of the specifications shall be furnished and installed in the control panel. The components shall be industrial rated, heavy duty.

8. Uninterruptible Power Supply (UPS) shall be provided for the panel. The UPS shall be installed within the panel and may sit on the bottom of the panel enclosure, however, the UPS shall not be located within 6-inches of any active components. The UPS shall not need to be moved to access other panel components. Provide panel enclosed Uninterrupted Power Supply

(UPS), for 15 minutes at full load and 30 minutes at half load for all control panel components and connected devices.

9. All field-mounted instrumentation utilizing 4-20 mA signals shall be furnished with an appropriately sized local surge arrester at each end of the line. The surge arrestor shall be adequate for the intended function and shall be by a nationally recognized manufacturer with a minimum of 3-years experience in the manufacturer of such devices. Submit selected model and backup information for review and acceptance by the Engineer. Surge arrestor shall be manufactured by Transtector, Phoenix Contact, or equal.

10. Furnish analog signal conditioning isolators between field instruments and control panels to protect analog signals from noise, surges and ground loops.

B. UL Label Requirement

1. Pump station controls shall conform to third party safety certification. The panel shall bear a serialized UL label listed for "Enclosed Industrial Control Panels". The enclosure, and all components mounted on the sub-panel or control cover shall conform to UL descriptions and procedures.

C. Auxiliary Power Transformer

1. The lift station shall be equipped with a 9 KVA step-down transformer to supply 115 volt, AC, single phase for the control and auxiliary equipment. The primary and secondary side of the transformer to be protected by a thermal magnetic circuit breaker, sized to meet the power requirements of the transformer. An operating mechanism shall penetrate the control panel door and a padlockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

D. Motor Branch Circuit Components

1. Main Connections

a. A main terminal block and ground lug shall be furnished for field connection of the electrical supply. The connections shall be designed to accept copper conductors of sufficient size to serve the pump station loads. The main terminal block shall be mounted to allow incoming wire bending space in accordance with article 373 of the National Electric Code (NEC). A separate terminal strip shall be provided for 115 volt, single phase control power and shall be segregated from the main terminal block. Ten percent of the control terminals shall be furnished as spares.

b. All motor branch and power circuit components shall be of highest industrial quality. The short circuit current rating of all power circuit devices shall be a tested combination or evaluated per the National Electrical Code Article 409. The lowest rated power circuit component shall be the overall control panel short circuit rating and shall not be less than the fault current available. The minimum control panel rating shall not be less than 10 kA, rms symmetrical. Control assemblies operating at 120 volts nominal or less may be provided with transformers which limit the fault current and may be rated less than the minimum required short circuit rating.

2. Circuit Breakers and Operating Mechanisms

a. A properly sized heavy duty air circuit breaker shall be furnished for each pump motor. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.

b. A padlocking operating mechanism shall be installed on each motor circuit breaker. Operator handles for the mechanisms shall be located on the exterior of the control compartment door, with interlocks which permit the door to be opened only when circuit breakers are in the "off" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

E. Motor Starters

1. The variable frequency drive shall be capable of operation under any combination of the following conditions without mechanical or electrical damage.

a. Relative Humidity: Less than 95% non-condensing

b. Ambient Temperature: 0 to + 40 degrees C

c. Altitude: Less than 1,000M (3300 ft) above sea level

d. Vibration: .006 inches displacement, 1G peak

e. Shock: 15G peak for 11mS (+/- 1.0mS)

f. Control Specification

g. Control System: Sinusoidal pulse width modulated voltage waveform

h. Frequency Accuracy: +/- 0.4% of max. frequency

i. Volts/Hertz Ratio: V/Hz user programmable

j. Operation Frequency: 0 to 60 Hz

k. Overload Capacity: 110% Overload capability for up to 1 minute, 150% Overload capability for up to 3 seconds

l. Variable frequency drives shall be Allen Bradley PowerFlex 753, or equal.

2. Digital Readout and Monitor

a. Interface to the drive is provided via a module with integral LCD display. Unit is a 7 line by 21 character backlit LCD display with graphics capability. It is used to display drive operating conditions, fault / alarm indications and programming information with full text support in multiple languages, including but not limited to English, German, French, Italian, Spanish, Portuguese and Dutch. The unit will display standby status (power on, not running), output frequency (drive run), set-up parameters and fault. With keypad, user can monitor current, voltage, frequency, acceleration and deceleration time, minimum frequency and maximum frequency. Readout also provides inverter status and protective circuit status.

3. Protection

a. The variable speed drive system shall include a diode or fully gated bridge rectifier, capacitor filter, and transistorized inverter section. Base driver signals to control firing of the power transistors will be designed with optically coupled isolators for maximum protection of the control circuits from high voltage and noise. The output will be a sinusoidal, pulse width modulated, voltage waveform for reduced harmonic heating in the motor.

4. The system protection will provide the following:

a. Intermittent overload - 50 to 150%

b. Current limit - 50 to 115%

c. Overcurrent - 220-300% of rated output current

d. Inverse time overload - 50 to 100%

e. Short circuit - Phase to phase or phase to ground

f. Overvoltage - 10% above input line or DC bus voltage

g. Undervoltage - 10% below line voltage

h. Power loss ride-through - 500Ms

5. When the inverter trips out on a fault, the fault relay shall activate and the display shall indicate the reason for the trip as follows:

a. Overcurrent

b. Short circuit

c. Overload

d. Overvoltage

e. Undervoltage

f. Overheat

g. Ground fault

h. Motor stalled

i. Power supply fault

6. Auto restart shall occur when the inverter faults. Auto restart shall be adjustable up to 9 attempts with a 0.5 to 30 second interval. Auto restart will not be attempted for ground fault, output shorted, transistor shorted or internal microprocessor fault but will trip out immediately, activate the fault relay and make the appropriate indication on the display.

7. In the event of a fault trip, the microprocessor shall save the status of the inverter at the time of the fault and make that information available on the digital display. Information regarding the last 4 faults is maintained in event of a power loss.

8. Operational Functions:

a. Acceleration and deceleration time independently adjustable from 0.1 to 3600.0 seconds (selectable ranges).

b. Volts/Hertz patterns user selectable.

c. Maximum and minimum frequency limit adjustments.

F. Three Phase Voltage Monitor

1. The control panel shall be equipped to monitor the incoming power and shut down the pump motors when required to protect the motor(s) from damage caused by phase reversal, phase loss, high voltage, low voltage, and voltage unbalance. An adjustable time delay shall be provided to minimize nuisance trips. The motor(s) shall automatically restart, following an adjustable time delay, when power conditions return to normal.

G. Transient Voltage Surge Suppressor

1. All Control Panels shall have Surge Protective Devices installed immediately after the main overcurrent device or immediately after the supply conductors to the panel have been terminated. The Surge Protective Device(s) shall follow IEEE C62.41 recommendation for cascading to protect all voltage levels to and including 24 volts AC/DC and shall be as follows:

2. Be UL 1449 3rd Edition Recognized for UL Type 2 applications except at 48 volts AC/DC and below may be UL 1449 3rd Edition for Type 3 applications.

3. Provide suppression for both normal mode (L-N [Wye]) and common mode (L+N-G [Wye] or L-G [Delta]).

4. Have a Surge Current Capacity (Imax) of at least 40kA.

5. Have a Nominal Surge Current Rating (In) of 20kA.

6. Have SCCRs of 200kA, except that 347Y/600V, 240/480V High leg Delta and 347V single-phase SPDs shall have a minimum SCCR of 125kA.

7. Use MOV technology with thermal disconnect.

8. Be RoHS compliant.

9. SPD status monitoring shall be provided by local visual indication and, if needed, by remote contact signaling using an optional Form C contact relay.

10. Hardwired Listed Type 1 or Type 2 Surge Protective Devices Shall:

    a. All Type 1 or Type 2 surge protective devices shall be manufactured by a single ISO-9001 registered company normally engaged in the design, development and manufacture of such devices for electrical distribution system/ equipment protection. Surge protective devices shall be UL Listed with a Short-Circuit Current Rating of 200kA, Nominal Discharge Current (In) of 20kA, and Surge Current Capacity (Imax) of120kA, 200kA, 300kA or 400kA. These SPDs shall be installed in accordance with the NEC® and/or local code requirements. The said manufacturer shall offer a minimum five (5) year warranty for its Type 1 and Type 2 surge protective devices.

    b. The hardwired surge protective device shall have specifications as shown below:

        1) The Maximum Continuous Operating Voltage (MCOV) shall not exceed 25% on Wye and 40% on Delta systems of the nominal voltage (system voltage) in the configuration being used

        2) Prewired NEMA 1 or NEMA 4X factory sealed enclosure suitable for the intended installation location

3) Shall have a two color LED status indicator per phase

4) Have an operating temperature range of at least -40˚C to +50˚C

5) Only use thermally protected MOV technology, such as Bussmann SurgePOD™.

c. Surge Protective Device Agency Information: SPDs shall be "Listed" by Underwriters Laboratories, Inc. to UL 1449 3rd Edition as a Type 1 or Type 2 device and shall exhibit the UL Listing mark for the UL category VZCA for USA and/or VZCA2 for Canada; and must have CSA certification.

d. Manufacturers must provide verification of performance data for UL and CSA standards.

e. All SPDs must be RoHS compliant.

f. Surge protective devices shall be installed and located in accordance with all the applicable agency, NEC® and local code requirements. The SPDs must be suitable for the particular installation, be it on the upstream side (Type 1) or downstream side (Type 1 or Type 2) of service entrance Overcurrent Protective Device (OCPD).

g. All SPDs shall match voltage and system specific requirements as provided by the manufacturer.

h. All SPDs shall provide surge protection for both normal mode (L-N [Wye], L-L [Delta]) and common mode (L+N-G [Wye] or L-G [Delta]).

i. Surge protective device shall be clearly marked with specifications as required by UL 1449 3rd Edition along with UL holographic label on the SPD.

j. Each surge protective device should be serial numbered along with barcode for easy identification and traceability.

H. Voltage Alert Indication

1. The control panel shall include a voltage alert indicator to reduce the risk of electrical arc flash by pre-verifying the electrical isolation from outside of the control panel. Hardwired to the main incoming point of termination, the indicator shall be powered by the same voltage that it indicates utilizing redundant circuitry, thereby flashing whenever voltage is present. An eight detector display shall visually alert the presence of dangerous AC or DC potentials occurring between any combination of the monitored input lines.

I. Other Components

1. Furnish, install, program and test the controller, also called programmable logic controller (PLC) or programmable automation controllers (PAC), as

described herein and in all applicable specification sections. The controller shall be programmed to meet the functional descriptions and general requirements detailed in this section.

2. The PLC shall be an Allen-Bradley CompactLogix 5370 L2 Control System. The PLC shall be equipped with a CPU with 750KB [1769-L16ER] or 1MB [1769-L18ERM] of user memory, and two EtherNet/IP communication ports supporting ring topologies and 1 USB port for firmware download and programming. The Controller shall utilize the small applications 1769 I/O modules. The Controller shall be designed to implement consumed tag, event instruction, embedded inputs, remote I/O, axis, and motion event triggers. The controller shall be equipped to handle up to 32 Controller Tasks and 100 programs/task.

3. The PLC shall operate on 24VDC power and be equipped with a 24VDC embedded power supply. A 1784-SD1 (1GB) Memory Module shall be shipped with the controller. The controller will contain, at least but not limited to, embedded digital I/O [16DC Inputs, 16DC Outputs]. The controller shall accept all digital and analog I/O necessary to accomplish the specified operation.

4. Provide PLC I/O modules required to connect signals listed in Attachment A of this section. Provide at least 25% spare I/O or one full spare module of each type of I/O for each control panel controller, which ever provides a greater number of spare I/O, unless otherwise specified.

5. The program logic shall be stored on the processor as well as on a programmable, read only 1 GB SD card [shipped with controller]. The memory module shall auto load and run when installed in the programmable control processor and is included to facilitate field repair or replacement of the programmable control hardware without the use of programming terminals or personal computers.

6. The controllers shall be equipped with all communications ports and cabling required to meet the functional descriptions and connect to equipment as shown on the Drawings and as specified herein.

7. The PLC shall communicate with the drive using an EtherNet/IP, but can also support other communication protocols such as ControlNet, or DeviceNet networks. The PLC shall issue drive start/stop and speed commands. Drive status shall also be communicated to the PLC using EtherNet/IP. The drive shall be configured to operate manually without the use of the PLC.

8. Provide the Owner with the original licensed software for each piece of hardware provided including the programming and communication software for the controllers, PLCs, and/or PACs.

9. An Allen-Bradley PanelView Plus 7 electronic operator interface shall be provided for data entry and display. The Operator Interface Display size will be at least 10 inches with Color active matrix, thin film transistor (TFT), liquid crystal display (LCD). The operator interface shall have an 18-Bit color graphic resolution with backlight CCFL of 50,000 hours minimum. The operator interface shall be mounted on the front of the control panel with other operator controls and shall be compatible with the PLC communication protocol. The operator interface shall be a backlit, touch-screen terminal. The operator interface program shall be stored externally on a Secure Digital (SD) card.

10. Electromechanical relays and timers, when used shall be equipped with 120vac coils and contacts rated NEMA A-300 minimum. Timers shall be pneumatic or synchronous motor driven.

11. The control circuit shall be fused, and shall be provided with a disconnect switch connected in such a manner as to allow control power to be disconnected from all control circuits.

12. Pump mode selector switches shall be connected to permit manual start and manual stop of each pump motor individually. Manual operation shall override shutdown systems supplied with the level control system except motor overload.

13. A pushbutton switch shall be provided to silence one of the 115 volt AC alarm circuits while corrective actions are underway. Depressing the alarm silence pushbutton shall also cause the high water alarm circuit (low water alarm optional) to reset when the liquid level has been lowered.

14. Pump alternation shall be integral to the PLC. Provisions for automatic alternation or manual selection shall also be integral to the PLC.

15. High Pump Temperature Shutdown Circuit

    a. A high pump temperature protection circuit shall override the level control and shut down the pump motor(s) when required to protect the pump from excessive temperature. A thermostat shall be mounted on each pump casing and connected to the PLC. If casing temperature rises to a level sufficient to cause damage, the thermostat N.O. contact shall close indicating a high pump temperature condition to the PLC. The PLC will then interrupt power to the pump motor. The operator interface terminal will display an alarm banner indicating the motor stopped due to high pump temperature. The motor shall remain locked out until the pump has cooled and circuit has been manually reset. Automatic reset of this circuit is not acceptable.

16. Elapsed Time Meter

    a. Six digit elapsed time meter shall be shall be displayed on the operator interface terminal to indicate total running time of each pump in "hours" and "tenths of hours". Pump runtime shall be adjustable and password protected.

17. Indicating Lights

    a. Indicating lights shall be provided on the Operator Interface Terminal to alert the user of the following conditions:

        1) Pump Run

        2) Pump Fault

        3) Motor High Temperature

        4) PLC Fail

        5) Wet Well Level Alarm Conditions

    b. Physical indicating lights shall be oil tight type and equipped with integral step down transformers for long lamp life. Lamps shall be incandescent type rated 14 volts or less. Lamps shall be replaceable from the front without opening the control panel door and without the use of tools. Physical indicating lights will be provided for the following functions:

        1) Normal Power Available

        2) General Alarm

18. Switch Controls:

    a. Hand switches and push button switches shall be through-door flush mounted and sealed in accordance with respective equipment and Control Panel manufacturers recommendations.

    b. Individual NEMA 4 Hand-Off-Automatic selector switches shall be provided for each pump. The switches shall be 3-position rotary-type with spring return on the Hand position.

19. In general, provide the following components for the pump station control panel MCP:

    a. NEMA 1 enclosure, 72”H x 72”W x 16”D

    b. PLC – AB CompactLogix L2, or equal

c. Power Supplies.

d. Surge Protection (power supply and analog field signal)

e. UPS sized for all critical panel components

f. GFCI duplex receptacle

g. Ethernet Switch

h. HMI/OIT – AB Panel View Plus 7, or equal

i. VFDs -AB PowerFlex 753, or equal

j. Pump #1 VFD Digital Readout and Monitor

k. Pump #2 VFD Digital Readout and Monitor

l. Pumps #1 and #2 Elapsed Time Meters

m. Pump #1 HOA hand switch

n. Pump #2 HOA hand switch

o. General Alarm Indicating Light

p. Panel Power Indicating Light

q. Acknowledge and Silence Alarm Push Button

r. All other components required to obtain the functionality described herein and to meet all codes and regulations.

20. Wiring

a. The pump station control panel, as furnished by the panel manufacturer, shall be completely pre-wired except for the power feeder lines and final connections to pump motors and remote alarm devices. The interconnecting wire, conduit, and other materials required shall be furnished and installed by the electrical contractor.

b. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications for industrial controls set forth by the Joint Industrial Council (JIC), National Machine Tool Builders Association (NMTBA), and the National Electric Code (NEC).

c. All user serviceable wiring shall be type MTW or THW, 600 volts, and shall be color coded as follows:

1) Line and load circuits, AC or DC power	black
2) AC control circuit less than line voltage	red

3)	Interlock control circuit, from external source	yellow
4)	Equipment grounding conductor	green
5)	Current carrying ground	white
6)	Hot with circuit breaker open	orange

21. Wire Identification and Sizing

    a. Control circuit wiring inside the panel, with the exception of internal wiring of individual components, shall be 16 gauge minimum, type MTW or THW, 600 volts. Wiring in conduit shall be 14 gauge minimum. Motor branch wiring shall be 10 gauge minimum.

    b. Motor branch conductors and other power conductors shall not be loaded above the temperature rating of the connected termination. Wires shall be clearly numbered at each end in conformance with applicable standards. All wire connectors in the control panel shall be of the ring tongue type with nylon insulated shanks. All wires on the sub plate shall be bundled and tied. All wires extending from components mounted on door shall be terminated on a terminal block mounted on the back panel. All wiring outside the panel shall be installed in conduit

22. Control conductors connecting components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall be allowed so that the door can swing to its full open position without undue mechanical stress or abrasion on the conductors or insulation. Bundles shall be clamped and held in place with mechanical fastening devices on each side of the hinge.

J. Conduit requirements are as follows:

1. All conduit and fittings shall be UL listed.

2. Liquid tight flexible metal conduit shall be constructed of a smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight, polyvinyl chloride cover.

3. Conduit shall be supported in accordance with articles 346, 347, and 350 of the National Electric Code.

4. Conduit shall be sized according to the National Electric Code.

K. Grounding

1. The pump station manufacturer shall ground all electrical equipment to the enclosure back panel. The mounting surface of all ground connections shall have any paint removed before making final connections.

2. The contractor shall provide an earth driven ground connection to the control panel at the main ground lug in accordance with the National Electric Code (NEC).

L. Equipment Marking

1. Permanent corrosion resistant name plate(s) shall be attached to the control and include following information:

   a. Equipment serial number

   b. Control panel short circuit rating

   c. Supply voltage, phase and frequency

   d. Current rating of the minimum main conductor

   e. Electrical wiring diagram number

   f. Motor horsepower and full load current

   g. Motor overload heater element (If applicable)

   h. Motor circuit breaker trip current rating

   i. Name and location of equipment manufacturer

2. Control components shall be permanently marked using the same identification keys shown on the electrical diagram. Labels shall be mounted adjacent to device being identified.

3. Switches, indicators, and instruments mounted through the control panel door shall be labeled to indicate function, position, etc. Labels shall be mounted adjacent to, or above the device.

M. Control logic shall be accomplished using programmable controllers. Electromechanical relays may be used when necessary. However, the primary control logic shall be performed by the PLC.

1. The O&M manual shall be provided with complete ladder logic program documentation including English names, rung comments, and coil/contact cross-references.

2. The control shall be pre-programmed or wired to provide the following routines:

   a. Pump alternation at lead stop

b. Excessive pump run time alternation

c. Jump to next pump on lead failure

d. Start/stop pumps at normal level settings (levels indicated on process mechanical drawings).

e. Pump start delays when called simultaneously

f. General alarm pilot light activation: Quick flashing alarm/slow flashing acknowledge/ steady on reset/off when clear

g. Station trouble alarm (115vac and normally open dry contact)

h. High and low-level alarms

i. Pump start/stop level control

j. Drive speed/level control

k. Pump high temperature shutdown

l. Drive fault alarm

3. All analog signals for process instrumentation shall be monitored for out-of-range or signal failure. When the signal input is below 4 mA or above 20 mA, a signal failure alarm shall be annunciated.

4. In addition to the alarms described elsewhere in this division, at a minimum, the PLC shall also collect the following internal and external I/O signals and relay the information to the OIT or as alarms:

a. Utility Power Fail

b. Panel Power Fail

c. Building Door Switch/ Intrusion Alarm

d. Building Fire Alarm

e. Pump Station Low Temperature Alarm

f. Personnel Emergency

g. General Alarm

h. PLC Fail

N. The operator interface shall be equipped with the following displays and functions:

1. Main Menu

2. Wet Well Level

3. Wet Well Level Simulation
4. Low Water Alarm Status
5. High Water Alarm Status
6. Pump High Temperature Status #1, #2
7. Drive Fault Status #1, #2
8. Pump Sequence Selection
9. Alarm Silence
10. Alarm Reset
11. General Alarm Lamp Test
12. Lead Level Start/Stop Setpoints
13. Lag Level Start/Stop Setpoints
14. Low Water Alarm Setpoints
15. High Water Alarm Setpoints
16. Speed/Level Setpoints 1 pump running
17. Speed/Level Setpoints 2 pumps running
18. Power-up Delay Setpoint
19. Alarm Delay Setpoint
20. Pump Start Delay Setpoint
21. Alternation Time Interval Setpoint
22. Level Transmitter Calibration
23. Flow meter signal readout
24. Flow totalization

2.02 LIQUID LEVEL CONTROL SYSTEM

A. The manufacturer of the liquid level control system must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.

B. The pumps will each be equipped with a VFD to control the motor speed and start/stop the pump. Each VFD is equipped with local controls for manual operation as well as inputs and outputs for remote monitoring and control.

C. H-O-A switches shall be provided for each pump to allow users to operate the pumps manually or select automatic control. In HAND, the pump shall start at the

operator-adjustable pre-set start speed. The user shall be able to control the pump speed on the OIT. In the OFF position, the pump shall not operate and be taken out of the lead/lag alteration sequence. In the AUTO position, the pumps shall operate on an alternating lead/lag configuration as described herein with start and stop controls based upon wetwell level.

D. Sequence of Operation with Utility Power

1. The level control system shall start and stop the pump motors in response to changes in wet well level. The level control system shall utilize the PLC sequencer to select first one pump, then the second pump, to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle or if one pump runs as the lead pump for an excessive time.

2. Level and speed controls shall include logical comparator setpoints. Settings shall be provided to control the levels at which the pumps start and stop as well as level endpoints for minimum and maximum speed. Two sets of speed setpoints shall be provided. The first set will be enabled when a single pump is running. The second set shall be enabled when two pumps are running. Each of the settings shall be adjustable and accessible to the operator without opening the control panel. Controls shall be provided to permit the operator to read and adjust the selected levels and speeds on the operator interface. Setpoint adjustments which require hard wiring, the use of electronic test equipment or artificial level simulation are not acceptable.

3. Upon operator selection of automatic operation, the PLC shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level". When the liquid is lowered to the "lead pump stop level", the PLC shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level continue to rise, the PLC shall start the second pump when the liquid reaches the "lag pump start level" so that both pumps are operating.

4. When a single pump is running and the wet well is equal to the “1 pump minimum level”, the drive will run at the “1 pump minimum speed”. As the level rises, drive speed will increase to the “1 pump maximum speed” when the wet well level is equal to the “1 pump minimum level”. Likewise, when two pumps are running, the “1 pump” settings will be disabled and the control will use the “2 pump” level and speed settings.

5. Level control range shall be 0 to 12.0 feet of water. Speed control range shall be 20.0 to 60.0 hertz. Overall repeat accuracy shall be (plus/minus) 0.1 feet of water or hertz.

E. Alarms and shutdown routines shall operate as follows:

1. Condition abnormal: The general alarm pilot light will quick flash until acknowledged, then slow flash until reset, then glow steady until condition returns to normal, then off. The operator interface will display the alarm when acknowledged. The external alarms will be active until silenced, and then off.

1. Condition abnormal then returns to normal: The general alarm pilot light will quick flash until silenced, then slow flash until reset, then off. The operator interface will display the alarm when acknowledged. The external alarms will be active until silenced, and then off.

2. Subsequent alarms will re-alarm when silenced or reset.

F. Submersible Level/ Pressure Sensor (PT)

1. Submersible transducer will be furnished with transient voltage surge suppression to protect related equipment from an induced voltage spike from lighting.

2. Provide lightning protection at field junction box and at main control panel. Verify installation depth prior to ordering calibration level transmitter with appropriate cable lengths.

3. An intrinsically safe repeater shall be supplied in a separate enclosure. Repeater must be recognized and listed as intrinsically safe by a nationally recognized testing laboratory. Electrical contractor shall make all connections from repeater to feeder lines and motor controls. Electrical contractor shall make connections from repeater to transducer.

4. For wastewater applications, the transducer shall have a diaphragm for solids and be vented with aneroid bellows housed in a junction box prior to signal entry into the control panel.

5. The transducer shall be in accordance with specification section 40 91 00.

2.03 STANDBY LEVEL CONTROL SYSTEM:

A. Two (2) displacement or float switches shall be provided to automatically operate the pump in back-up mode, in case of failure of the submersible level transducer and PLC.

B. Provide float switch according to the following criteria:

1. Non-mercury switch type liquid level displacement sensor.

2. Suspended from a bracket by its own cable.

3. Vendor supplied instrument signal cable, length as required for each level switch application with 24 inches for future field adjustment.

4. In wetwells and open tanks, provide float chain and weight, cable strain relief and cable clips to secure the float location.

5. Float switches for use in wastewater process applications shall be rated for Class 1 Div 2 Group D hazardous location.

PART 3 - EXECUTION

3.01 GENERAL:

A. All controls shall be installed in accordance with state and local building and electrical codes, general instrumentation practices, and manufacturer's requirements. All equipment shall be fully tested and calibrated. Provide documented record drawings. The Engineer shall review all instrumentation and controls at the time of startup, and all corrections made by Contractor as required.

B. The ranges and field connections shall be verified by the Engineer and instrumentation system integrator during the submittal process.

C. The control panels shall be completely factory assembled and tested. Do not ship the panel to the site until the Owner has approved the completed panel. The contractor shall provide all equipment from other divisions as required to make a complete system.

3.02 START-UP AND TESTING:

A. In accordance with Specification Division 1.

B. Start-up of individual control systems may be required prior to start-up of the overall control system and control system network. The Instrumentation Supplier shall integrate all individual sub-control systems into a site-wide complete system to achieve final start-up. A start-up checklist and procedure for the control system, PLC network and Instrumentation shall be prepared and submitted to the Engineer for approval prior to final start-up.

C. The Contractor shall coordinate the work of the system manufacturer's service personnel, as necessary. This shall include the installation, interconnection, testing, and calibration of the instruments, and the scheduling of the manufacturer's service personnel.

D. The Instrumentation System Supplier shall perform factory testing and checkout of each panel prior to delivery. Submit factory test reports and panel certifications.

E. Each panel shall be tested and checked out in the field to confirm each input and output connected to instrumentation and other devices. Submit testing and

checkout reports to the Engineer with final start-up schedule and request for Engineer witnessed testing.

3.03 TRAINING:

A. Provide the services of authorized manufacturers' representatives to instruct the Owner's representatives in the proper operation and basic troubleshooting of the PLC and I/O system of each instrument and device installed under this Contract.

B. Instrumentation training should be conducted by a qualified manufacturer’s representative or person certified by the manufacturer in training of the equipment. This training should be conducted when all instrumentation is installed, calibrated, and after installation has been certified by the manufacturer’s representative.

C. Operator training shall be provided for a minimum of one, 4-hour training session (not including travel time) for the overall instrumentation and control system after system acceptance by the Engineer.

D. The Supplier shall provide complete documentation for all systems prior to Owner/Engineer witness testing.

E. All training and instructions shall be scheduled at the convenience of the Engineer and the Owner and shall be scheduled with at least five (5) days written notice.

END OF SECTION

DRAWINGS

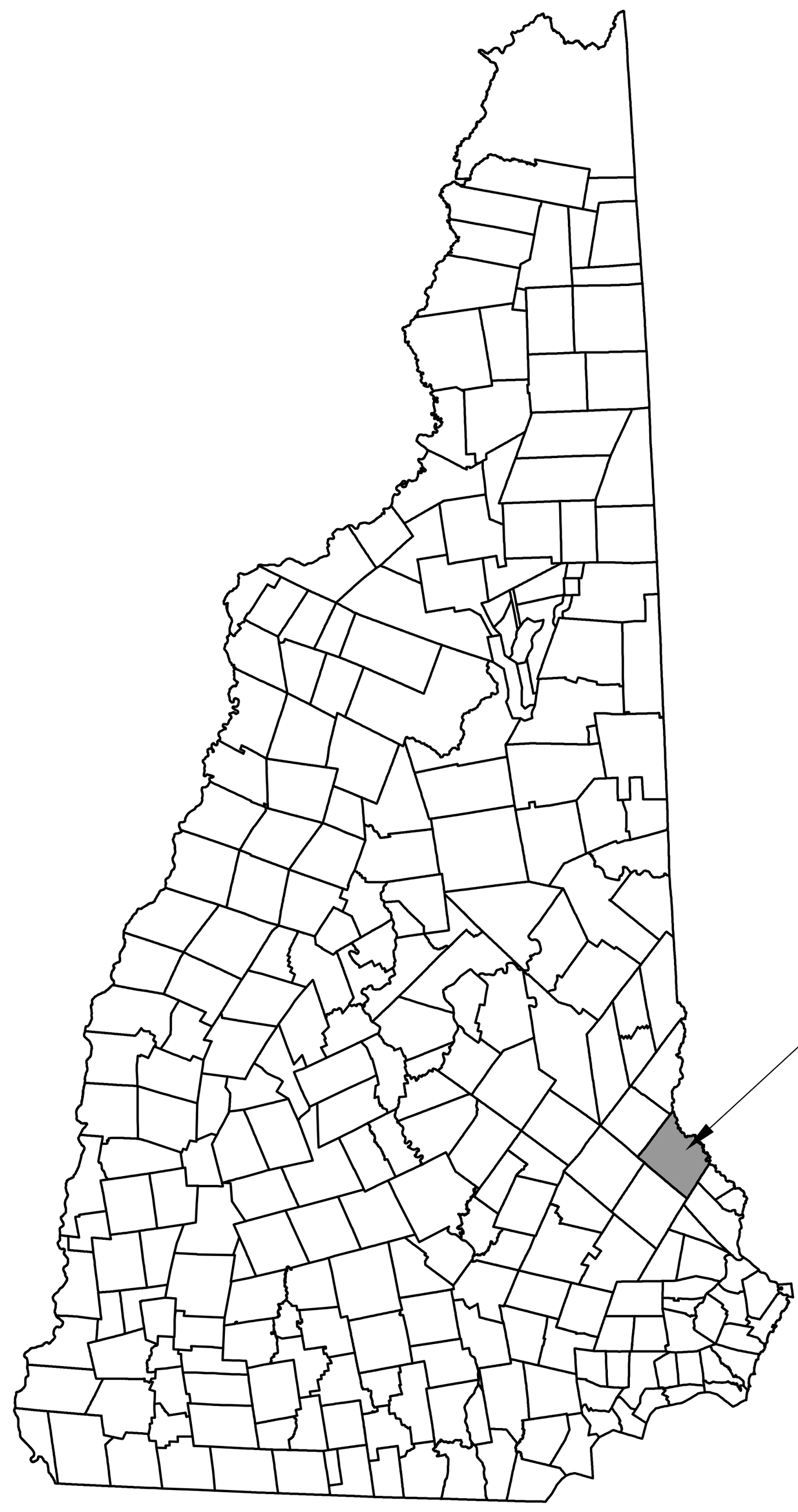
CITY OF ROCHESTER, NEW HAMPSHIRE

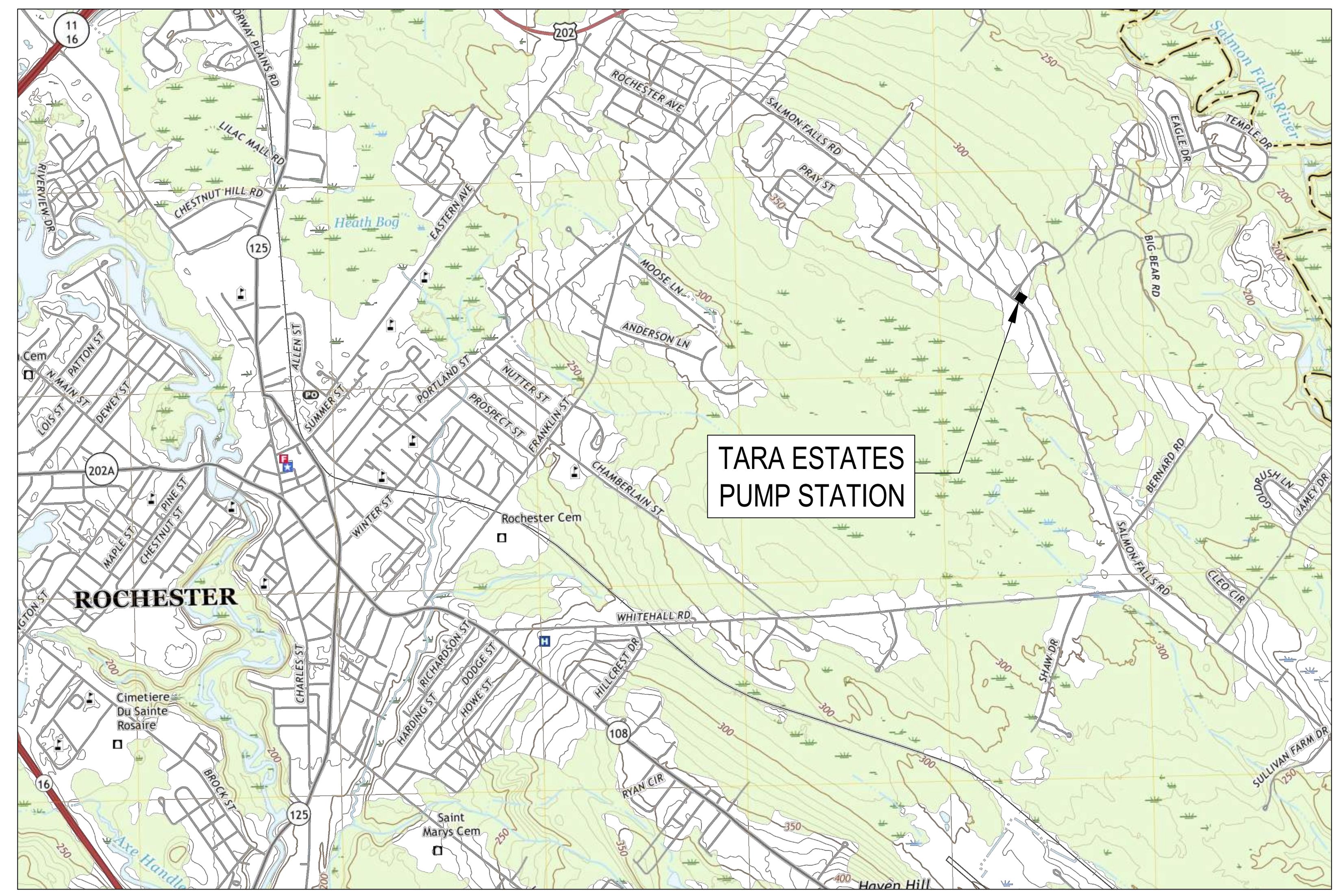
TARA ESTATES SEWER PUMP STATION UPGRADE

724 SALMON FALLS ROAD, ROCHESTER, NEW HAMPSHIRE, 03868

CLEAN WATER STATE REVOLVING FUND: CS-330122-19
CITY OF ROCHESTER: BID 23-01

Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

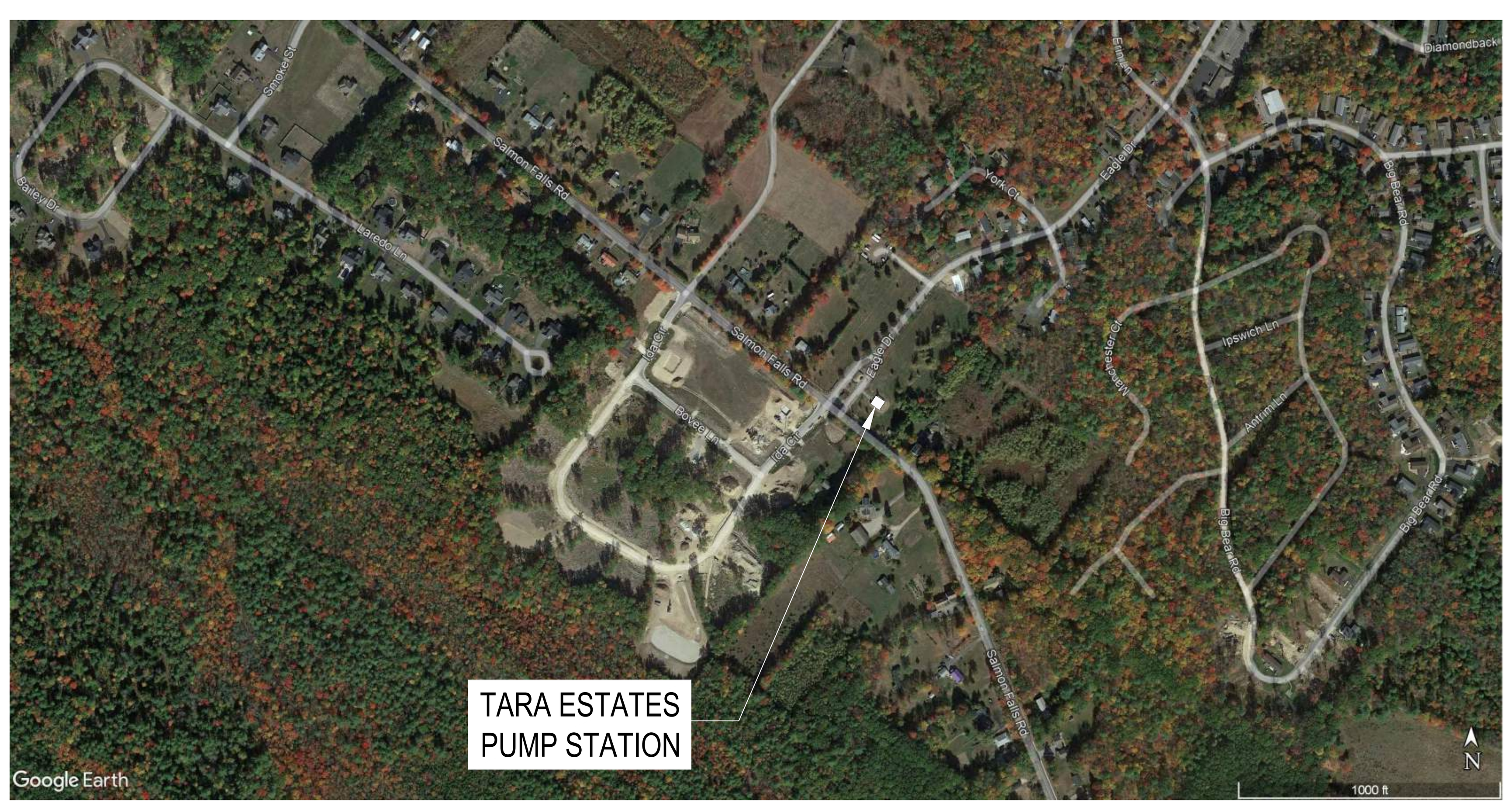




LOCATION MAP
SCALE: 1" = 2,000'

DRAWING INDEX

SHEET	TITLE
G000	COVER AND SHEET LIST
G001	ABBREVIATIONS, NOTES, AND LEGEND
C101	EXISTING CONDITIONS AND DEMOLITION PLAN
C102	PROPOSED SITE LAYOUT
C501	CIVIL DETAILS I
C502	CIVIL DETAILS II
C503	CIVIL DETAILS III
A101	PREFABRICATED BUILDING PLAN AND EXTERIOR ELEVATIONS
A102	PREFABRICATED BUILDING TYPICAL WALL SECTION AND ROOF TRUSS
S001	GENERAL NOTES AND TYPICAL DETAILS
S111	FOUNDATION PLAN AND DETAILS
S112	3D VIEWS AND ELEVATIONS
M101	DEMOLITION PLANS AND SECTIONS
M102	PROPOSED PLANS AND SECTIONS
M501	MECHANICAL DETAILS
H000	LEGENDS, NOTES, AND ABBREVIATIONS
H101	FIRST FLOOR NEW WORK PLAN, SCHEDULES, CONTROLS, AND NOTES
H501	HVAC DETAILS
H502	HVAC DETAILS
E001	ELECTRICAL LEGEND, NOTES, AND ABBREVIATIONS
E002	ELECTRICAL SITE PLANS
E101	ELECTRICAL PLANS, PHOTOS, AND SCHEDULES
E501	ELECTRICAL DETAILS



AERIAL MAP
NOT TO SCALE

SEAL
NOT TO SCALE

STATE OF NEW HAMPSHIRE
CHRISTOPHER M. PERKINS
No. 12004
LICENSED
PROFESSIONAL ENGINEER

Seal:

Issued Date:

09/21/2022

Know what's below.
Call before you dig.

Issued For:

BIDDING - ADDENDUM NO. 3

LEGEND

DESCRIPTION	EXISTING	PROPOSED
SANITARY SEWER	S	6"S PVC
FORCE MAIN	FM	6"SFM
WATER MAIN	W	6"W DI
TEMPORARY WATER		6"W
STORM DRAIN	D	12"D RCP
GAS	G	6"G PL
ELECTRIC	E	E
UNDERGROUND ELECTRIC	UGE	UGE
TELEPHONE	T	T
GRINDER PUMP		GP
SANITARY SEWER MANHOLE		SMH
STORM DRAIN MANHOLE		SDMH
ELECTRICAL MANHOLE		EMH
TELEPHONE MANHOLE		TMH
AIR RELEASE VALVE MANHOLE		ARMH
FORCE MAIN CLEANOUT MANHOLE		FMCO
CLEANOUT		CO
CATCH BASIN		CB
CATCH BASIN (CURB INLET)		
HYDRANT		
TEMPORARY HYDRANT		
GATE VALVE		
CHECK VALVE		
CURB STOP		
BUTTERFLY VALVE		
BALL VALVE		
REDUCER		
CAP OR PLUG		
GAS GATE VALVE	GV	
UTILITY POLE		
GUY POLE		
LIGHT POST		
EDGE OF PAVEMENT	EOP	EOP
EDGE OF UNPAVED ROAD		
CURB	CURB	CURB
SIDEWALK		
RAILROAD		
STONE WALL		
RETAINING WALL	RET WALL	RET WALL
FENCE		
INDIVIDUAL DECIDUOUS TREE		
INDIVIDUAL EVERGREEN TREE		
TREE LINE		
SURVEY MARKER		
PROPERTY LINE		
EASEMENT LINE		
LIMIT OF WORK		
APPROX. LIMIT OF REFUSE		
SPOT ELEVATIONS	x 141.5	x 141.5
CONTOUR LINES	56	56
DEPRESSION CONTOUR LINES		
HOUSE NUMBER	#35	
FLOOR ELEVATION	FL=56.7	
SILL ELEVATION	S=56.7	
WETLAND		
WETLAND FLAGS		1 2
RIP RAP		
STATE HIGHWAY STATION		
SURFACE MOUNTED DELINEATOR		
GUARD POST		
BOLLARD	B	B
SIGN		
BENCH MARK		
AUGER	A-1	A-1
PERCOLATION TEST	PT 1	PT-1
TEST PIT	TP 1	TP-1
BORING	B-10	B-11
PROBE	P-10	P-11
GROUNDWATER MONITORING WELL	WS-1	WS-1
GAS MONITORING WELL	GMW-10	GMW-10
GAS VENT	GV	GV
HAY BALES		
ROCK OUTCROP		
DRAINAGE DITCH / SWALE		

NOTE: ITEMS SHOWN IN THE LEGEND MAY NOT BE PRESENT IN THESE PLANS

ABBREVIATIONS

AC	ASBESTOS CEMENT PIPE
ACCMP	ASPHALT COATED CORRUGATED METAL PIPE
ARV	AIR RELEASE VALVE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
BC	BITUMINOUS CONCRETE
BIT	BITUMINOUS
BLDG	BUILDING
BM	BENCH MARK
BO	BLOW OFF
BV	BUTTERFLY VALVE
CATV	CABLE TELEVISION
CB	CATCH BASIN
CC	CONCRETE CURB
CI	CAST IRON
℄	CENTERLINE
CL	CEMENT LINED
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE
CU FT	CUBIC FEET
CY	CUBIC YARD
D	STORM DRAIN, DEPTH FROM RIM TO INVERT
DI	DROP INLET, DUCTILE IRON
DIA	DIAMETER
DMH	DRAIN MANHOLE
DWG	DRAWING
E	EAST, ELECTRIC
EA	EACH
EF	EACH FACE
EL	ELEVATION
ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
EW	EACH WAY
EXIST	EXISTING
FLG	FLANGE
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET, FOOT
G	NATURAL GAS
GALV	GALVANIZED
GC	GRANITE CURB
GR	GRANITE
HC	HOUSE CONNECTION
HORIZ	HORIZONTAL
HP	HIGH PRESSURE
HYD	FIRE HYDRANT
I	INVERT
INV	INVERT
ID	INSIDE DIAMETER
IP	IRON PIPE
LB	POUND
LF	LINEAR FEET
LS	LUMP SUM
MAX	MAXIMUM
MB	MAIL BOX
MECH	MECHANICAL
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
N	NORTH
NE	NORTH EAST
NHDES	NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES
NHDOT	NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
NW	NORTH WEST
NF	NOT FOUND
NO OR #	NUMBER
OD	OUTSIDE DIAMETER
PCCP	PRESTRESSED CONCRETE CYLINDER PIPE
PE	PLAIN END, POLYETHYLENE
℘	PROPERTY LINE
PL	PLATE
PS	PUMP STATION
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
RCP	REINFORCED CONCRETE PIPE
ROW	RIGHT-OF-WAY
RQD	ROCK QUALITY
S	SEWER, SOUTH
SE	SOUTH EAST
SECT	SECTION
SF	SQUARE FEET
SHT	SHEET
SPEC	SPECIFICATIONS
SQ FT	SQUARE FEET
SS	SEWER SERVICE, STAINLESS STEEL
STA	STATION
STL	STEEL
SW	SIDEWALK, SOUTH WEST
T	HYDROSTATIC THRUST, TELEPHONE
TBM	TEMPORARY BENCH MARK
THK	THICK (NESS)
TYP	TYPICAL
UP	UTILITY POLE
VC	VITRIFIED CLAY
VERT	VERTICAL
W	WATER, WEST
W/	WITH
W/O	WITHOUT

GENERAL CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL CALL DIGSAFE AT 811 OR 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, SUNDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE OWNER PRIOR TO EXCAVATION.
2. LOCATIONS OF EXISTING PIPES, CONDUITS, UTILITIES, FOUNDATIONS AND OTHER UNDERGROUND OBJECTS WERE OBTAINED FROM THE BEST AVAILABLE RECORDS AND ARE NOT WARRANTED TO BE CORRECT. THE CONTRACTOR SHALL HAVE NO CLAIM ON THAT ACCOUNT SHOULD THEY BE OTHER THAN SHOWN.
3. LOCATIONS OF EXISTING UTILITY AND PROPERTY LINE INFORMATION, EDGE OF PAVEMENT, UTILITY POLE LOCATIONS, CONSTRUCTION EASEMENT, AND PERMANENT EASEMENT WERE OBTAINED BY INFORMATION PROVIDED BY THE OWNER.
4. ASSESSORS INFORMATION REPRESENTED ON THESE DRAWINGS IS INCLUDED FOR ILLUSTRATIVE PURPOSES ONLY. ASSESSORS INFORMATION IS NOT INTENDED TO BE AN AUTHORITATIVE RECORD OF PROPERTY BOUNDARIES OR A SOURCE OF INFORMATION FOR AN ACTUAL SURVEY OR LEGAL DESCRIPTION OF THE PROPERTY. NO WORK HAS BEEN PERFORMED TO DETERMINE THE DEPICTED PROPERTY LINES AND THEREFORE, THESE DRAWINGS ARE NOT INTENDED BE USED TO DELINEATE ANY EXISTING OR PROPOSED STRUCTURES, FEATURES OR BOUNDARIES RELATIVE TO PROPERTY LINES. AUTHORITATIVE RECORDS OF PROPERTY LINES MAY BE LOCATED AT THE STATE OR MUNICIPAL AGENCY RESPONSIBLE FOR MAINTAINING PUBLIC RECORDS IN WHICH THE PARCEL IS LOCATED. LEGALLY AUTHORITATIVE MAPS OF PROPERTY LINES MAY ONLY BE PRODUCED BY A PROFESSIONAL LAND SURVEYOR.
5. CONTRACTOR SHALL HIRE INDEPENDENT UTILITY LOCATOR TO VERIFY LOCATION OF ALL UTILITIES WITHIN THE PROPOSED CONSTRUCTION EASEMENT PRIOR TO CONSTRUCTION.
6. TEST PITS TO LOCATE EXISTING UTILITIES MAY BE ORDERED BY THE ENGINEER.
7. CONTRACTOR SHALL SECURE THE SITE WITH TEMPORARY CHAIN LINK FENCE. ALL OPEN EXCAVATIONS SHALL BE SECURED WITH TEMPORARY BARRICADES AND ORANGE SAFETY FENCE AT END OF EACH WORK DAY. OWNER SHALL NOT BE LIABLE FOR THEFT OR DAMAGE TO CONTRACTOR'S STORED MATERIALS OR EQUIPMENT.
8. STONE WALLS, FENCES, MAIL BOXES, SIGNS, CURBS, LIGHT POLES, ETC. SHALL BE REMOVED AND REPLACED AS NECESSARY TO PERFORM THE WORK. UNLESS OTHERWISE INDICATED, ALL SUCH WORK SHALL BE INCIDENTAL TO CONSTRUCTION OF THE PROJECT.
9. ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND PAYMENT LIMITS SHALL BE RESTORED AT NO ADDITIONAL COST TO THE OWNER.
10. THE CONTRACTOR SHALL NOT STORE ANY APPARATUS, MATERIALS, SUPPLIES, OR EQUIPMENT ON DRAINAGE STRUCTURES OR WITHIN 100 FEET OF WETLANDS.
11. THE CONTRACTOR SHALL MAINTAIN LOCAL TRAFFIC ACCESS TO ALL STREETS THROUGHOUT THE DURATION OF THE PROJECT.
12. CONTRACTOR SHALL MAINTAIN EXISTING FLOWS IN THE SYSTEM, BYPASSING AS NECESSARY TO PREVENT SURCHARGING, AT NO ADDITIONAL COST TO THE OWNER, AS APPROVED BY THE ENGINEER. SEE SECTION 01 14 19.13 TEMPORARY BYPASS PUMPING SYSTEM AND SECTION 01 14 19.22 HANDLING EXISTING FLOWS.
13. THE CONTRACTOR SHALL NOT TRACK OR SPILL EARTH, DEBRIS, OR OTHER CONSTRUCTION MATERIAL ON PUBLIC OR PRIVATE STREETS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE IMMEDIATE ASSOCIATED CLEAN UP.
14. CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL DEBRIS AND EXCESS EXCAVATED MATERIAL FROM WITHIN THE CONSTRUCTION LIMIT OF WORK TO A SUITABLE SITE PROVIDED BY THE CONTRACTOR, IN COMPLIANCE WITH ALL STATE AND CITY REGULATIONS.
15. ALL AREAS THAT ARE EXCAVATED, FILLED, OR OTHERWISE DISTURBED BY THE CONTRACTOR SHALL BE LOAMED, GRADED, LIMED, FERTILIZED, SEEDED, AND MULCHED, UNLESS OTHERWISE NOTED. THE TOP SIX INCHES OF SOIL SHALL BE LOAM. THE CONTRACTOR SHALL GRADE TO MEET EXISTING CONDITIONS.
16. ALL PAVEMENT DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE SPECIFICATIONS AND AS SHOWN ON THE DRAWINGS. CONTRACTOR SHALL MATCH EXISTING GRADES TO THE EXTENT POSSIBLE WHERE EXISTING PAVEMENT IS REMOVED AND REPLACED.
17. IN PAVED AREAS THE TOPS OF THE MANHOLE COVERS SHALL BE SET FLUSH WITH THE PAVED SURFACE.
18. ALL PENETRATIONS, PIPES AND CONDUITS INTO THE WETWELL SHALL HAVE GASKETS/FITTINGS ON BOTH ENDS TO MAKE EXPLOSION PROOF AND GAS AND WATER TIGHT.
19. ALL WALL SLEEVES AND WALL CASTINGS SHALL HAVE WATERSTOPS. SEE MECHANICAL DRAWINGS FOR LOCATIONS OF PENETRATIONS.
20. A MINIMUM OF 5 FEET OF COVER OR 2 INCHES OF CELLULAR GLASS INSULATION REQUIRED ON ALL LIQUID CARRYING PIPES.
21. REFER TO SPECIFICATION SECTION 31 00 00 AND CIVIL DETAILS FOR PIPE AND STRUCTURE BEDDING, COMPACTION, AND BACKFILL REQUIREMENTS.
22. CONCRETE USED FOR PIPE ANCHOR BLOCKS, BACKING, PIPE CRADLES, ARCHES, AND FILL SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.
23. APPROVED JOINT RESTRAINT METHODS SHALL BE PROVIDED FOR ALL UNDERGROUND PIPING WHERE ANY BENDS, TEES, PLUGS, OR WYES ARE INSTALLED. CONCRETE THRUST BLOCKS, ANCHOR BLOCKS, AND TIE RODS MAY BE USED FOR 6-INCH AND 8-INCH PIPE WHERE JOINT RESTRAINT IS NOT FEASIBLE. FOR THRUST BLOCK DETAILS AND MINIMUM BLOCK BEARING AREAS, SEE DETAILS AND SPECIFICATIONS.
24. ALL STRUCTURES AND PIPING LOCATED ADJACENT TO ANY TRENCH OR OPEN CUT EXCAVATION SHALL BE PROTECTED AND FIRMLY SUPPORTED BY THE CONTRACTOR UNTIL THE EXCAVATION IS BACKFILLED. DAMAGE TO ANY SUCH STRUCTURES CAUSED BY OR RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. ALL UTILITIES REQUIRING REPAIR, RELOCATION, OR ADJUSTMENT AS A RESULT OF THE PROJECT SHALL BE COORDINATED THROUGH THE OWNER.
25. ALL EXISTING UTILITIES ENCOUNTERED DURING CONSTRUCTION SHALL BE EITHER NOT DISTURBED, REPLACED, OR RELOCATED. ALL UTILITIES WHICH ARE REPLACED OR RELOCATED SHALL BE CONSTRUCTED OF NEW MATERIALS APPROVED BY THE ENGINEER AND SIMILAR TO THOSE OF THE EXISTING UTILITY.
26. CONTRACTOR SHALL FULLY CLEAN THE INTERIORS OF BOTH WETWELLS. CLEANING SHALL INCLUDE THE USE OF HYDRAULIC CLEANING EQUIPMENT AND VACUUM TRUCKS TO REMOVE SLUDGE, DIRT, GREASE, ETC. FROM THE INTERIOR WALLS AND BOTTOMS OF THE WET WELL. ANY GRATING IN THE WETWELLS SHALL ALSO BE CLEANED. THE WETWELL SHALL BE PUMPED TO ALLOW THE WATER LEVEL TO DROP SO THAT THE ENTIRE WETWELL INTERIOR IS VIEWABLE. CLEANING SHALL ALSO INCLUDE REMOVAL OF ALL FOREIGN OBJECTS OR DEBRIS FROM THE WET WELLS WHICH SHALL BE REMOVED EITHER MANUALLY OR MECHANICALLY. ALL DEBRIS, SOLIDS OR SEMI-SOLIDS RESULTING FROM THE CLEANING OPERATIONS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF AT A LEGALLY PERMITTED SITE FOR THAT PURPOSE. AT A MINIMUM ALL MATERIALS SHALL BE REMOVED FROM THE SITE AT THE END OF EACH WORKDAY. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR BE ALLOWED TO ACCUMULATE DEBRIS, ETC., ON THE SITE OF WORK BEYOND THE STATED TIME, EXCEPT IN TOTALLY ENCLOSED CONTAINERS AND AS APPROVED BY THE ENGINEER. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL FEES AND TIPPING CHARGES FOR DISPOSAL. THE CONTRACTOR MUST FOLLOW ALL CURRENT APPLICABLE LOCAL, STATE AND FEDERAL RULES AND LAWS REGARDING THE APPROPRIATE DISPOSAL OF WASTE MATERIALS FROM CLEANING OPERATIONS. UNDER NO CIRCUMSTANCES SHALL SEWAGE OR SOLIDS REMOVED IN THE CLEANING PROCESS BE DUMPED INTO STREETS, DITCHES, CATCH BASINS, STORM DRAINS, SEWER MANHOLES, WETWELLS, CLEANOUTS, OR DUMPS.
27. WRITTEN DIMENSIONS IN THE CONTRACT DRAWINGS SHALL PREVAIL OVER SCALE DISTANCES. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
28. ELEVATIONS REFERENCED ARE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
29. POTABLE WATER IS NOT AVAILABLE ON SITE.

Project:
CITY OF ROCHESTER, NH

TARA ESTATES SEWER PUMP STATION UPGRADE

724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson
Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

COA:

Seal:
STATE OF NEW HAMPSHIRE – PROFESSIONAL ENGINEER – CHRISTOPHER M. PERKINS No. 12004 LICENSED

Issued For:
BIDDING
ADDENDUM NO. 3

Scale: NO SCALE

Date: 09 / 21 / 2022
Drawn By: GSP
Reviewed By: JMS
Approved By: CMP
W&S Project No.: ENG21-0987
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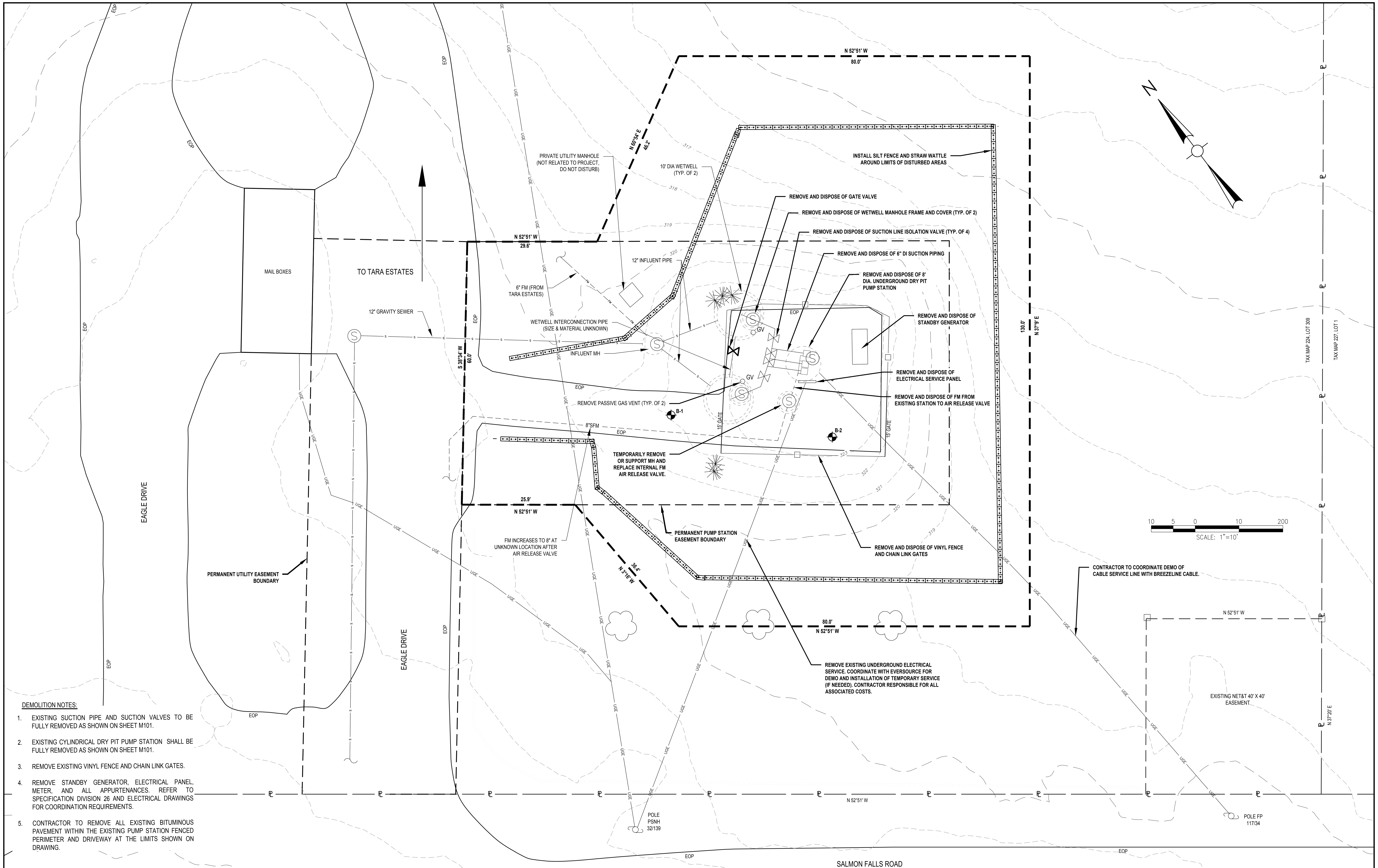
Drawing Title:
ABBREVIATIONS, NOTES, AND LEGEND

Sheet Number:
G001



DEMOLITION NOTES:

1. EXISTING SUCTION PIPE AND SUCTION VALVES TO BE FULLY REMOVED AS SHOWN ON SHEET M101.
2. EXISTING CYLINDRICAL DRY PIT PUMP STATION SHALL BE FULLY REMOVED AS SHOWN ON SHEET M101.
3. REMOVE EXISTING VINYL FENCE AND CHAIN LINK GATES.
4. REMOVE STANDBY GENERATOR, ELECTRICAL PANEL, METER, AND ALL APPURTENANCES. REFER TO SPECIFICATION DIVISION 26 AND ELECTRICAL DRAWINGS FOR COORDINATION REQUIREMENTS.
5. CONTRACTOR TO REMOVE ALL EXISTING BITUMINOUS PAVEMENT WITHIN THE EXISTING PUMP STATION FENCED PERIMETER AND DRIVEWAY AT THE LIMITS SHOWN ON DRAWING.

GENERAL NOTES:

1. EXISTING UNDERGROUND UTILITIES SHOWN BASED UPON BEST AVAILABLE RECORDS. CONTRACTOR TO HIRE UTILITY LOCATOR TO IDENTIFY ALL UNDERGROUND UTILITIES AND EQUIPMENT PRIOR TO ANY EXCAVATION.
2. LOCATIONS OF UNDERGROUND STRUCTURES, SUCTION PIPING, VALVES, AND FORCE MAIN, AS SHOWN ON THE DRAWINGS, ARE APPROXIMATE AND BASED ON FIELD OBSERVATIONS. NO RECORD INFORMATION AVAILABLE.
3. CONTRACTOR RESPONSIBLE FOR HANDLING EXISTING FLOWS AT PUMP STATION DURING CONSTRUCTION PER SECTION 01 14 19.13 AND 01 14 19.22. AIR RELEASE VALVE MANHOLE MAY BE UTILIZED AS FORCE MAIN CONNECTION POINT FOR BYPASS SYSTEM. BYPASS PUMPING SYSTEM SHALL BE INSTALLED AND OPERATIONAL PRIOR TO DEMOLITION OF THE EQUIPMENT IN THE DRY PIT, FORCEMAIN PIPING, GENERATOR, AND/OR ELECTRICAL/INSTRUMENTATION SYSTEMS.
4. DRAIN AND FULLY CLEAN WETWELLS. PERFORM CONCRETE REPAIRS AS NECESSARY PER CIVIL DETAILS AND SPECIFICATION SECTION 03 01 30.62.
5. EXCAVATION TO BE BACKFILLED WITH STRUCTURAL FILL PER SPECIFICATIONS SECTION 31 00 00.
6. ALL SUCTION AND DISCHARGE PIPE TRENCH SHALL BE MARKED WITH METAL WIRE OR TAPE PER SPECIFICATION 33 05 26.13.
7. CONTRACTOR TO REPLACE ALL EXISTING BITUMINOUS PAVEMENT WITHIN THE EXISTING PUMP STATION FENCED PERIMETER AND DRIVEWAY. PROVIDE GRADING AND DRAINAGE THAT ENSURES NEW PAVEMENT DRAINS APPROPRIATELY TO EXISTING DISCHARGE POINTS WITH NO INCREASE IN POST CONSTRUCTION FLOW RATE OR VOLUME OFF THE SITE. INSTALL 2" OF WINTER BINDER AND 1-1/2" TOP COURSE BITUMINOUS CONCRETE PAVEMENT WHERE SHOWN.
8. ALL EXISTING TREES, SHRUBS, BUSHES AND PLANTS SHALL BE PROTECTED DURING CONSTRUCTION. ALL AREAS DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO PRE-CONSTRUCTION CONDITION AT THE CONTRACTOR'S EXPENSE.
9. PUMP STATION LOCATED ON PRIVATELY OWNED LOT. CONTRACTOR TO KEEP LIMITS OF WORK WITHIN PROPOSED CONSTRUCTION EASEMENT SHOWN ON PLAN. CONTRACTOR SHALL NOT INSTALL PERMANENT STRUCTURE OUTSIDE LIMITS OF PERMANENT EASEMENT SHOWN ON PLAN. CONTRACTOR SHALL NOT DISTURB ANY AREAS OUTSIDE THE TEMPORARY CONSTRUCTION EASEMENT EXCEPT FOR INSTALLATION OF CABLE AND ELECTRICAL SERVICES.
10. CONTRACTOR SHOULD PROVIDE CONSTRUCTION FENCING AT LIMITS OF WORK WITHIN TEMPORARY CONSTRUCTION EASEMENT.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE EXTENSION OF ALL NECESSARY UTILITIES TO THE PUMP STATION SITE AS SHOWN ON THE DRAWINGS AND AS DESCRIBED IN THE SPECIFICATIONS.
12. CONTRACTOR SHALL LOAM AND SEED PER SPECIFICATIONS ALL AREAS DISTURBED BY CONSTRUCTION ACTIVITIES UNLESS OTHERWISE NOTED.
13. REFER TO ELECTRICAL DRAWINGS FOR POWER AND INSTRUMENTATION CONDUIT LOCATIONS.
14. FOR BORING LOGS, SEE SPECIFICATION 00 31 32a.
15. CONTRACTOR SHALL REPLACE THE EXISTING AIR RELEASE VALVE IN-KIND. VALVE SHALL BE FURNISHED WITH HOSE, QUICK-CONNECTS, AND ISOLATION BALL VALVES. BLOW OFF VALVE SHALL MATCH EXISTING AND ALL FITTINGS, VALVES, HARDWARE, SADDLES SHALL BE 304 SS.
16. CONTRACTOR SHALL SUBMIT SUPPORT OF EXCAVATION PLAN PER SPECIFICATION SECTION 31 50 00.

Project:

CITY OF ROCHESTER, NH

TARA ESTATES SEWER PUMP STATION UPGRADE

724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson

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100 International Drive, Suite 152
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978.532.1900 800.SAMPSON
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Consultants:

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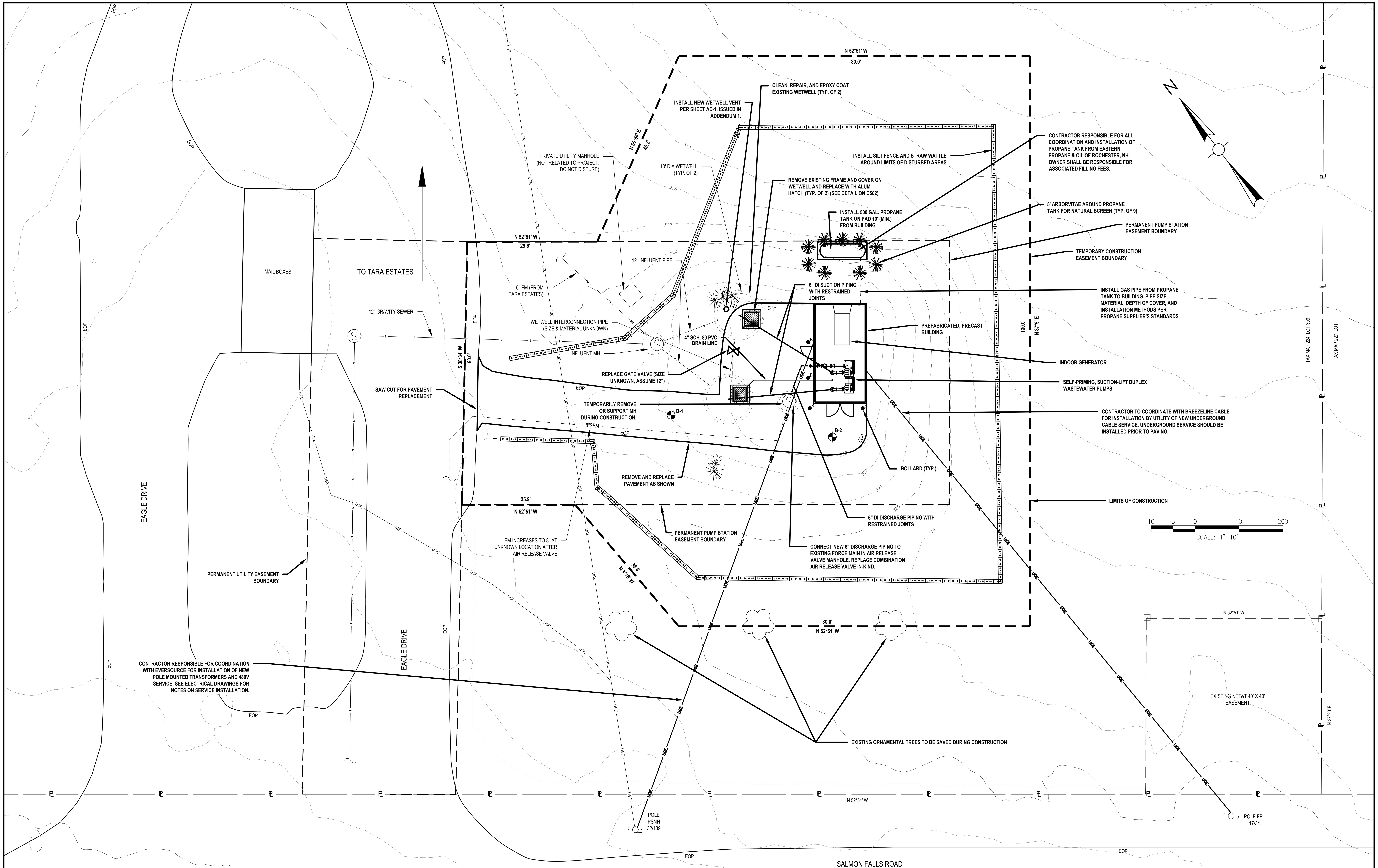
Drawing Title:

EXISTING CONDITIONS AND DEMOLITION PLAN

Sheet Number:

C101



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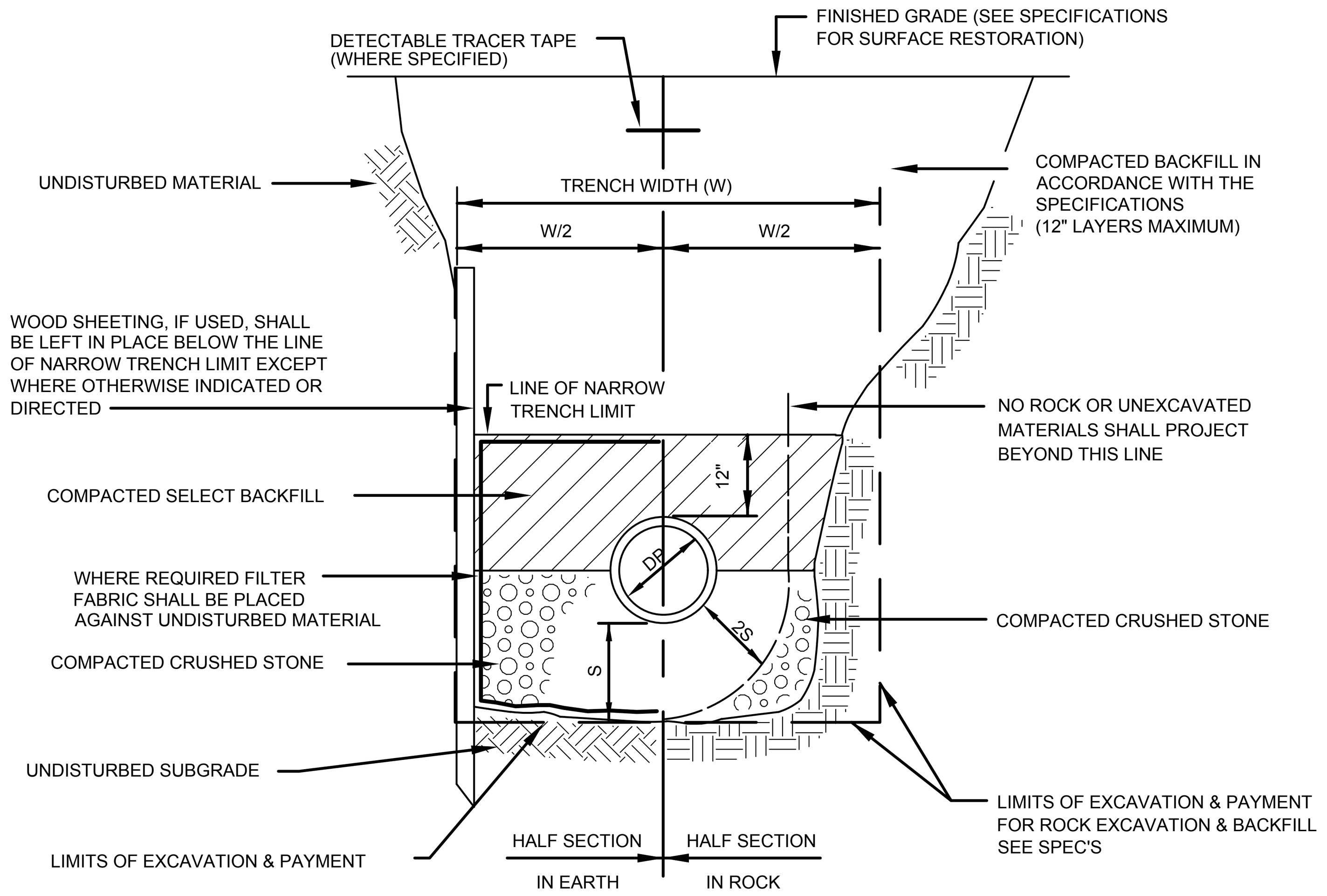
PROPOSED SITE LAYOUT

Sheet Number:
C102



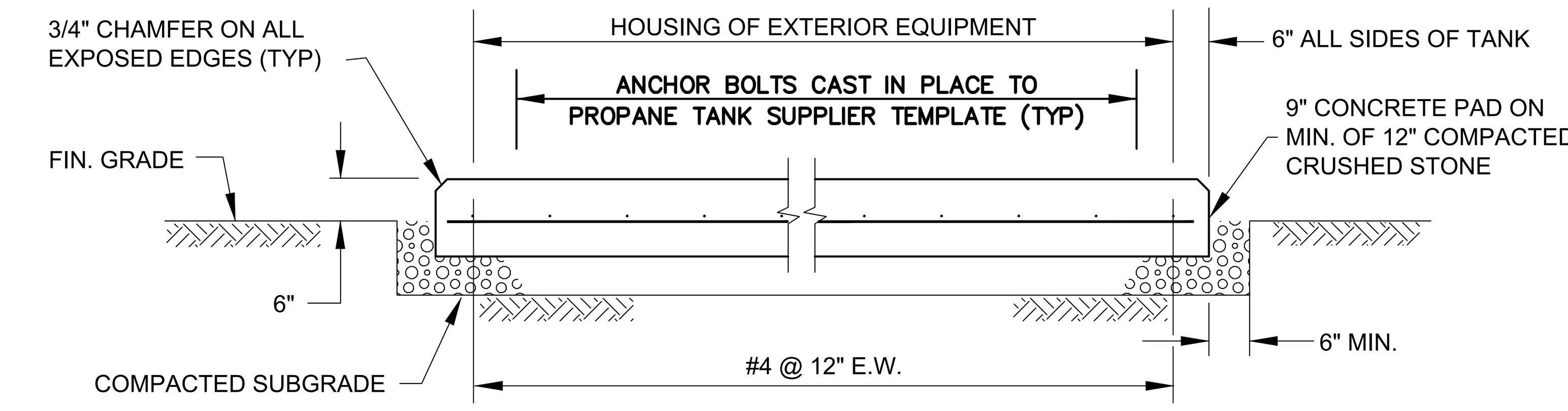
SEWER TRENCH DETAIL

N.T.S.

(GRAVITY SEWER, FORCEMAIN, AND STORM DRAIN)

DIAMETER OF PIPE (DP)	MAXIMUM TRENCH WIDTH BELOW LINE OF NARROW TRENCH LIMIT (SHEETED OR UNSHEETED) (W)	MINIMUM CLEARANCE (S)
<15"	36"	6"

TABLE A

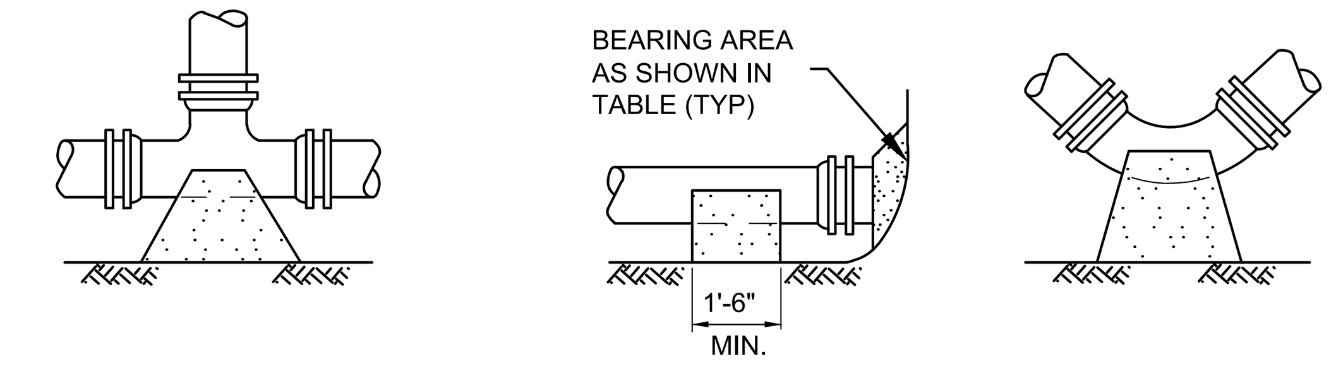


NOTES:

1. COORDINATE ALL OPENINGS IN PAD WITH EQUIPMENT MANUFACTURER.
2. PROVIDE PAD FOR PROPANE STORAGE TANK. COORDINATE PAD DIMENSIONS WITH UTILITY.
3. PROVIDE ANCHOR BOLTS AS REQUIRED BY UTILITY.

L.P. GAS TANK PAD DETAIL

N.T.S.



TEE DETAIL (PLAN VIEW) — CAP DETAIL (PLUG SIMILAR) (SECTION VIEW) — BEND DETAIL (PLAN VIEW)

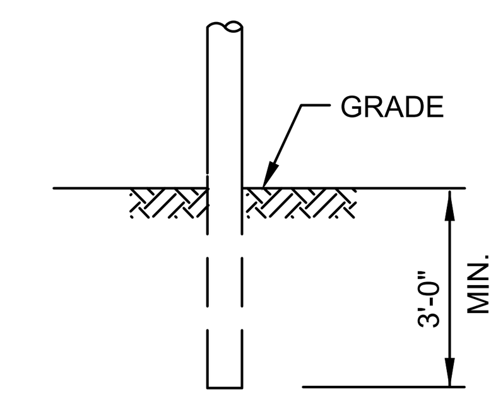
TABLE OF CONCRETE THRUST RESTRAINT MINIMUM BEARING AREAS IN SQUARE FEET AGAINST UNDISTURBED MATERIAL FOR ALL PRESSURE PIPE FITTINGS				
SIZE OF MAIN	90° BENDS, TEES, CAPS AND PLUGS	45° BENDS AND WYES	22-1/2° BENDS	11-1/4° BENDS
6", 8"	5	4	2	2
10", 12"	12	9	5	2

CONCRETE THRUST RESTRAINT FOR FITTINGS

N.T.S.

NOTES:

1. CONCRETE THRUST RESTRAINT SHALL ONLY BE USED WHERE OTHER MEANS OF RESTRAINT ARE NOT FEASIBLE.
2. CONTRACTOR SHALL USE CARE TO AVOID PLACEMENT OF CONCRETE ON THE FITTING JOINTS.

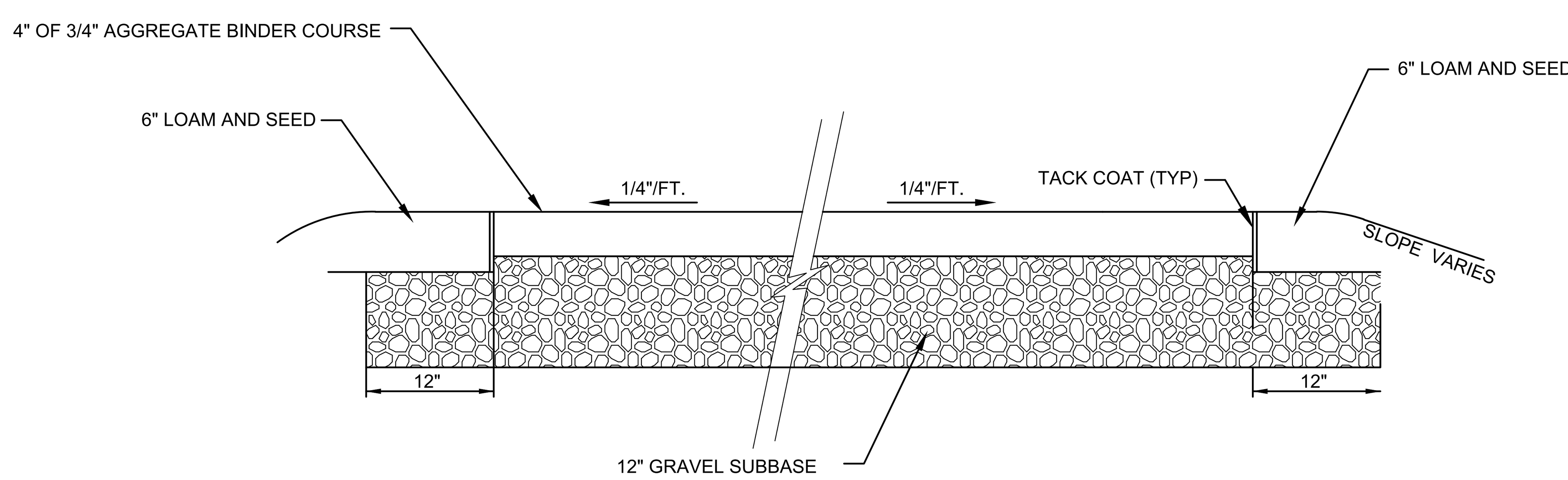


NOTES:

1. SEE SPECIFICATION SECTION 01 56 26-TEMPORARY CHAIN LINK FENCE
2. PORTABLE/TEMPORARY CHAIN LINK FENCE IS ALLOWABLE.

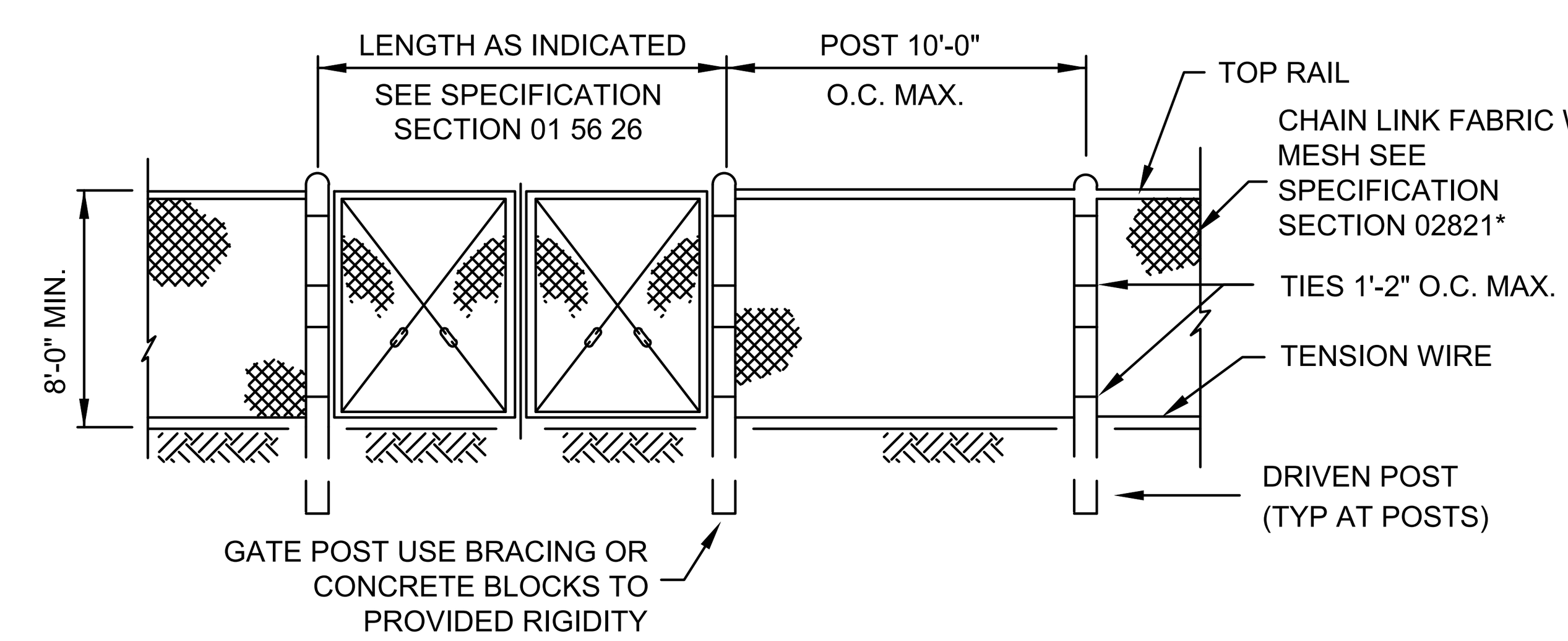
DRIVEN POST DETAIL

N.T.S.



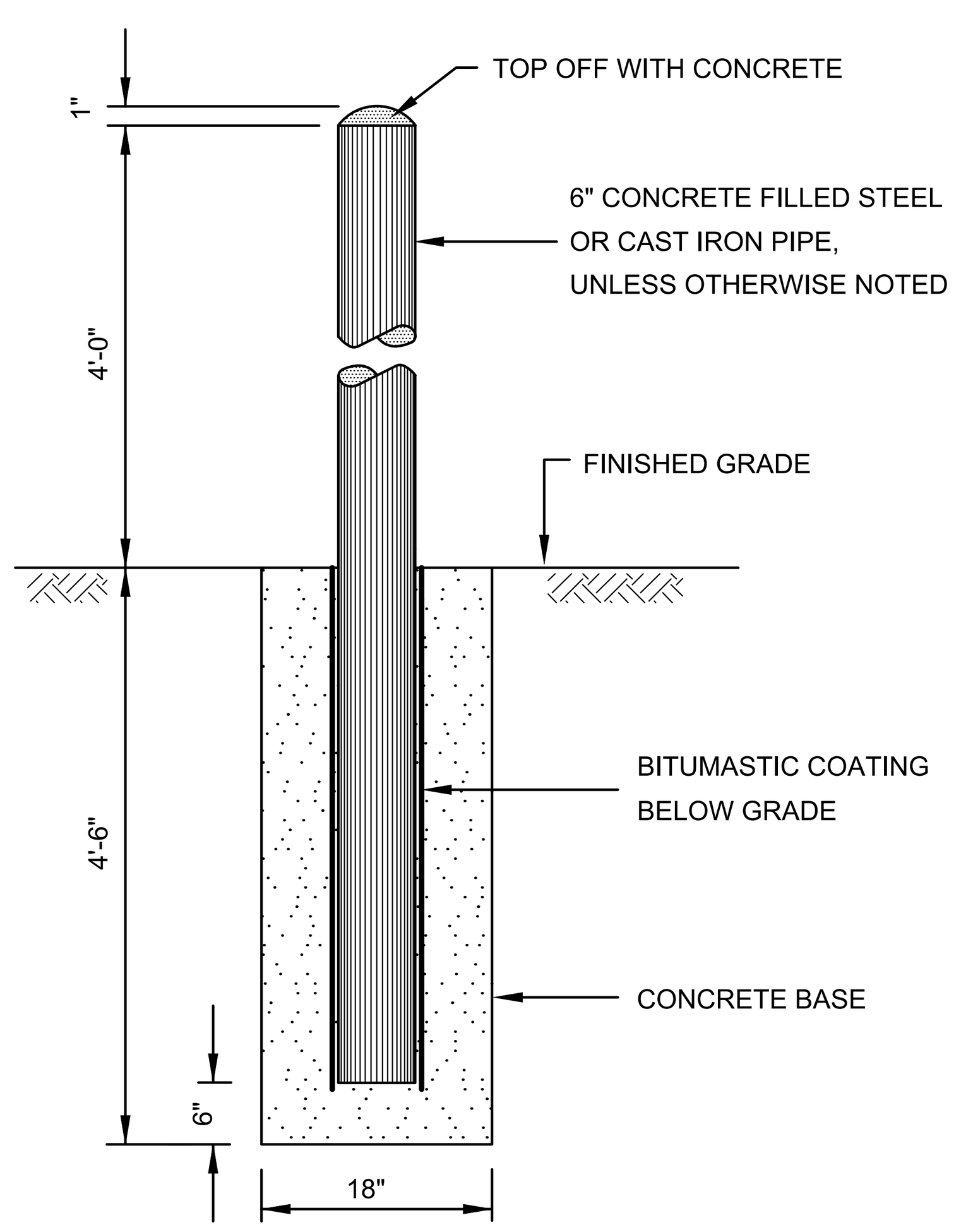
PARKING LOTS AND DRIVEWAYS

N.T.S.



TEMPORARY CHAIN LINK FENCE AND GATE DETAIL

N.T.S.

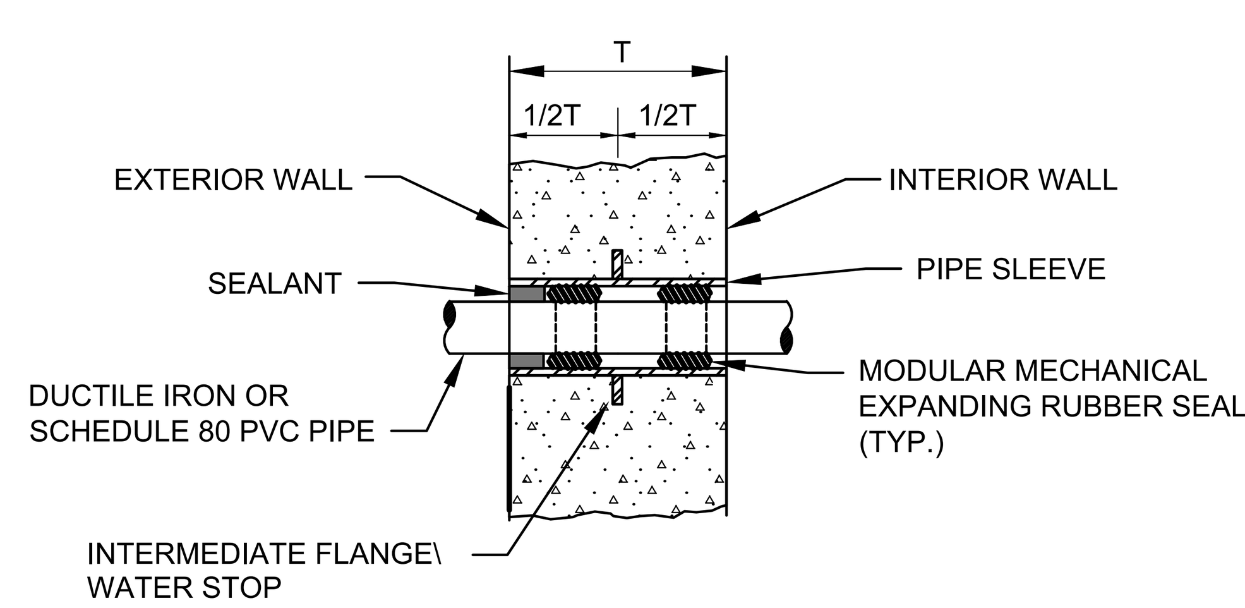


BOLLARD DETAIL

N.T.S.

NOTES:

1. PIPE SHALL BE PAINTED SAFETY YELLOW WITH CATALIZED EPOXY PAINT.
2. POST SHALL BE COVERED WITH 1/8" THICK HDPE SAFETY YELLOW BOLLARD COVER BY POST GUARD OR APPROVED EQUAL.

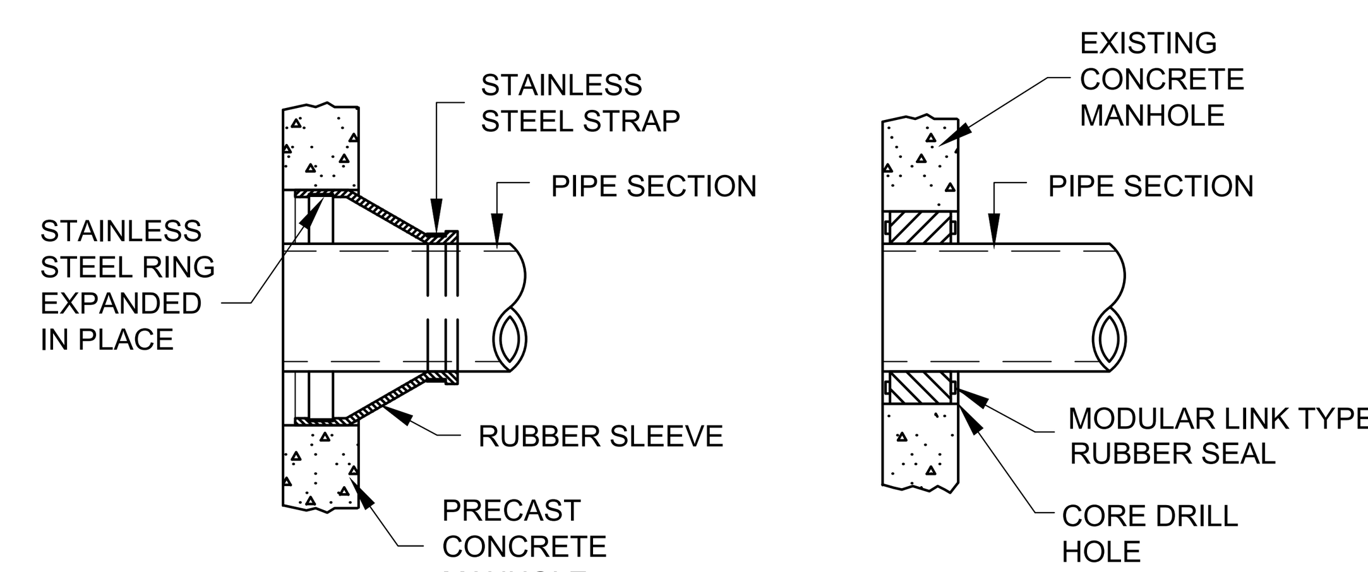


WATER-TIGHT PENETRATION THROUGH NEW WALL

N.T.S.

NOTES:

1. TYPICAL ALL WALL AND FLOOR PENETRATIONS UNLESS SHOWN OTHERWISE.
2. SLEEVE DIAMETER SHALL BE AS RECOMMENDED BY THE MECHANICAL SEAL MANUFACTURER.



WETWELL AND MANHOLE SEAL DETAILS

N.T.S.

NOTES:

1. ALL PENETRATIONS INTO THE WETWELL AND AIR RELEASE VALVE MANHOLE SHALL BE VAPOR AND GAS TIGHT.

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Drawing Title:
CIVIL DETAILS I

Sheet Number:
C501

STRUCTURAL REPAIR NOTES:

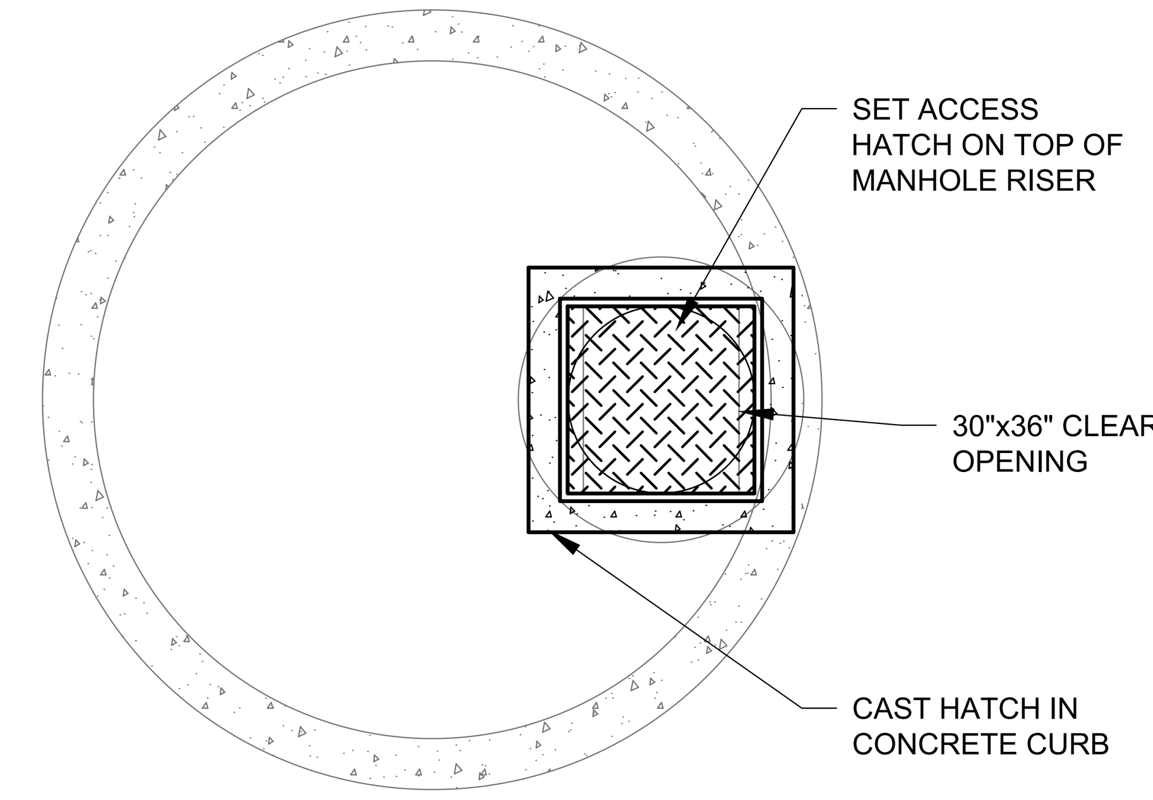
GENERAL REPAIR NOTES:
1. WETWELLS SHOULD BE THOROUGHLY CLEANED AND POWER WASHED CAREFULLY PRIOR TO ANY OF THE CONCRETE REPAIR PROCEDURES LISTED BELOW.
2. CONTRACTOR TO ASSUME PARTIAL DEPTH CONCRETE REPAIR IS NOT NECESSARY. LIMITS TO BE DETERMINED DURING FIELD SURVEY.
3. COATINGS SHALL BE APPLIED AFTER COMPLETION OF CRACK REPAIRS, FLOOR SLOPE MODIFICATIONS, AND INSTALLATION OF TOP SLAB/CURB.

EPOXY INJECTION CRACK REPAIR:
4. CONTRACTOR TO PERFORM FIELD SURVEY TO DETERMINE LIMITS OF CRACKS AND REQUIRED REPAIRS.
5. AFTER APPROVAL OF LIMITS IS RECEIVED FROM ENGINEER, CONCRETE CRACKS SHALL BE REPAIRED BY EPOXY INJECTION.
6. CRACKS SHALL BE CLEANED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS PRIOR TO INSTALLATION OF INJECTION PORTS.
7. CLEAN AREAS TO RECEIVE CAPPING ADHESIVE OF OIL, DIRT, AND OTHER SUBSTANCES THAT WOULD INTERFERE WITH BOND, AND CLEAN CRACKS WITH OIL-FREE COMPRESSED AIR OR LOW-PRESSURE WATER TO REMOVE LOOSE PARTICLES.
8. PLACE INJECTION PORTS AS RECOMMENDED BY EPOXY MANUFACTURER, SPACING NO FARTHER APART THAN THICKNESS OF MEMBER BEING INJECTED. SEAL INJECTION PORTS IN PLACE WITH CAPPING ADHESIVE.
9. SEAL CRACKS AT EXPOSED SURFACES WITH A RIBBON OF CAPPING ADHESIVE AT LEAST ¼ INCH THICK BY 1 INCH WIDER THAN CRACK.
10. INJECT CRACKS WITH A WIDTH OF 0.005 INCH TO 0.25 INCH.
11. INJECT EPOXY ADHESIVE, BEGINNING AT WIDEST PART OF CRACK AND WORKING TOWARD NARROWER PARTS, INJECT ADHESIVE INTO PORTS TO REFUSAL, CAPPING ADJACENT PORTS WHEN THEY EXTRUDE EPOXY. CAP INJECTED PORTS AND INJECT THROUGH ADJACENT PORTS UNTIL CRACK IS FILLED.
12. AFTER EPOXY ADHESIVE HAS SET, REMOVE INJECTION PORTS, AND GRIND SURFACES SMOOTH.

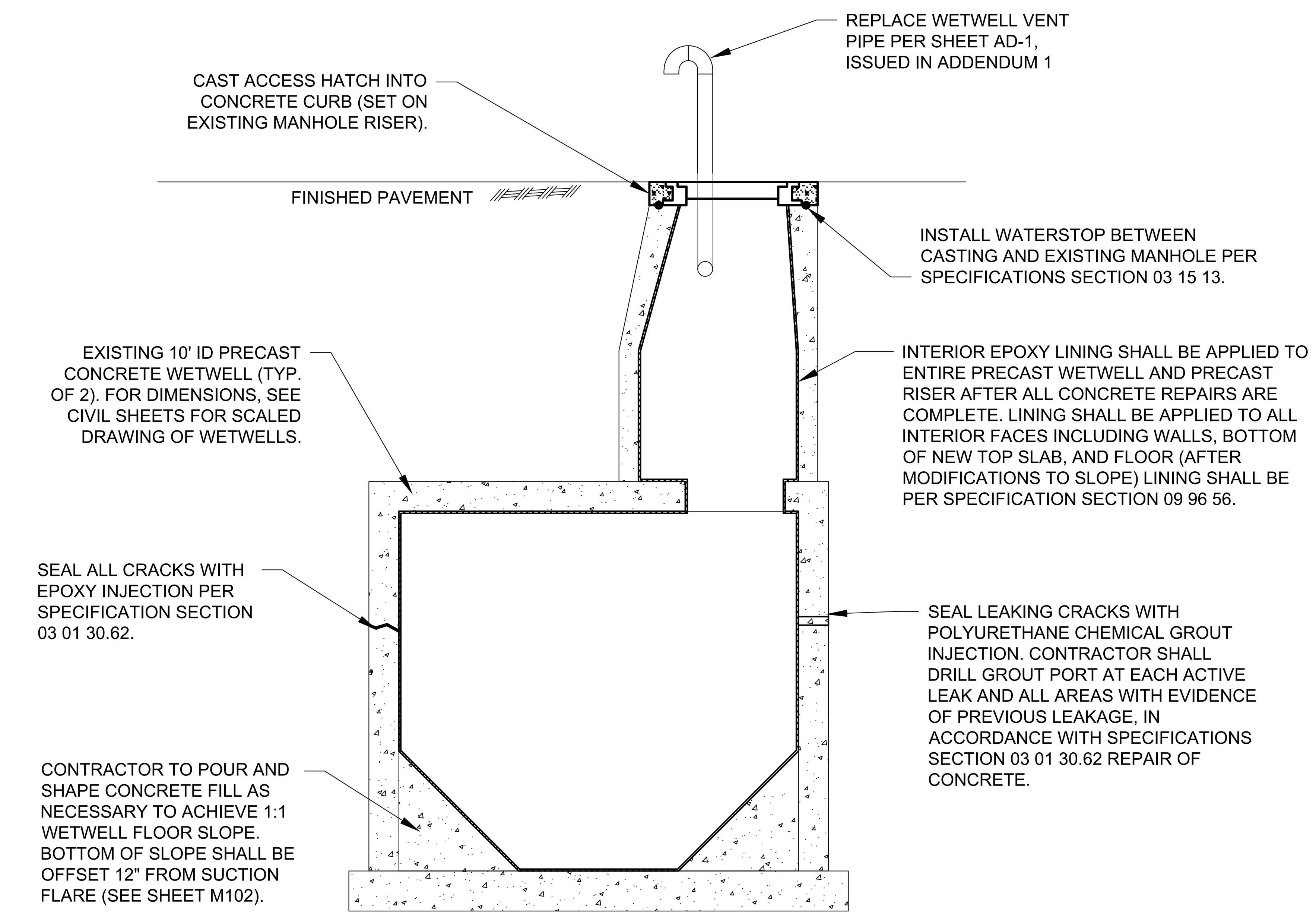
PARTIAL DEPTH REPAIR NOTES:
13. CONTRACTOR TO PERFORM FIELD SURVEY TO DETERMINE LIMITS OF DETERIORATION AND REQUIRED REPAIRS. THIS SURVEY SHALL INCLUDE THE WETWELL FLOOR AND SIDEWALLS.
14. AFTER APPROVAL OF LIMITS RECEIVED FROM ENGINEER, CONTRACTOR TO REMOVE DETERIORATED CONCRETE TO SOUND CONCRETE AT REPAIR LOCATIONS.
15. IF MORE THAN 50% OF A PIECE OF REINFORCING STEEL IS EXPOSED, THE CONCRETE SHALL BE REMOVED TO A MINIMUM OF 1" AROUND THE REINFORCING STEEL AS SHOWN ABOVE.
16. IF REINFORCING STEEL IS FOUND TO BE DETERIORATED, SUPPLEMENTARY REINFORCING STEEL IS TO BE PROVIDED.
 16.1. PROVIDE 2 - #5 BARS TO SUPPLEMENT A DETERIORATED ¾" SQUARE BAR.
 16.2. PROVIDE 1 - #4 BAR TO SUPPLEMENT A DETERIORATED WIRE TIE.
17. SUPPLEMENTARY REINFORCEMENT TO BE LAPPED WITH EXISTING REINFORCEMENT.
18. CONCRETE SURFACE SHALL BE DAMPENED PRIOR TO PATCHING IN ACCORDANCE WITH SPECIAL PROVISIONS.
19. IF LIMITS OF REPAIR ARE LESS THAN 2" DEEP, TYPE A REPAIR IS TO BE PERFORMED AS SHOWN BELOW.
 19.1. TYPE A REPAIRS TO BE PATCHED WITH MATERIAL AS SPECIFIED IN SPECIAL PROVISIONS FOR CEMENTITIOUS MORTAR FOR PATCHING.
20. IF LIMITS OF REPAIR ARE MORE THAN 2" DEEP, TYPE B REPAIR IS TO BE PERFORMED AS SHOWN BELOW.
 20.1. TYPE B REPAIRS TO BE PATCHED WITH 5000 PSI - 3/8" CEMENT CONCRETE.
21. ALL PATCHES TO BE FINISHED FLUSH WITH SURROUNDING CONCRETE SURFACE.

SKIM COAT:
22. ALL LOOSE OR FLAKING MATERIAL TO BE REMOVED FROM EXISTING FACE OF CONCRETE SURFACE.
23. SKIM COAT TO BE APPLIED PER THE MANUFACTURER'S SPECIFICATIONS AND MUST MATCH EXISTING THICKNESS ON FACE OF CONCRETE SURFACE.
24. SKIM COAT SHOULD BE ONE OF THE FOLLOWING OR EQUAL:
 24.1. TNEMEC SERIES 218/219 MORTAR CLAD OR APPROVED EQUAL.

PROTECTIVE COATING ON WETWELL INTERIOR WALLS:
25. PROTECTIVE COATING TO BE APPLIED PER THE MANUFACTURER'S SPECIFICATIONS.
26. TWO TOP COATS SHALL BE APPLIED WITH TOTAL DRY THICKNESS OF 80 MILS.
27. ENTIRE INTERIOR OF STRUCTURE SHALL BE COATED INCLUDING BOTTOM OF TOP SLAB AND SLOPED FLOORS.
28. PROTECTIVE COATING SHOULD BE ONE OF THE FOLLOWING OR EQUAL:
 28.1. TNEMEC SERIES 435 PERMA-GLAZE OR APPROVED EQUAL.



PLAN



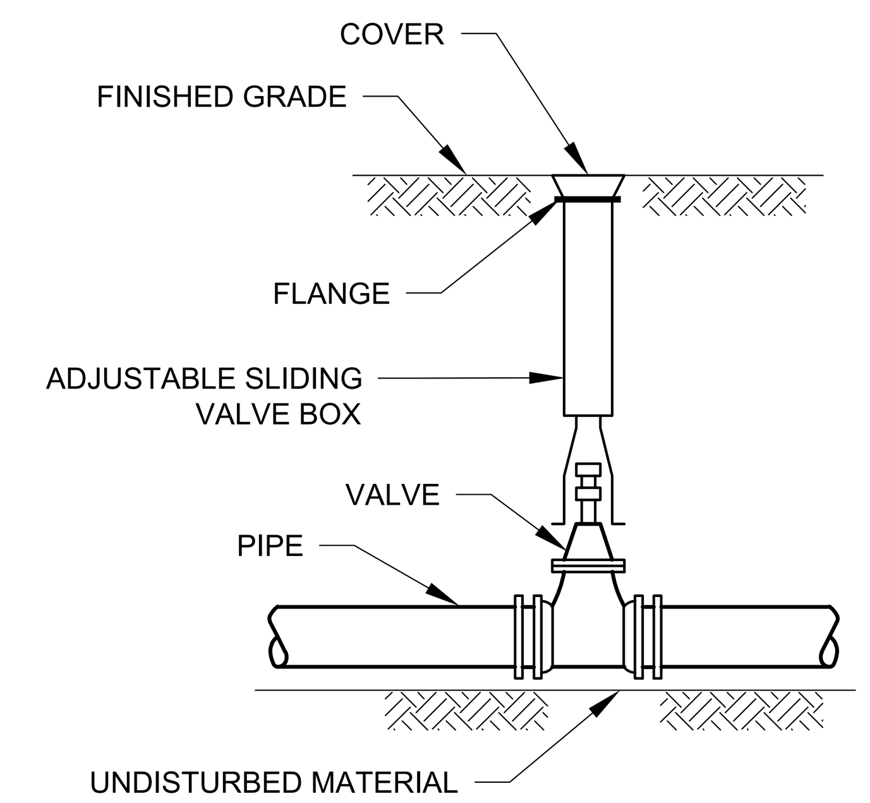
SECTION

WETWELL REPAIR AND MODIFICATIONS

N.T.S.

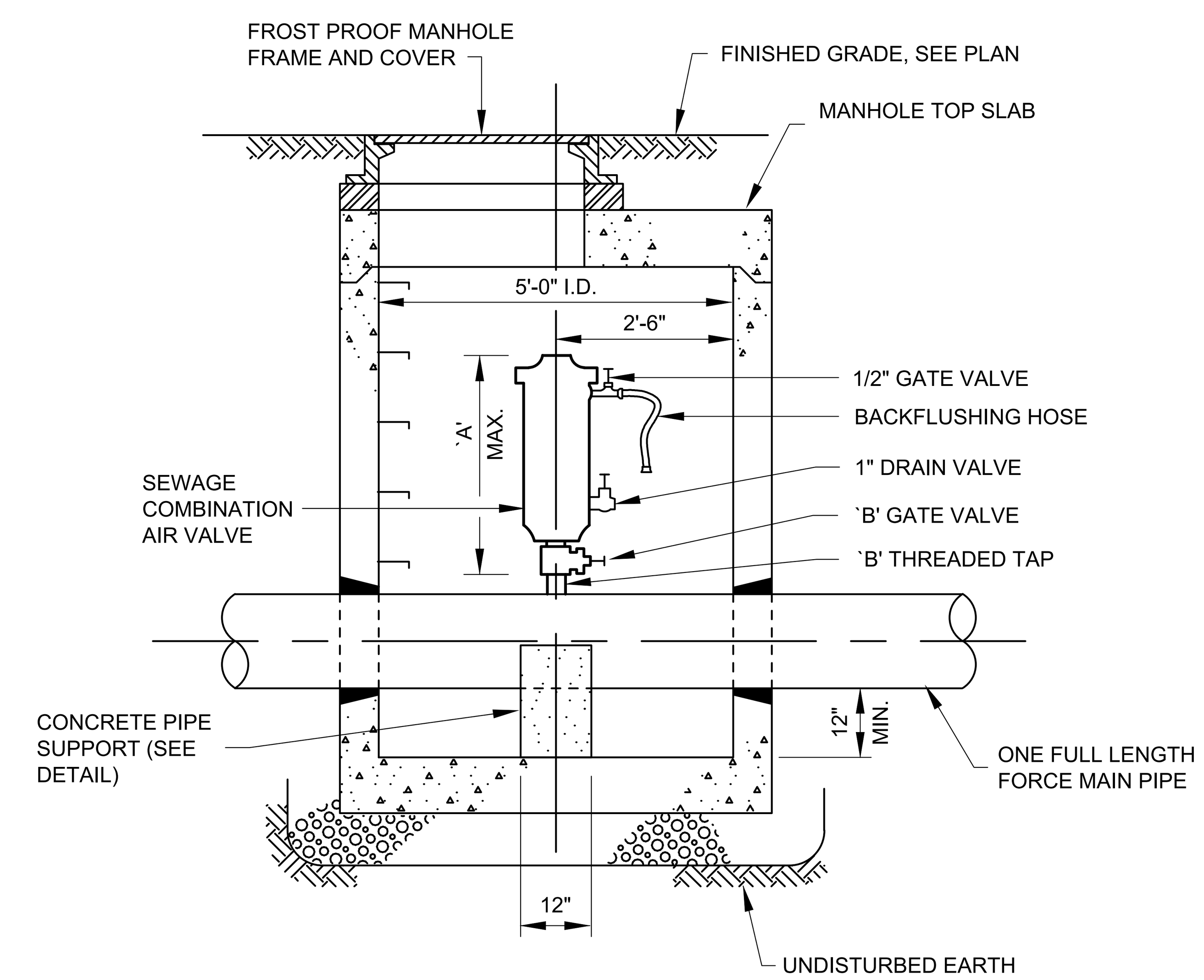
NOTES:

1. REMOVE EXISTING MANHOLE FRAMES AND COVERS.
2. INSTALL NEW ALUMINUM FLOOR HATCHES WITH 30"X36" CLEAR OPENING, H20 LOAD RATING, FALL THROUGH PROTECTION, AND LOW PROFILE FRAME (4.5" TALL MAX). SEE SPECIFICATION SECTION 08 34 83 FOR ALL HATCH REQUIREMENTS.
3. INSTALLATION OF HATCHES SHALL ALLOW FOR FINAL PAVING TO BE FLUSH WITH THE COVER AND TOP OF CURB.
4. WETWELL REPAIRS AND MODIFICATIONS TO BE PERFORMED ON BOTH WETWELLS.
5. CONTRACTOR TO ASSUME 30 LF OF EPOXY INJECTION REPAIR AND 20 LF OF POLYURETHANE CHEMICAL GROUT REPAIR (TOTAL) FOR COMPARISON OF BIDS.



VALVE AND BOX DETAIL

N.T.S.

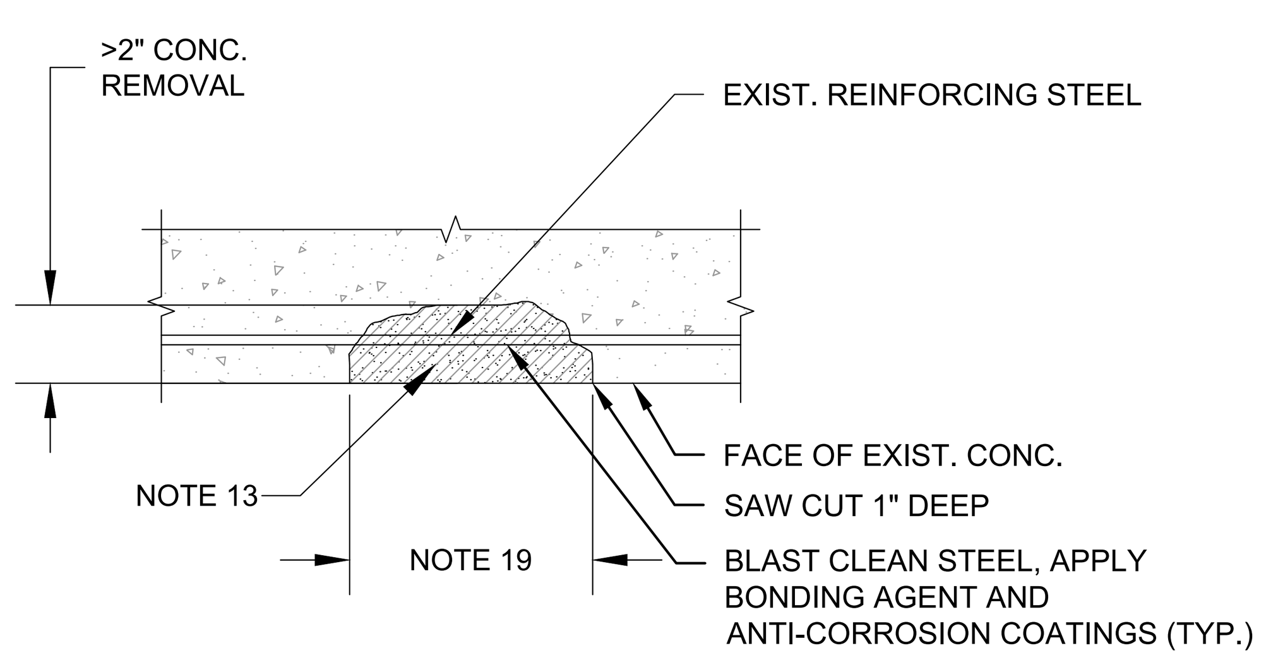


SEWAGE COMBINATION AIR VALVE STRUCTURE

N.T.S.

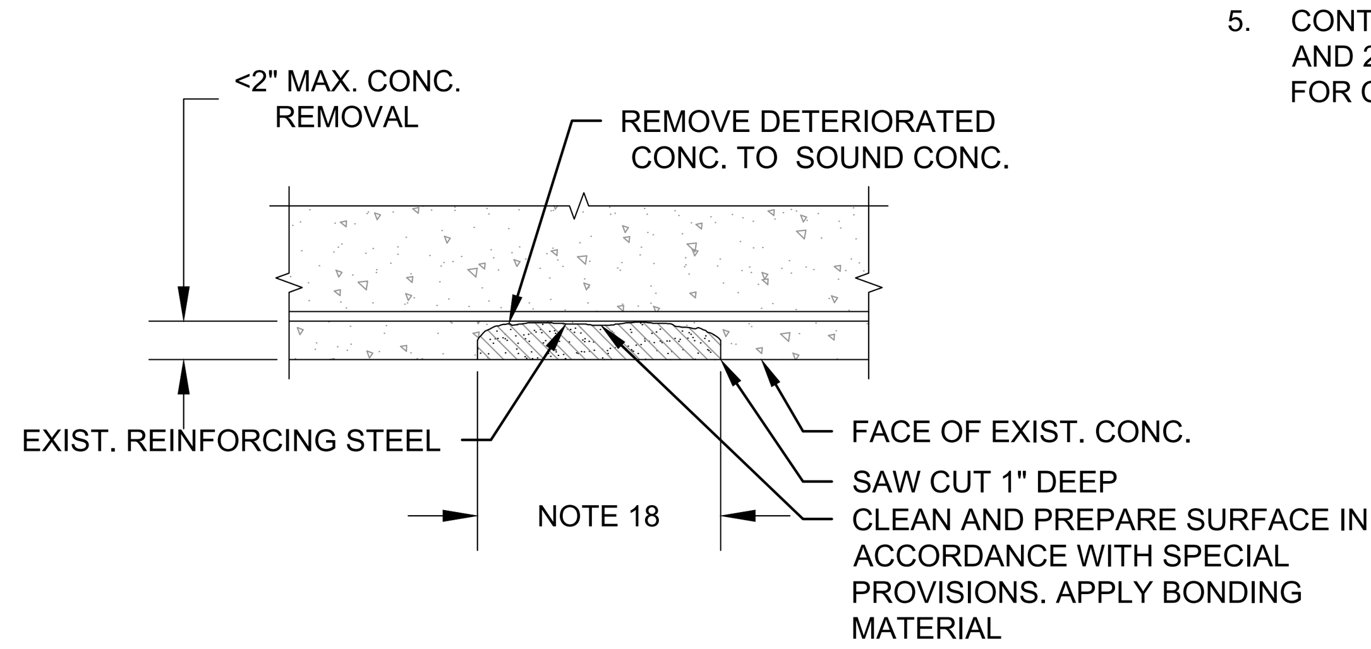
NOTES:

1. CONTRACTOR TO REPLACE EXISTING 6" AIR RELEASE VALVE IN KIND.
2. AIR RELEASE VALVE MH TO BE TEMPORARILY REMOVED OR SUPPORTED DURING EXCAVATION ACTIVITIES.



TYPE B (MORE THAN 2" DEEP)

N.T.S.



TYPE A (LESS THAN 2" DEEP)

N.T.S.

PARTIAL DEPTH CONCRETE REPAIR DETAILS

NOTES:

1. CONTRACTOR TO ASSUME PARTIAL DEPTH CONCRETE REPAIR IS NOT NECESSARY. LIMITS OF CONCRETE REPAIR TO BE DETERMINED BY CONTRACTOR AFTER CLEANING AND INSPECTION OF WETWELLS.

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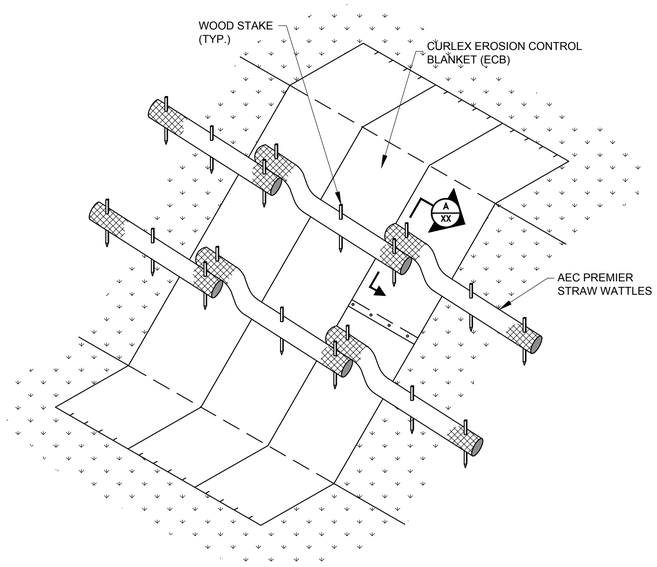
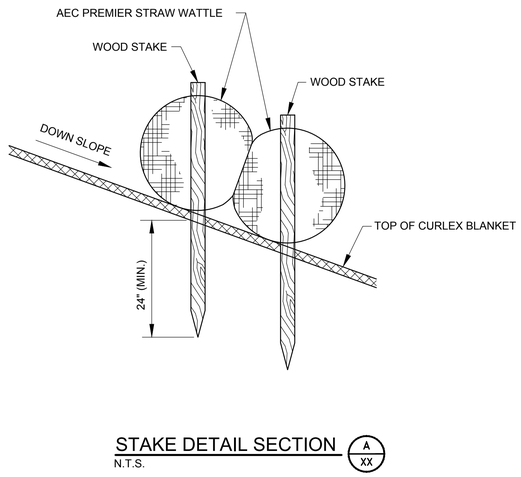
Drawing Title:
CIVIL DETAILS II

Sheet Number:
C502



SLOPE DETAIL
N.T.S.



STAKE DETAIL SECTION (A / XX)
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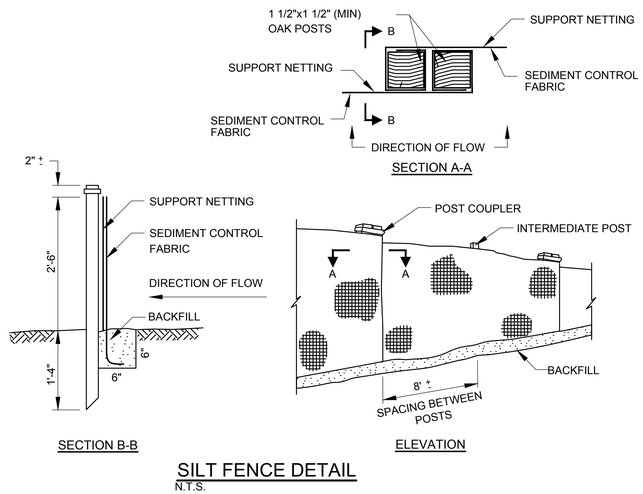

SILT FENCE DETAIL
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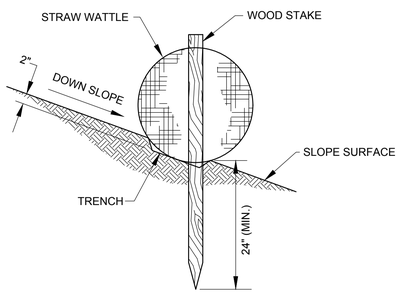

STAKE DETAIL (ON BARE SOIL)
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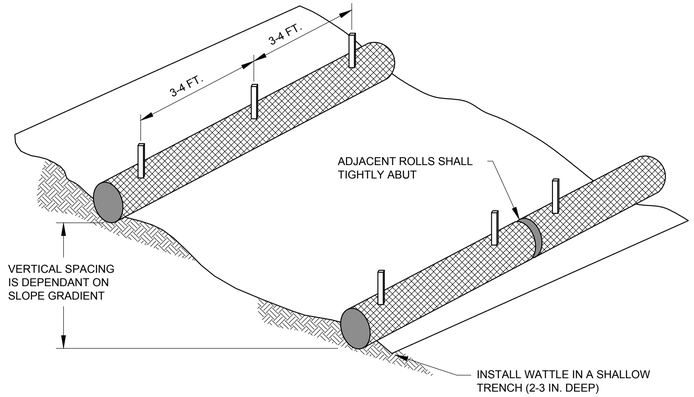
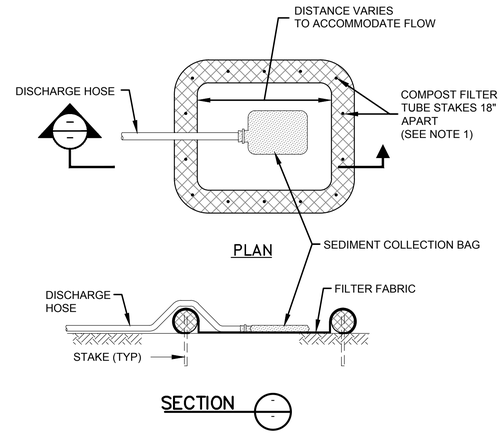


STRAW WATTLE INSTALLATION GUIDE
N.T.S.

NOTES:

1. BEGIN AT THE LOCATION WHERE THE WATTLE IS TO BE INSTALLED BY EXCAVATING A 2-3" DEEP X 9" WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHOULD BE PLACED UP-SLOPE FROM THE ANCHOR TRENCH.
2. PLACE THE WATTLE IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT SOIL FROM THE EXCAVATED TRENCH AGAINST THE WATTLE ON THE UPHILL SIDE. ADJACENT WATTLES SHOULD TIGHTLY ABUT.
3. SECURE THE WATTLE WITH 18-24" STAKES EVERY 3-4' AND WITH A STAKE ON EACH END. STAKES SHOULD BE DRIVEN THROUGH THE MIDDLE OF THE WATTLE LEAVING AT LEAST 2-3" OF STAKE EXTENDING ABOVE THE WATTLE. STAKES SHOULD BE DRIVEN PERPENDICULAR TO SLOPE FACE.



DEWATERING DISCHARGE DISPOSAL DETAIL
N.T.S.

NOTE:

1. WHEN STAKING IS NOT POSSIBLE, SUCH AS WHEN TUBES MUST BE PLACED ON PAVEMENT, HEAVY CONCRETE OR CINDER BLOCKS CAN BE USED BEHIND TUBES UP TO 5 FT. APART OR AS REQUIRED TO SECURE TUBES IN PLACE.

Project:
CITY OF ROCHESTER, NH

TARA ESTATES SEWER PUMP STATION UPGRADE

724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description
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Seal:
STATE OF NEW HAMPSHIRE
CHRISTOPHER M. PERKINS
No. 12004
LICENSED PROFESSIONAL ENGINEER

Issued For:
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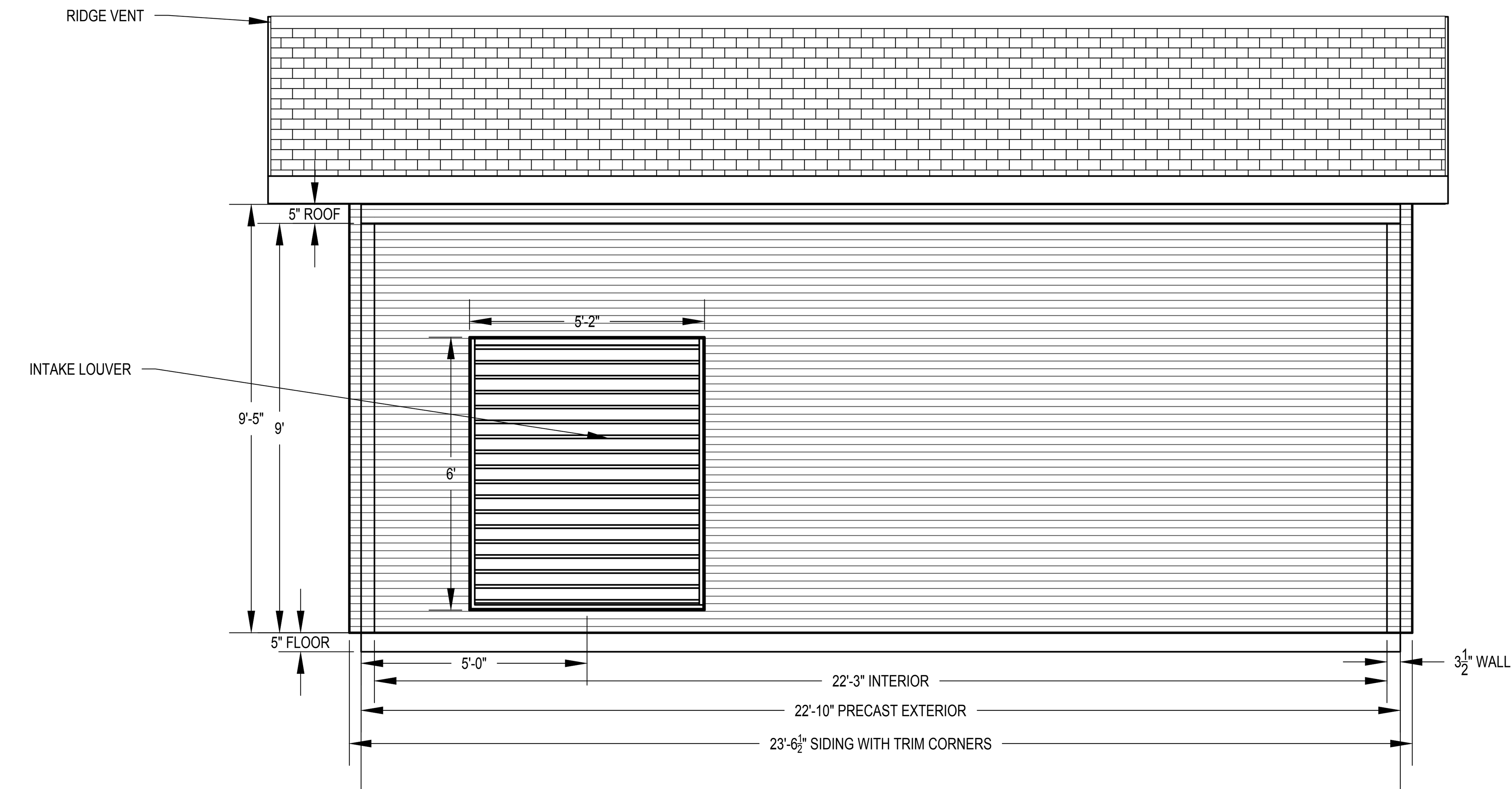
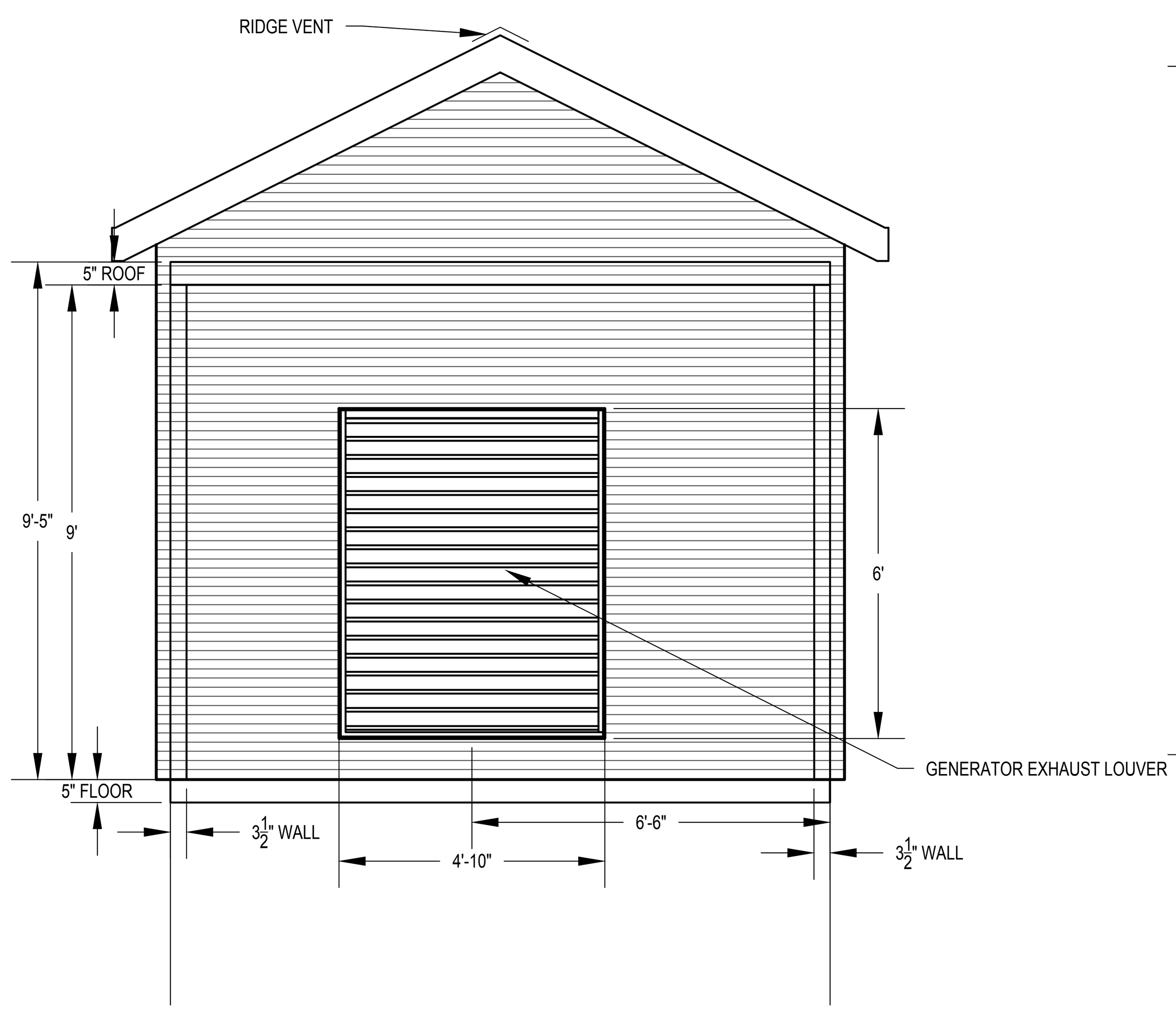
C503

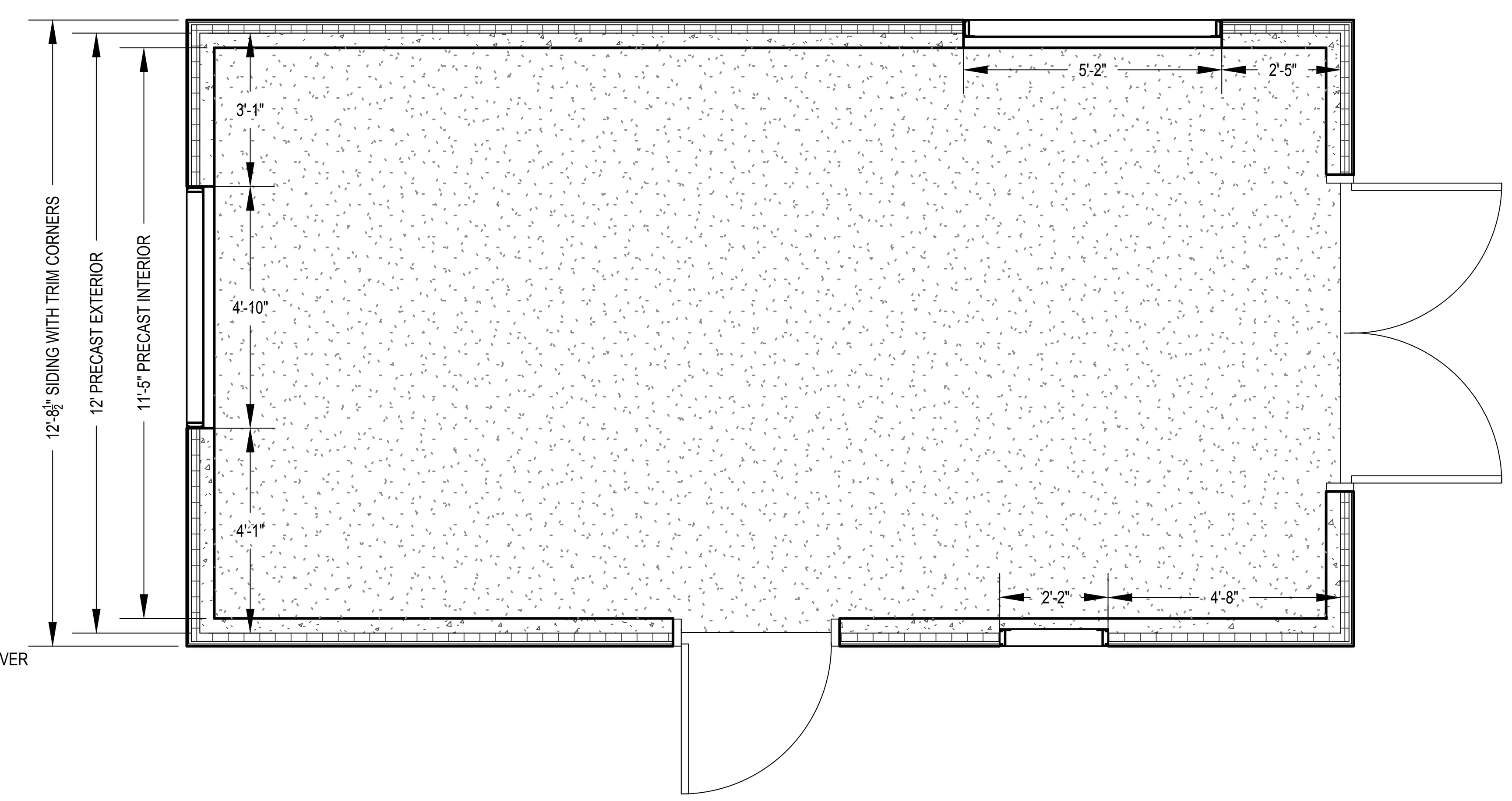


EAST ELEVATION

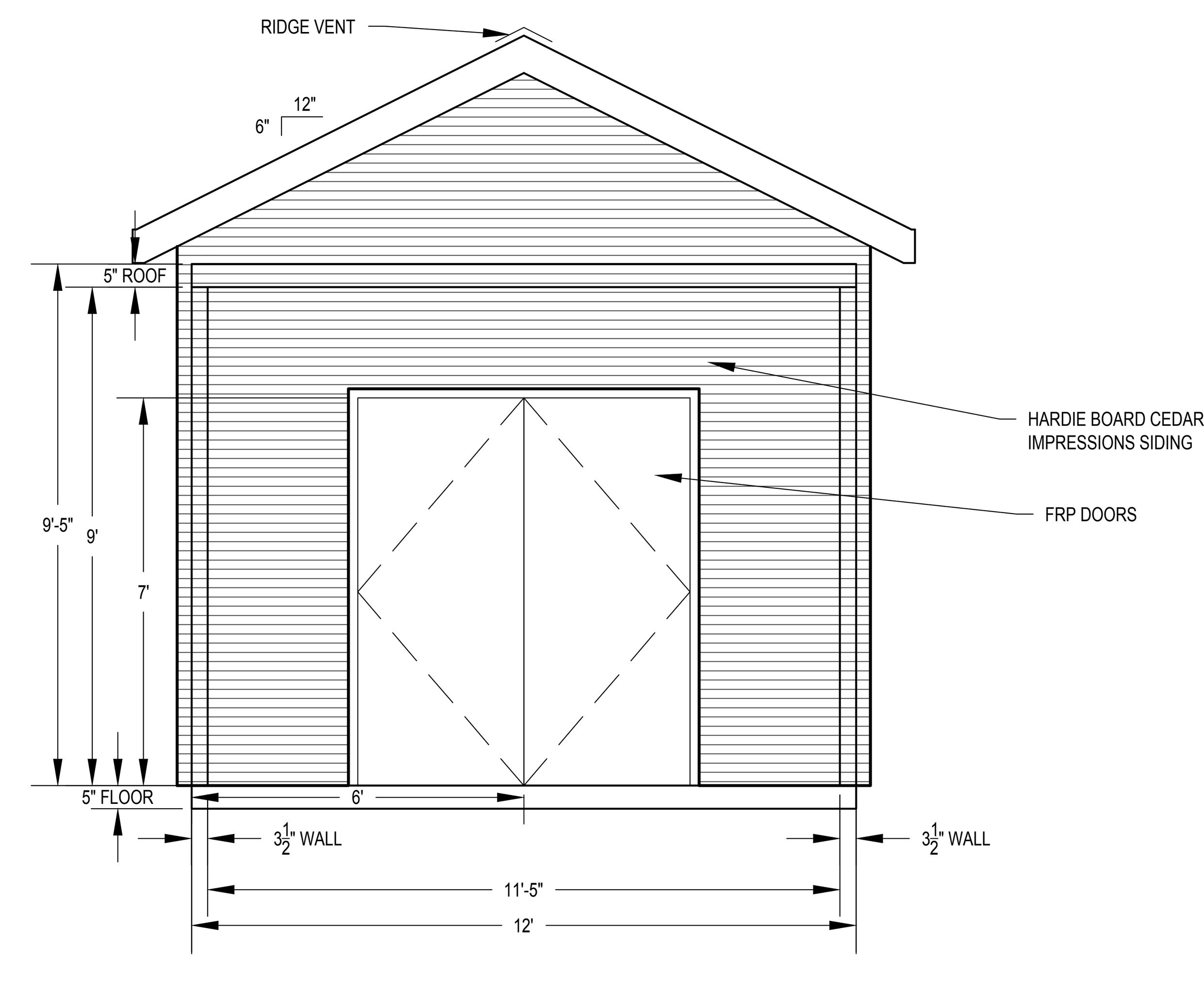
FINISH SCHEDULE		
AREA	COATING TYPE	COLOR
BUILDING EXTERIOR ROOF	GABLE ROOF, WOOD TRUSS SYSTEM ASPHALT COMPOSITION TILES. FIELD INSTALLED	PEWTER GRAY
EXTERIOR SIDING EXTERIOR TRIM	HARDIE BOARD CEDAR IMPRESSIONS SIDING AZEK VINYL TRIM	STERLING GRAY
BUILDING INTERIOR WALLS, CEILING	(1) COAT OF THOROSEAL	N/A
BUILDING INTERIOR FLOOR	(1) COAT OF THOROSEAL	N/A
BUILDING DOORS & FRAMES	PRE-FINISHED	PER OWNER'S SPECIFICATIONS
LOUVERS	KYNAR FINISH	PER OWNER'S SPECIFICATIONS
CONSTRUCTION SEALANT	TREMCO DYMONIC CAULKING	LIMESTONE



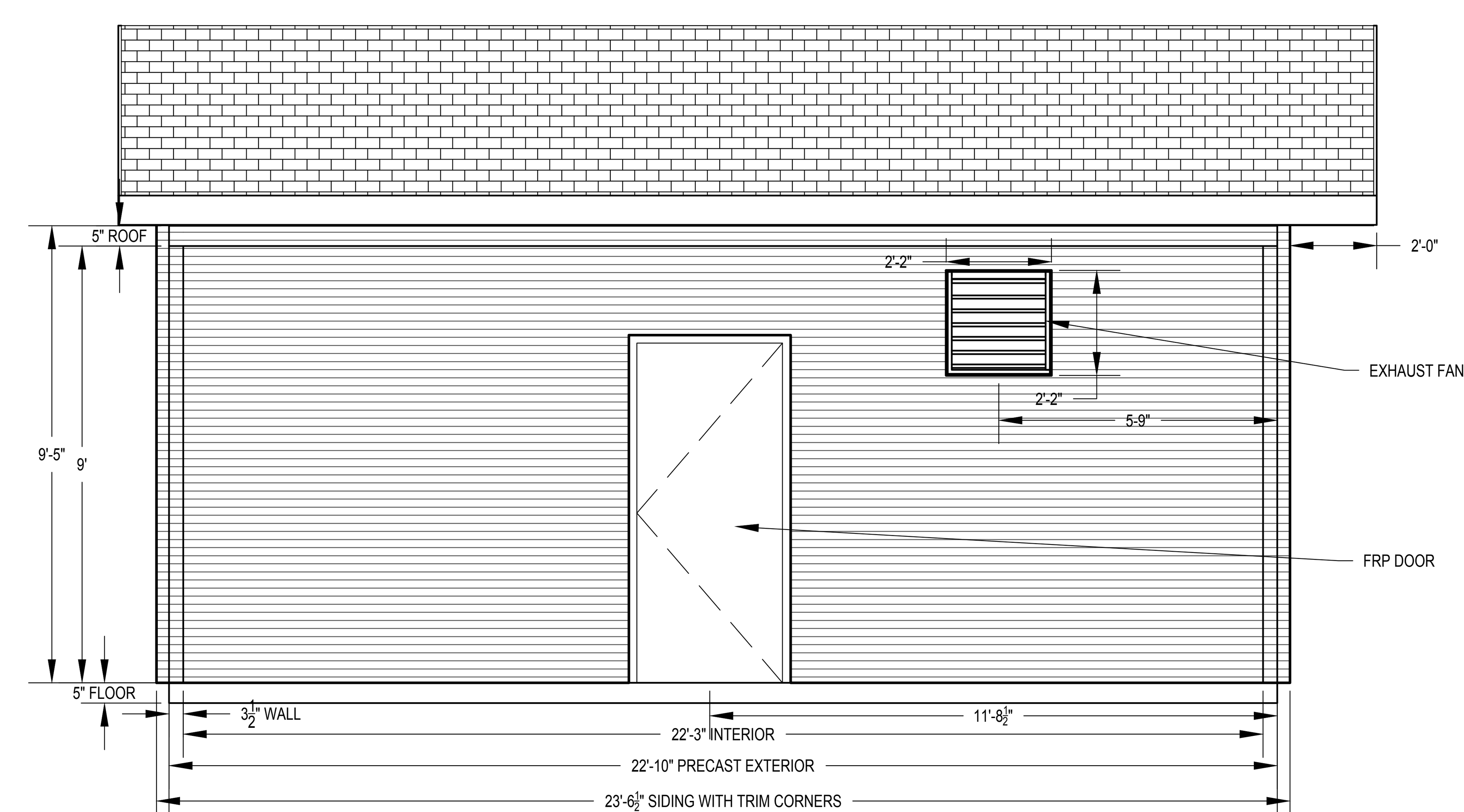
NORTH ELEVATION



PLAN VIEW



SOUTH ELEVATION



WEST ELEVATION

NOTES:

1. DRAWINGS FOR REFERENCE PURPOSES ONLY. BUILDING IS NOT DRAWN TO SCALE.
2. MANUFACTURER TO SUBMIT DRAWINGS STAMPED BY PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW HAMPSHIRE.
3. THE INTERIOR PRECAST DIMENSIONS SHALL BE A MINIMUM OF 22'-3" LONG, 11'-5" WIDE, 9' TALL.
4. CONTRACTOR TO INSTALL THE PREFABRICATED, PRECAST BUILDING IN THE LOCATION SHOWN ON CIVIL AND MECHANICAL DRAWINGS. SECURE BUILDING TO FOOTING PER STRUCTURAL DRAWINGS AND BUILDING MANUFACTURER'S RECOMMENDATIONS.
5. CONTRACTOR SHALL COORDINATE ALL BUILDING PENETRATIONS WITH PRECAST BUILDING MANUFACTURER. REFERENCE PROCESS MECHANICAL, HVAC, AND ELECTRICAL DRAWINGS FOR LOCATIONS AND SIZES OF PENETRATIONS.
6. BUILDING SHALL BE PREFABRICATED WITH FRP DOUBLE DOORS, FRP SINGLE DOOR, INSULATION, SIDING, ARCHITECTURAL FINISHES, HVAC EQUIPMENT (INCLUDING HVAC CONTROL PANEL) PER THE HVAC DRAWINGS, AND ELECTRICAL SYSTEMS PER THE ELECTRICAL DRAWINGS.
7. STRUCTURAL SHALL BE WET CAST USING SELF COMPACTING CONCRETE MIX.
8. REINFORCING STEEL DEFORMED BARS CONFORM TO LATEST ASTM SPECIFICATION A615, GRADE 60, 1 $\frac{1}{12}$" MINIMUM COVER.
9. THE BUILDING SHALL HAVE A FLOOR.
10. ALL LOUVERS SHALL BE INSTALLED MIN. 6" BELOW THE CEILING.
11. CONTRACTOR AND BUILDING MANUFACTURER TO REFERENCE HVAC DRAWINGS FOR LOCATIONS, SIZES, AND SCHEDULES OF ALL LOUVERS AND HVAC SYSTEM COMPONENTS.
12. SEE SPECIFICATION SECTION 13 34 23.29 FOR STRUCTURAL, ARCHITECTURAL, HVAC, AND ELECTRICAL REQUIREMENTS FOR THE BUILDING.

\\wse03.local\WSE\Projects\NH\Rochester, NH\ENG20-0987 Tara Estates PS Final Design\102 - DESIGN\A - Architectural\A - Sheets - Revised for Addendum No. 3.dwg

Project:
CITY OF ROCHESTER, NH

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COA:

Seal:
STATE OF NEW HAMPSHIRE
CHRISTOPHER M. PERKINS
No. 12004
LICENSED
PROFESSIONAL ENGINEER

Issued For:
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ADDENDUM NO. 3

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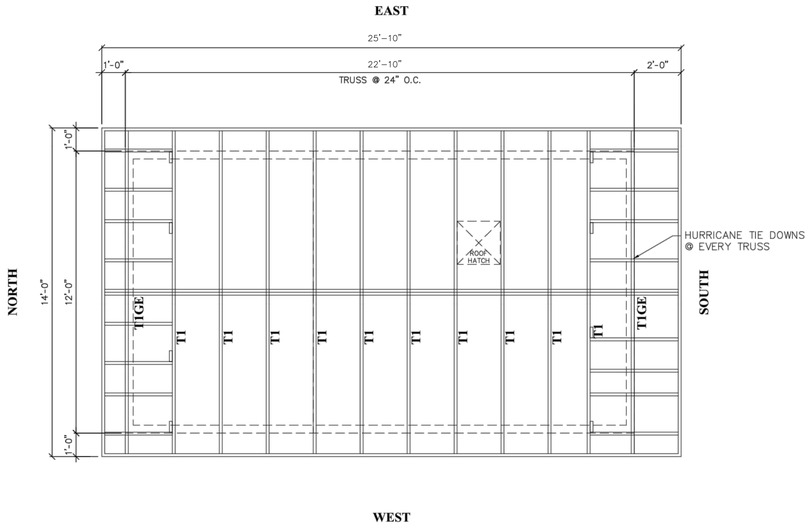
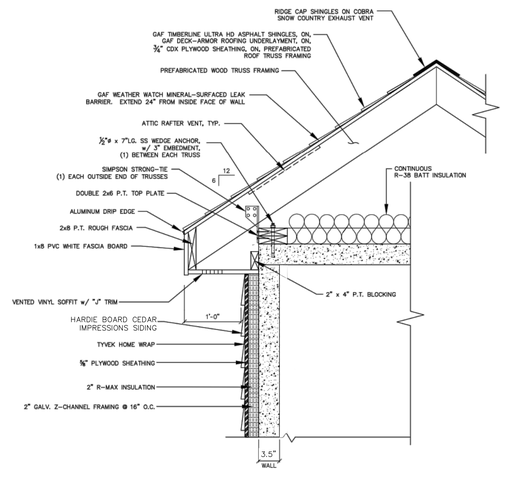
Drawing Title:
PREFABRICATED BUILDING PLAN AND EXTERIOR ELEVATIONS

Sheet Number:
A101



TRUSS LAYOUT



TYPICAL WALL / ROOF SECTION
NTS

NOTES:

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9. THE BUILDING SHALL HAVE A FLOOR.
10. ALL LOUVERS SHALL BE INSTALLED MIN. 6" BELOW THE CEILING.
11. CONTRACTOR AND BUILDING MANUFACTURER TO REFERENCE HVAC DRAWINGS FOR LOCATIONS, SIZES, AND SCHEDULES OF ALL LOUVERS AND HVAC SYSTEM COMPONENTS.
12. SEE SPECIFICATION SECTION 13 34 23.29 FOR STRUCTURAL, ARCHITECTURAL, HVAC, AND ELECTRICAL REQUIREMENTS FOR THE BUILDING.

DRAWING LOG

REV.NO.	DATE	DESCRIPTION
-	-	-
-	-	-
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CUSTOMER:	CITY OF ROCHESTER
JOB NAME:	TARA ESTATES
JOB LOCATION:	ROCHESTER, NH
DWG TITLE:	INTERIORS ELEVATIONS AND ROOF TRUSS

DRAWN BY: TC	DATE: 09/01/21	PM CHK'D: -	DATE: -
CAD CHK'D: -	DATE: -	GM CHK'D: -	DATE: -
JOB NO.: 27400	SCALE: N.T.S. 3/8"=1'-0"	DAWING NO.: A-2	

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Seal:
STATE OF NEW HAMPSHIRE – CHRISTOPHER M. PERKINS No. 12004 LICENSED PROFESSIONAL ENGINEER

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PREFABRICATED BUILDING TYPICAL WALL SECTION AND ROOF TRUSS

Sheet Number:
A102

1.0 - GENERAL

1.01 THE STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH ALL OTHER CONTRACT DRAWINGS AND SPECIFICATIONS. REFER TO CIVIL, ARCHITECTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS FOR LOCATION, DIMENSIONS, AND DETAILS OF OPENINGS, SLEEVES, EMBEDMENTS, INSERTS, PADS, CURBS, DEPRESSIONS, ANCHOR BOLTS, AND OTHER PROJECT REQUIREMENTS NOT SHOWN ON STRUCTURAL DRAWINGS.

1.02 THE CONTRACTOR IS RESPONSIBLE FOR CHECKING, COORDINATING AND VERIFYING ALL DIMENSIONS IN THE FIELD PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL IMMEDIATELY REPORT ANY DISCREPANCY TO THE ARCHITECT AND ENGINEER AS A REQUEST FOR INFORMATION (RFI) BEFORE PROCEEDING WITH WORK.

1.03 THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IN THE FIELD THE EXISTENCE AND LOCATION OF OVERHEAD, BURIED AND/OR EMBEDDED UTILITIES, AND DETERMINING LOCATIONS OF ALL EMBEDDED MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS AFFECTED BY THE WORK OF THIS CONTRACT.

1.04 ALL WORK IS TO CONFORM WITH THE FOLLOWING CODES AND STANDARDS:

(A) NEW HAMPSHIRE STATE BUILDING CODE (NHSBC)
(B) INTERNATIONAL BUILDING CODE, (IBC 2015)
(C) "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" - AMERICAN CONCRETE INSTITUTE (ACI 318)
(D) "MANUAL OF STEEL CONSTRUCTION" - AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC 360)
(E) "STRUCTURAL WELDING CODE - STEEL" - AMERICAN WELDING SOCIETY (AWS D1.1)
(F) "SEISMIC PROVISION FOR STRUCTURAL STEEL BUILDINGS" -AMERICAN INSTITUTE OF STEEL CONSTRUCTION, (AISC)
(G) "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES" - AMERICAN SOCIETY OF CIVIL ENGINEERS, (ASCE 7-10)

FOR ADDITIONAL CODES AND STANDARDS REFER TO SPECIFICATIONS.

1.05 THE CONTRACTOR SHALL NOTIFY THE ARCHITECT AND ENGINEER OF UNFORESEEN CONDITIONS THAT MAY BE UNCOVERED DURING DEMOLITION AND CONSTRUCTION AS A REQUEST FOR INFORMATION (RFI) BEFORE PROCEEDING WITH WORK.

1.06 PERMANENT STRUCTURAL ELEMENTS TO BE DESIGNED IN ACCORDANCE WITH PERFORMANCE SPECIFICATIONS INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

(A) PRE-FABRICATED BUILDING
(B) MISC. ARCH COMPONENT SEISMIC SUPPORTS
(C) MISC. MECHANICAL AND ELECTRICAL COMPONENT AND SYSTEM SEISMIC SUPPORTS

FOR PERFORMANCE DESIGN REQUIREMENTS OF ELEMENTS LISTED ABOVE, REFER TO ADDITIONAL NOTES ON THESE SHEETS AND IN THE TECHNICAL SPECIFICATIONS. ALL DESIGN SUBMITTAL DRAWINGS AND CALCULATIONS SHALL BE CERTIFIED, SIGNED AND SEALED BY A PROFESSIONAL STRUCTURAL ENGINEER REGISTERED IN THE STATE OF NEW HAMPSHIRE.

1.07 STRUCTURAL REQUIREMENTS TO ACCOMMODATE FIXED EQUIPMENT, INCLUDING BUT NOT LIMITED TO ROOF TOP UNITS ARE INCIDENTAL TO THE REQUIREMENTS OF A SPECIFIC EQUIPMENT MANUFACTURER. ALL WORK SHALL CONFORM TO APPROVED EQUIPMENT MANUFACTURER'S SHOP DRAWINGS AND INSTALLATION INSTRUCTIONS. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL ANY REQUIRED MODIFICATIONS TO ACCOMMODATE APPROVED EQUIPMENT DRAWINGS. SUCH MODIFICATIONS SHALL BE MADE AT NO COST TO THE OWNER.

1.08 DETAILS AND NOTES SHOWN ON STRUCTURAL DRAWINGS SHALL BE APPLICABLE TO ALL PARTS OF THE STRUCTURAL WORK EXCEPT WHERE SPECIFICALLY REQUIRED OTHERWISE BY CONTRACT DOCUMENTS. CONDITIONS NOT SPECIFICALLY SHOWN SHALL BE SIMILAR TO THOSE SHOWN FOR LIKE CONDITIONS AS DETERMINED BY THE ENGINEER.

1.09 IN ACCORDANCE WITH SPECIFICATION SECTION 01 45 23, TESTING AND INSPECTION OF STRUCTURAL WORK SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE COSTS FOR TESTING AND INSPECTIONS WILL BE PAID BY THE CONTRACTOR. PROVIDE TEST RESULTS TO THE ENGINEER IN A TIMELY MANNER.

1.10 THE CONTRACTOR SHALL DESIGN AND PROVIDE ALL REQUIRED SHORING AND TEMPORARY BRACING TO RESIST FORCES ON THE STRUCTURE THROUGHOUT THE CONSTRUCTION PERIOD.

2.0 - FOUNDATIONS

2.01 THE SUBSURFACE CONDITIONS DESCRIBED IN THE DRAWINGS, SPECIFICATIONS, TEST BORINGS AND TEST PITS ARE INCLUDED ONLY TO ASSIST THE CONTRACTOR DURING BIDDING AND SUBSEQUENT CONSTRUCTION AND REPRESENT CONDITIONS ONLY AT THESE SPECIFIC LOCATIONS AT THE TIME THEY ARE MADE.

2.02 THE CONTRACTOR SHALL DESIGN AND PROVIDE ALL TEMPORARY EARTH SUPPORT, SHORING AND BRACING REQUIRED TO PERFORM THE WORK IN ACCORDANCE WITH OSHA, STATE AND LOCAL REQUIREMENTS.

2.03 THE CONTRACTOR SHALL DESIGN AND PROVIDE SHEETING, SHORING, BRACING, AND/OR UNDERPINNING IN ORDER TO PROTECT EXISTING UTILITIES FROM EXCESSIVE MOVEMENTS DURING THE CONSTRUCTION PERIOD, IN ACCORDANCE WITH OSHA, STATE & LOCAL REQUIREMENTS.

2.04 THE CONTRACTOR SHALL CARRY OUT CONTINUOUS CONTROL OF SURFACE AND SUBSURFACE WATER. DEWATER ANY AREAS REQUIRING EXCAVATION IN ADVANCE OF PERFORMING EXCAVATION. MAINTAIN GROUNDWATER LEVELS AT LEAST 2 FEET BELOW PLANNED SUBGRADES.

2.05 ALL SUBGRADES TO RECEIVE FILL MATERIALS, FOUNDATIONS, SLABS OR OTHER CONSTRUCTION SHALL BE FREE OF RUNNING OR STANDING WATER PRIOR TO PLACEMENT.

2.06 SPREAD FOOTINGS AND PIERS AS SHOWN ARE DESIGNED FOR ESTIMATED METAL BUILDING REACTIONS AND ARE APPROXIMATE IN SIZE. THESE ELEMENTS ARE SUBJECT TO CHANGE IN DIMENSION (IF REQUIRED) WITH THE APPROVED METAL BUILDING SUBMITTAL. ANY CHANGES SHALL COME AT NO ADDITIONAL COST TO THE OWNER.

2.07 FOUNDATIONS SHALL BE INSTALLED IN THE GEOMETRY SHOWN IN THE PLANS, ANY ROCK ENCOUNTERED DURING EXCAVATION SHALL BE REMOVED TO CLEAR THE REQUIRED FOUNDATION GEOMETRY.

2.08 SPREAD FOOTING BEARING SURFACES SHALL BE EXCAVATED BY EQUIPMENT WITH A SMOOTH, TOOTHLESS CUTTING EDGE.

2.09 THE GEOTECHNICAL REPORT PREPARED BY WESTON & SAMPSON DATED 07/16/21 IS PROVIDED FOR INFORMATION PURPOSES ONLY.

3.0 - CAST IN PLACE CONCRETE

3.01 CONCRETE WORK SHALL CONFORM TO "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" (ACI 318) AND "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS" (ACI 301).

3.02 CONCRETE SHALL BE CONTROLLED CONCRETE, PROPORTIONED, MIXED AND PLACED IN THE PRESENCE OF A REPRESENTATIVE OF AN APPROVED TESTING AGENCY.

3.03 UNLESS NOTED OTHERWISE, CONCRETE SHALL BE NORMAL WEIGHT AND HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH AS FOLLOWS:

(A) ALL STRUCTURAL CONCRETE: 4500 PSI
(B) EXTERIOR WALKS AND SLABS: 5000 PSI

3.04 ALL PERMANENTLY EXPOSED VERTICAL AND HORIZONTAL CONCRETE SURFACES SHALL BE TREATED OR SEALED IN ACCORDANCE WITH PROJECT SPECIFICATIONS.

3.05 CONCRETE WORK SHALL BE COORDINATED WITH ALL ARCHITECTURAL, MECHANICAL, PLUMBING, ELECTRICAL WORK, AND ALL EQUIPMENT. THE CONTRACTOR SHALL VERIFY INSTALLATION AND LOCATIONS OF ALL EMBEDDED ITEMS INCLUDING BUT NOT LIMITED TO INSERTS, ANCHOR BOLTS, DOWELS, BLOCKOUTS, SLEEVES, EMBEDDED PIPING, AND EMBEDDED CONDUIT PRIOR TO CONCRETE PLACEMENT.

3.06 SEALANT FOR CONTROL/CONTRACTION JOINTS AND SAW CUT JOINTS SHALL BE SIKADUR 51 MANUFACTURED BY SIKA OR AN APPROVED EQUAL.

3.07 CONCRETE EXPOSED TO WEATHER (FREEZE-THAW CONDITIONS) IN THE FINISHED PROJECT SHALL BE AIR ENTRAINED PER SPECIFICATIONS REQUIREMENTS.

3.08 A MINIMUM OF 72 HOURS SHALL ELAPSE BETWEEN ADJACENT CONCRETE PLACEMENTS.

3.09 CONCRETE SLABS SHALL BE PLACED SO THAT THE SLAB THICKNESS IS AT NO POINT LESS THAN THAT INDICATED ON THE DRAWINGS.

3.10 PROVIDE A 3/4" CHAMFER ON ALL VERTICAL AND HORIZONTAL CORNERS EXPOSED TO VIEW UNLESS NOTED OTHERWISE.

3.11 ALL CONCRETE SHALL BE WATER CURED UNLESS OTHERWISE AUTHORIZED BY THE ENGINEER.

3.12 NON-SHRINK, NON-METALLIC, GROUT SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 7,500 PSI (ASTM C942) AND A MINIMUM BOND STRENGTH OF 2,000 PSI AT 28-DAYS (ASTM C882). GROUT MAY BE EXTENDED WITH COARSE AGGREGATE PER THE MANUFACTURER'S RECOMMENDATIONS.

4.0 - CAST IN PLACE CONCRETE REINFORCEMENT

4.01 REINFORCEMENT DETAILING, FABRICATION, AND ERECTION SHALL CONFORM TO "ACI DETAILING MANUAL" - SP-66, "CRSI MANUAL OF STANDARD PRACTICE".

4.02 STEEL REINFORCEMENT, UNLESS NOTED OTHERWISE, SHALL CONFORM TO THE FOLLOWING:

(A) BARS, TIES, AND STIRRUPS___ASTM A615 GRADE 60
(B) WELDED WIRE FABRIC,ASTM A185, FLAT SHEETS

4.03 REINFORCING STEEL SHALL BE UNCOATED AND DEFORMED.

4.04 MINIMUM CONCRETE PROTECTIVE COVERING FOR REINFORCEMENT, UNLESS REQUIRED FOR FIRE PROTECTION OR NOTED OTHERWISE, SHALL BE AS FOLLOWS:

(A) CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH:____3"
(B) CONCRETE EXPOSED TO EARTH OR WEATHER:
(1) NO. 6 THRU NO. 18 BARS____2"
(2) NO. 5 BAR, W31 OR D31 WIRE AND SMALLER____2"
(C) SURFACES NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND:
(1) SLABS, WALLS, JOISTS:
(a) NO. 14 AND NO 18 BARS____2"
(b) NO. 11 BARS AND SMALLER____2"
(2) BEAMS, COLUMNS:
(a) PRIMARY REINFORCEMENT____2-1/2"
(b) TIES, STIRRUPS, SPIRALS____2"

4.05 REINFORCING STEEL SHALL BE CONTINUOUS THROUGH ALL CONSTRUCTION JOINTS, CORNERS, AND INTERSECTIONS UNLESS OTHERWISE NOTED. REINFORCING SHALL BE LAPPED AT NECESSARY SPLICES OR HOOKED AT DISCONTINUOUS ENDS, UNLESS OTHERWISE NOTED.

4.06 FOR REINFORCING STEEL SPLICE LAP LENGTHS REFER TO THE TABLE PROVIDED UNLESS OTHERWISE INDICATED.

4.07 MECHANICAL SPLICES SHALL BE PERMITTED SUBJECT TO APPROVAL BY THE ENGINEER. MECHANICAL SPLICES SHALL DEVELOP AT LEAST 125 PERCENT OF THE SPECIFIED YIELD STRENGTH OF THE BAR. NO WELDED CONNECTIONS ARE PERMITTED.

4.08 WELDED WIRE FABRIC SHALL BE LAPPED (1) SQUARE PLUS (2) INCHES WHERE REQUIRED AND SHALL BE WIRED TOGETHER AT ALL LAPS. WWF SHALL BE SUPPORTED BY CHAIRS AND/OR CARRYING BARS PRIOR TO CONCRETE PLACEMENT.

4.09 REINFORCEMENT SHALL NOT BE TACK WELDED.

4.10 NOTIFY THE TESTING LAB AND ENGINEER A MINIMUM OF 48 HOURS PRIOR TO SCHEDULED CONCRETE PLACEMENT IN ORDER TO ACCOMMODATE INSPECTION OF REINFORCEMENT AND CONCRETE TESTING. NO CONCRETE SHALL BE PLACED WITHIN 48 HOURS OF SUCH NOTIFICATION.

4.11 WHERE REINFORCEMENT IS NOT SHOWN ON DRAWINGS, PROVIDE REINFORCEMENT IN ACCORDANCE WITH APPLICABLE DETAILS AS DETERMINED BY THE ARCHITECT AND ENGINEER. IN NO CASE SHALL REINFORCEMENT BE LESS THAN THE MINIMUM REINFORCEMENT PERMITTED BY THE CODES, NOR LESS THAN THE FOLLOWING:

(E) CONCRETE WALLS: .0025 x GROSS CONCRETE AREA IN EACH DIRECTION

4.12 WHERE REINFORCEMENT IS REQUIRED IN SECTION, REINFORCEMENT IS CONSIDERED TYPICAL WHEREVER THE SECTIONS APPLIES.

4.13 WHERE THERE IS CONFLICT BETWEEN LOCATIONS OF COLUMN VERTICAL BARS AND BEAM HORIZONTAL BARS, THE COLUMN BARS SHALL REMAIN IN THEIR DESIGNATED POSITIONS AND BEAM BAR LOCATIONS SHALL BE ADJUSTED.

4.14 DOWELS SHALL MATCH BAR SIZE, NUMBER AND SPACING, UNLESS NOTED OTHERWISE.

4.15 SUBMIT REINFORCING SHOP DRAWINGS FOR APPROVAL PRIOR TO FABRICATION.

6.0 - POST INSTALLED CONCRETE ANCHORS AND REINFORCING DOWELS

6.01 ADHESIVE ANCHORS AND REINFORCING DOWELS SHALL BE HILTI HIT-HY-200 ADHESIVE ANCHORING SYSTEM OR APPROVED EQUAL. DOWELS SHALL BE ASTM A307 PR APPROVED EQUAL AND BE HOT-DIPPED GALVANIZED.

6.02 INSTALL ANCHORS IN STRICT CONFORMANCE WITH THE MANUFACTURER'S REQUIREMENTS. A MANUFACTURER'S REPRESENTATIVE SHALL TRAIN THE CONTRACTOR'S PERSONNEL ON INSTALLATION OF THE ADHESIVE ANCHORS.

6.03 HOLES SHALL BE THOROUGHLY CLEANED AND DRY PRIOR TO INSTALLING ANCHORS.

6.04 DO NOT DAMAGE EXISTING REINFORCING. LOCATE REINFORCING WITH PROFOMETER OR OTHER MEANS PRIOR TO DRILLING CONCRETE.

6.05 ANCHORS SHALL BE PROOF TESTED BY THE MANUFACTURER'S FIELD ENGINEER OR OTHER APPROVED AGENCY. PROOF TEST A MINIMUM OF 25% OF THE ANCHORS OR (2) TOTAL, WHICHEVER IS GREATER. PROVIDE TESTING REPORT TO THE ENGINEER FOR REVIEW

9.0 DESIGN LOADS

LOADS, LOADING CONDITIONS AND COMBINATIONS SHALL BE IN ACCORDANCE WITH THE NEW HAMPSHIRE STATE BUILDING CODE, IBC 2015 AND ASCE 7-10 AS APPLICABLE. LOADS DESIGNATED BY "PSF" ARE UNIFORM LOADS, THOSE DESIGNATED BY "LB" ARE CONCENTRATED LOADINGS AND SHALL BE APPLIED AS REQUIRED BY THE NHSBC.

BUILDING OCCUPANCY CATEGORY___III

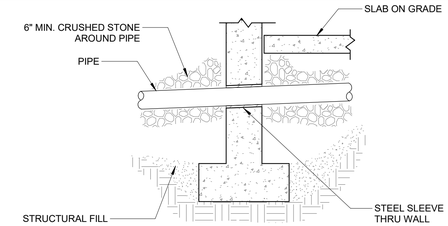
9.01 DEAD LOADS
(A) SELF-WEIGHT OF ALL ATTACHED AND SUSPENDED ELEMENTS, CONSULT APPLICABLE DRAWINGS AND TRADES FOR FURTHER INFORMATION

9.02 LIVE LOADS
(A) FLOOR LIVE LOADS
(1) MINIMUM AT PREFABRICATED BUILDING ____ 250 PSF
(B) ROOF LIVE LOADS
(1) CONSTRUCTION___20 PSF, 300 LB

9.03 ROOF SNOW LOAD
(A) GROUND SNOW LOAD, PG___70 PSF
(B) DESIGN SLOPED ROOF SNOW LOAD, Ps___59.3 PSF
(C) SNOW EXPOSURE FACTOR, CE___1.0
(D) SNOW LOAD IMPORTANCE FACTOR, I___1.1
(E) THERMAL FACTOR, CT___1.1

9.04 WIND DESIGN DATA
(A) BASIC WIND SPEED, V___127 MPH
(B) WIND EXPOSURE____C

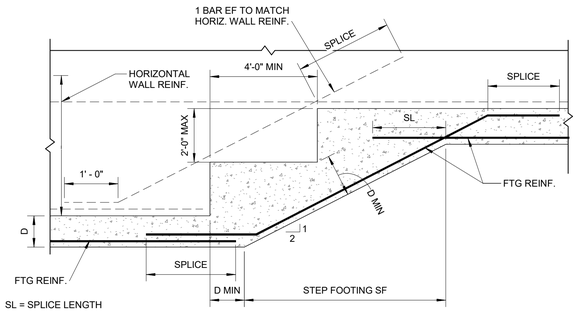
9.05 EARTHQUAKE DESIGN DATA
(A) SEISMIC IMPORTANCE FACTOR, Ie____1.25
(B) MAPPED SPECTRAL RESPONSE ACCELERATIONS, SS, S1____0.280G, 0.084G
(C) SITE CLASS____D
(D) SPECTRAL RESPONSE COEFFICIENTS, SDS AND SD1____0.295G, 0.134G
(E) DESIGN CATEGORY____C



NOTE(S):

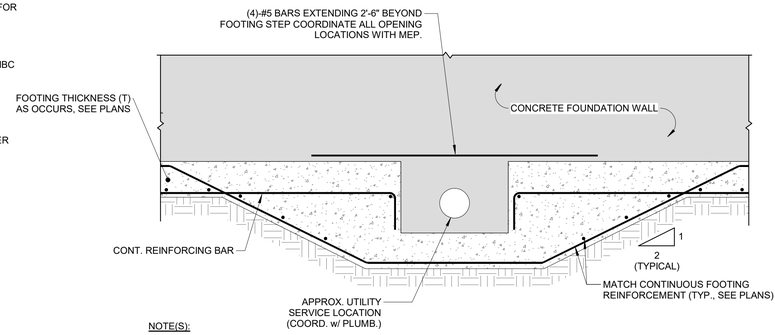
1. PIPE SHALL NOT PASS UNDER OR THRU WALL FOOTING. LOWER FOOTING BY STEPPING TO AVOID INTERFERENCE.

2 PIPE THROUGH FOUNDATION WALL
SCALE: 3/4" = 1'-0"



SL = SPLICE LENGTH

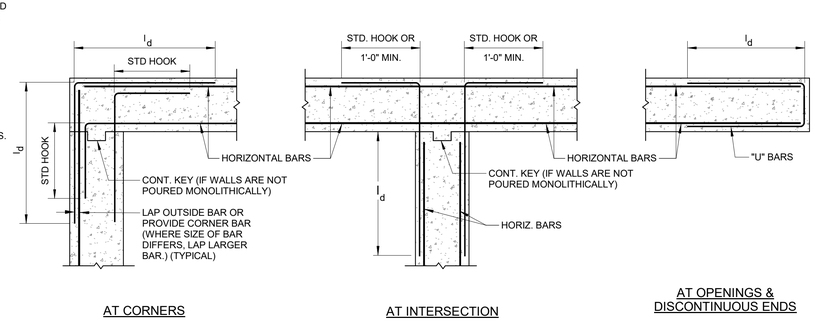
3 STEP FOOTING DETAIL
SCALE: 3/4" = 1'-0"



NOTE(S):

1. REFER TO ARCH./CIVIL DETAILS FOR ADDITIONAL UNDER SLAB & FOUNDATION REQUIREMENTS NOT SHOWN ON THESE DRAWINGS. REQUIREMENTS MAY INCLUDE BUT ARE NOT LIMITED TO: PERIMETER DRAINS, INSULATION, WEEP HOLES, & SITE PREPARATION. REPORT ANY DISCREPANCIES BETWEEN DISCIPLINES TO A/E FOR CLARIFICATION PRIOR TO PROCEEDING WITH WORK.

4 UTILITY OPENING
SCALE: 1/2" = 1'-0"

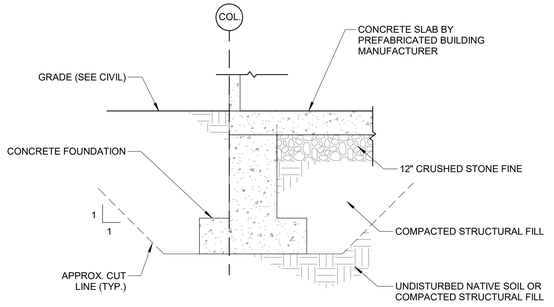


AT CORNERS | AT INTERSECTION | AT OPENINGS & DISCONTINUOUS ENDS

NOTE(S):

1. VERTICAL BARS NOT SHOWN FOR CLARITY. (TYP.)
2. FOR LENGTH OF ld, REFER TO SPLICE AND DEVELOPMENT LENGTH TABLE.

5 HORIZONTAL WALL REINFORCING PLAN
SCALE: 1/2" = 1'-0"



FOUNDATION NOTE(S):

1. UNDOCUMENTED FILL AND LOOSE OR DISTURBED SOILS SHALL BE REMOVED FROM ALL FOUNDATION AREAS. THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO FOUNDATION CONSTRUCTION TO OBSERVE ALL FOUNDATION SUBGRADES.
2. THE CONTRACTOR IS RESPONSIBLE FOR SUBGRADE PROTECTION.

6 TYPICAL CUT/FILL DETAIL
SCALE: 1/2" = 1'-0"

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Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
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Revisions:

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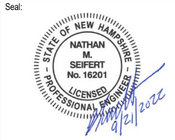

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GENERAL NOTES AND TYPICAL DETAILS

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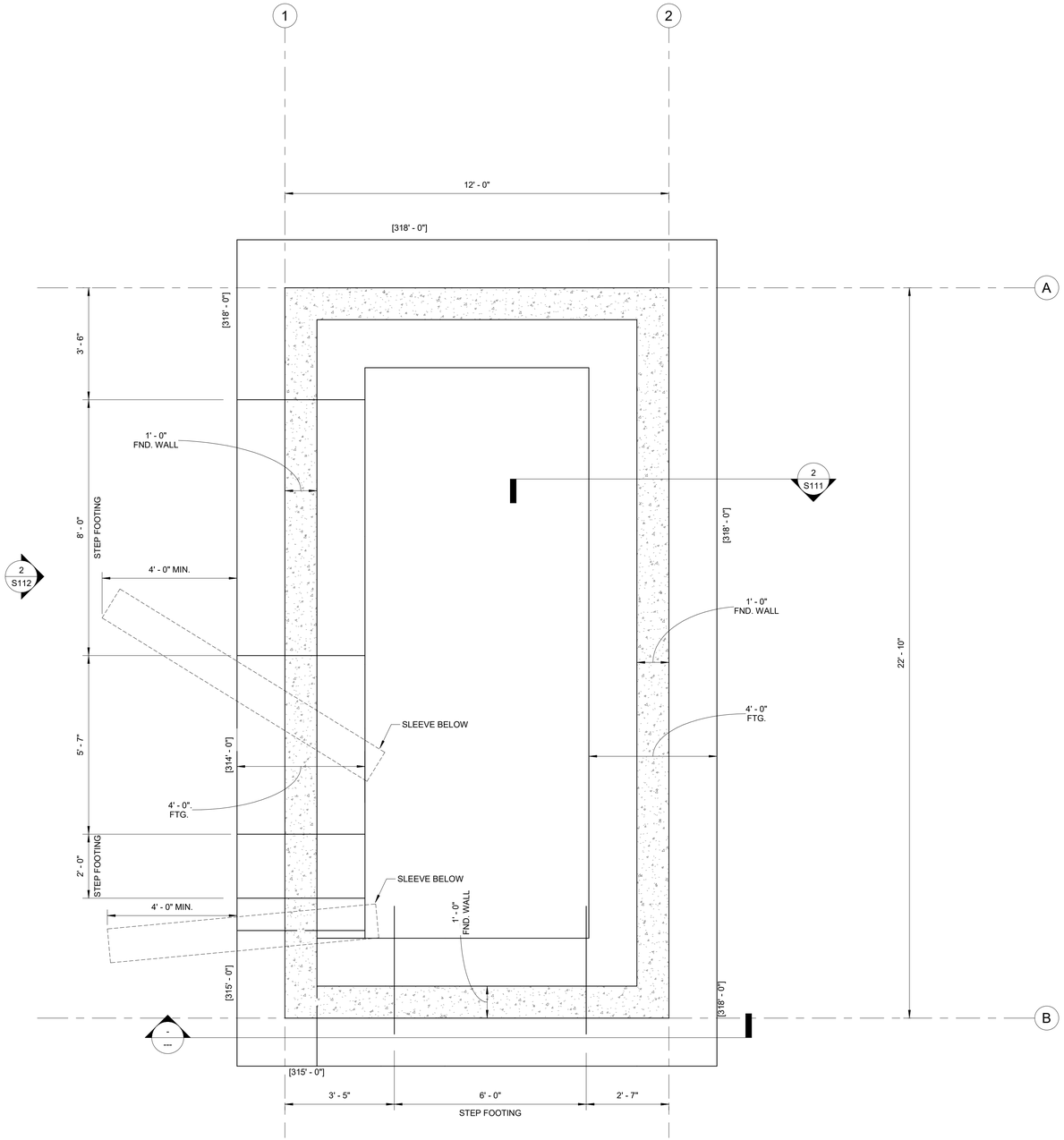
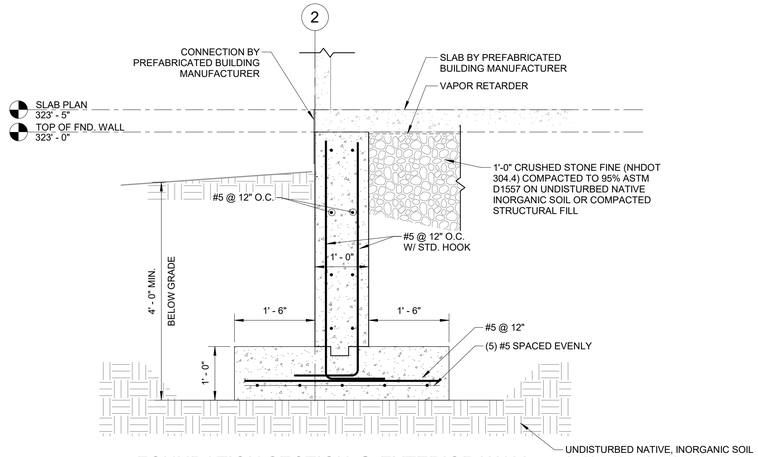


1 FOUNDATION PLAN

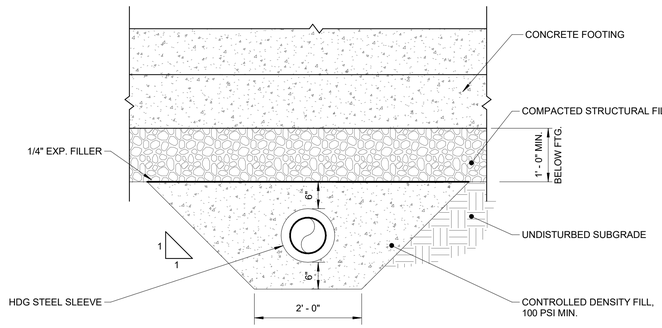
SCALE: 1/2" = 1'-0"

NOTES:
1. COORDINATE ALL WORK (INCLUDING, BUT NOT LIMITED TO, FLOOR ELEVATIONS, DIMENSIONS, FINISH DETAILS, PENETRATIONS, ETC.) WITH ARCHITECTURE, CIVIL/SITE, HVAC, EQUIPMENT AND PLUMBING DRAWINGS.
2. COORDINATE WITH APPROVED PRE-FABRICATED BUILDING SHOP DRAWINGS.



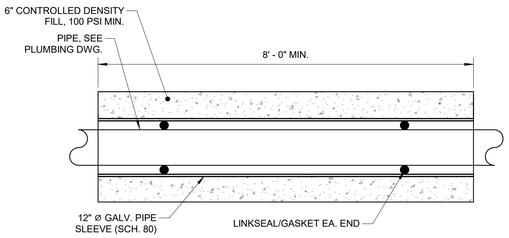
2 FOUNDATION SECTION @ EXTERIOR WALL

SCALE: 3/4" = 1'-0"



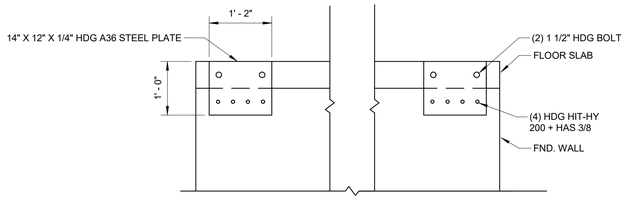
3 SUCTION PIPE PROFILE AT WALL

SCALE: 3/4" = 1'-0"



4 ELEVATION OF PIPE SLEEVE AT WALL

SCALE: 3/4" = 1'-0"



NOTE(S):
1. COORDINATE WITH APPROVED PREFABRICATED BUILDING SHOP DRAWINGS.
2. AT A MINIMUM LOCATE CONNECTION PLATES AT EACH SIDE OF EACH CORNER - (8) TOTAL.
3. HARDWARE AND FASTENERS SHALL BE HOT-DIPPED GALVANIZED (HDG).

5 CONNECTION DETAIL

SCALE: 3/4" = 1'-0"

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100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

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STATE OF NEW HAMPSHIRE
NATHAN M. SEIFERT
No. 16201
LICENSED PROFESSIONAL ENGINEER
9/21/2022

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Sheet Number:
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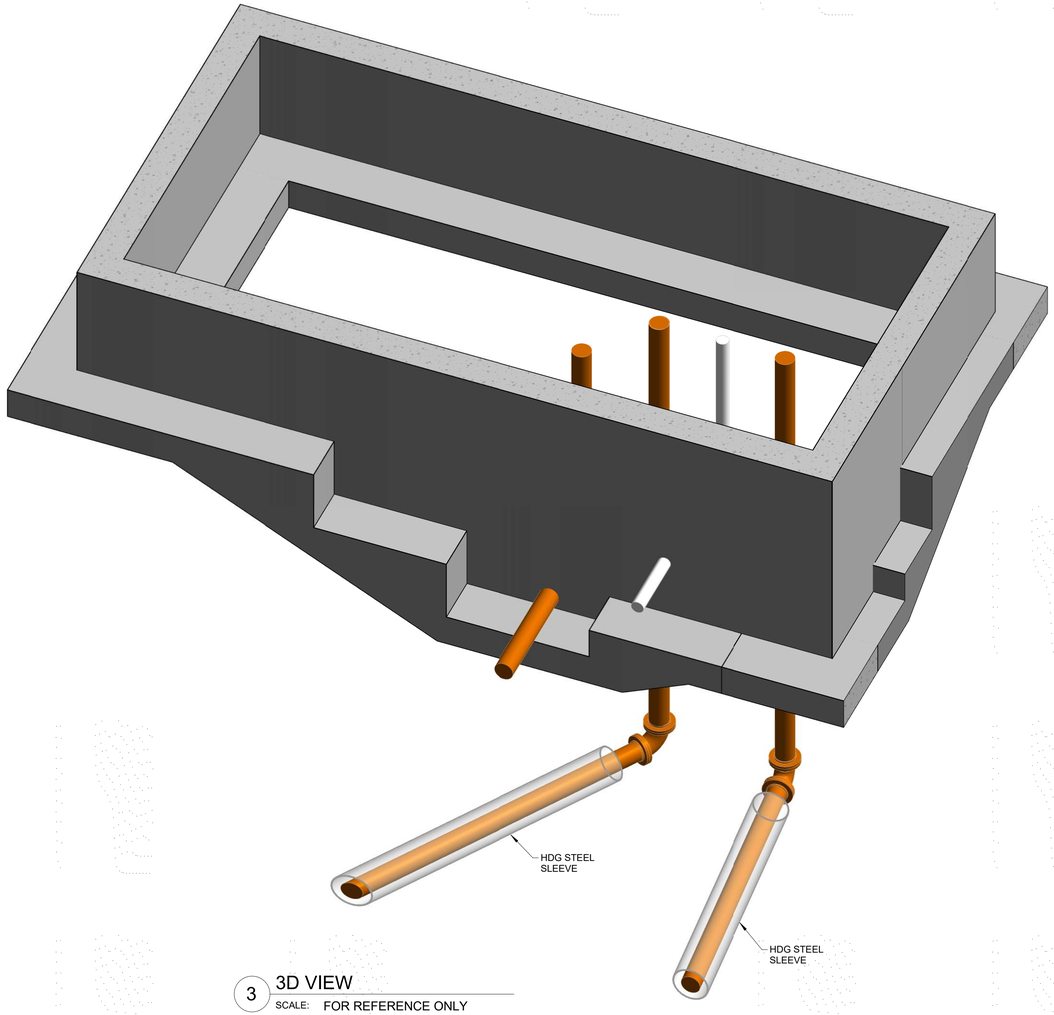
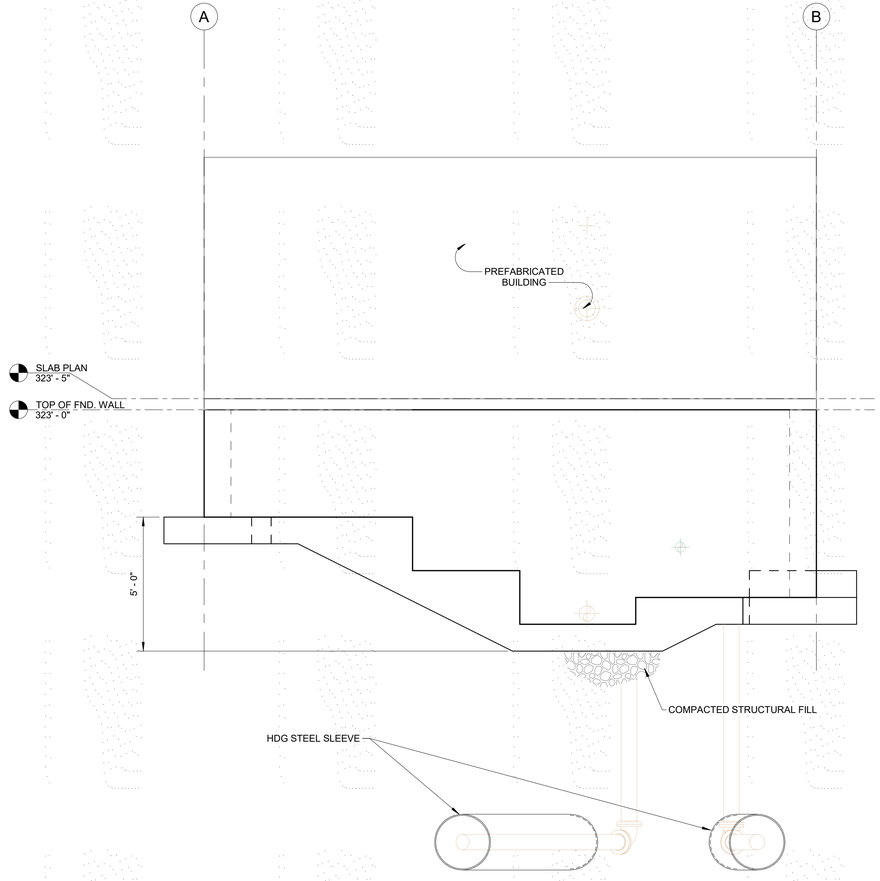


3 3D VIEW
SCALE: FOR REFERENCE ONLY



NOTE:
1. REFER TO DETAIL 3 ON S001 FOR ADDITIONAL STEP FOOTING REQUIREMENTS.

2 STEP FOOTING AND PIPE INLET ELEV.
SCALE: 3/8" = 1'-0"

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3D VIEWS AND ELEVATIONS

Sheet Number:
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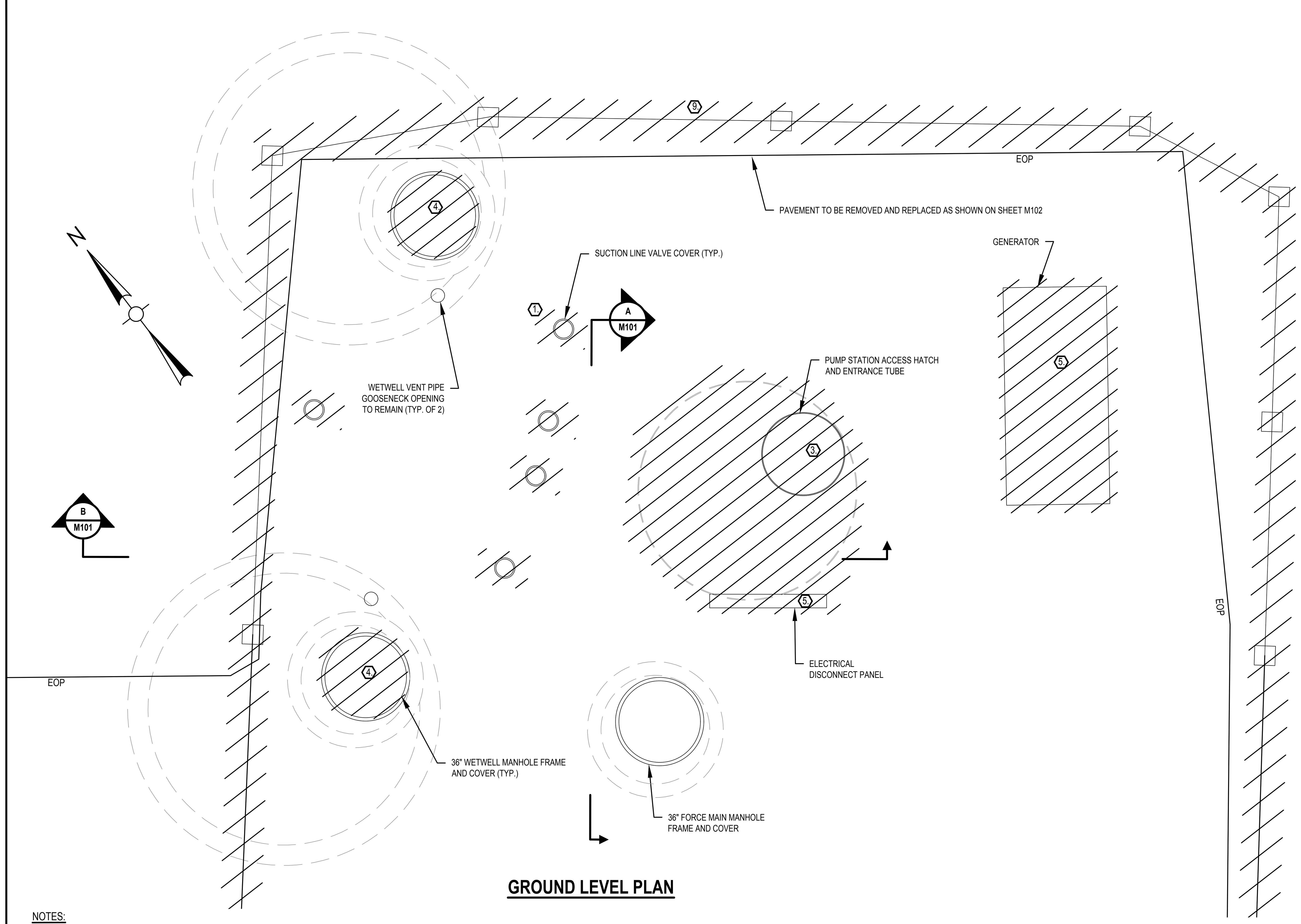
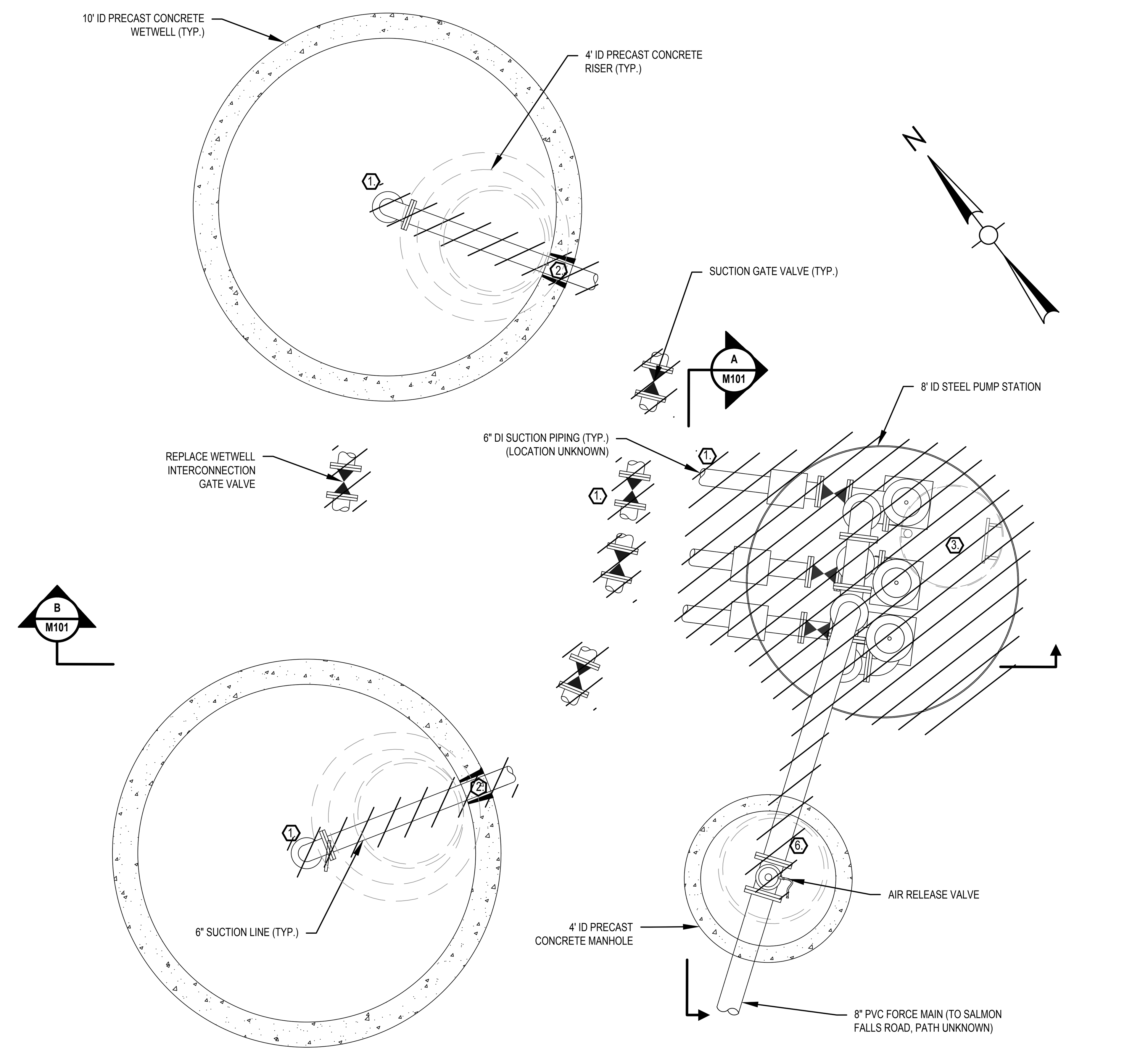


GROUND LEVEL PLAN



LOWER LEVEL PLAN

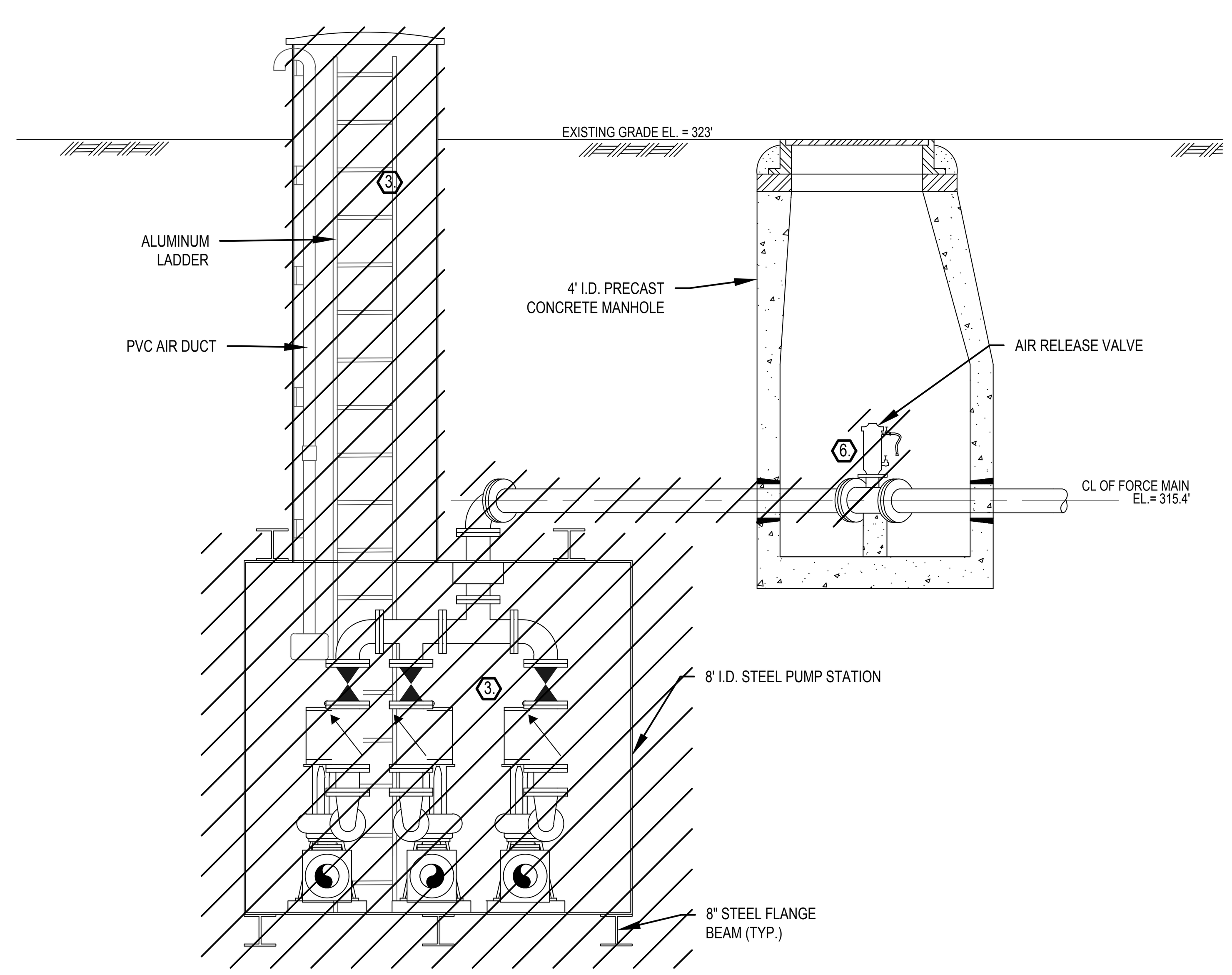
NOTES:

1. LOCATIONS AND DIMENSIONS OF EXISTING UNDERGROUND UTILITIES, STRUCTURES AND EQUIPMENT BASED UPON BEST AVAILABLE RECORDS. CONTRACTOR TO FIELD LOCATE AND VERIFY ALL DIMENSIONS PRIOR TO PROPOSED WORK.
2. ELEVATIONS OF UNDERGROUND STRUCTURES BASED ON FIELD MEASUREMENTS AND GPS SURVEYED PAVEMENT ELEVATION OF 323' NAVD88 AT EXISTING PUMP STATION ENTRANCE.
3. CONTRACTOR TO VERIFY ELEVATION OF WETWELL GRAVITY INVERTS AND WETWELL FLOOR, AND NOTIFY ENGINEER IMMEDIATELY.
4. HATCHING DENOTES EXTENTS OF DEMOLITION. EXACT LIMITS OF DEMOLITION SHALL BE FIELD COORDINATED BY THE CONTRACTOR IN ACCORDANCE WITH PROPOSED WORK.
5. CONTRACTOR RESPONSIBLE FOR PROPER DISPOSAL OF ALL DEMOLITION ITEMS INDICATED IN NOTES AND ON DRAWINGS.

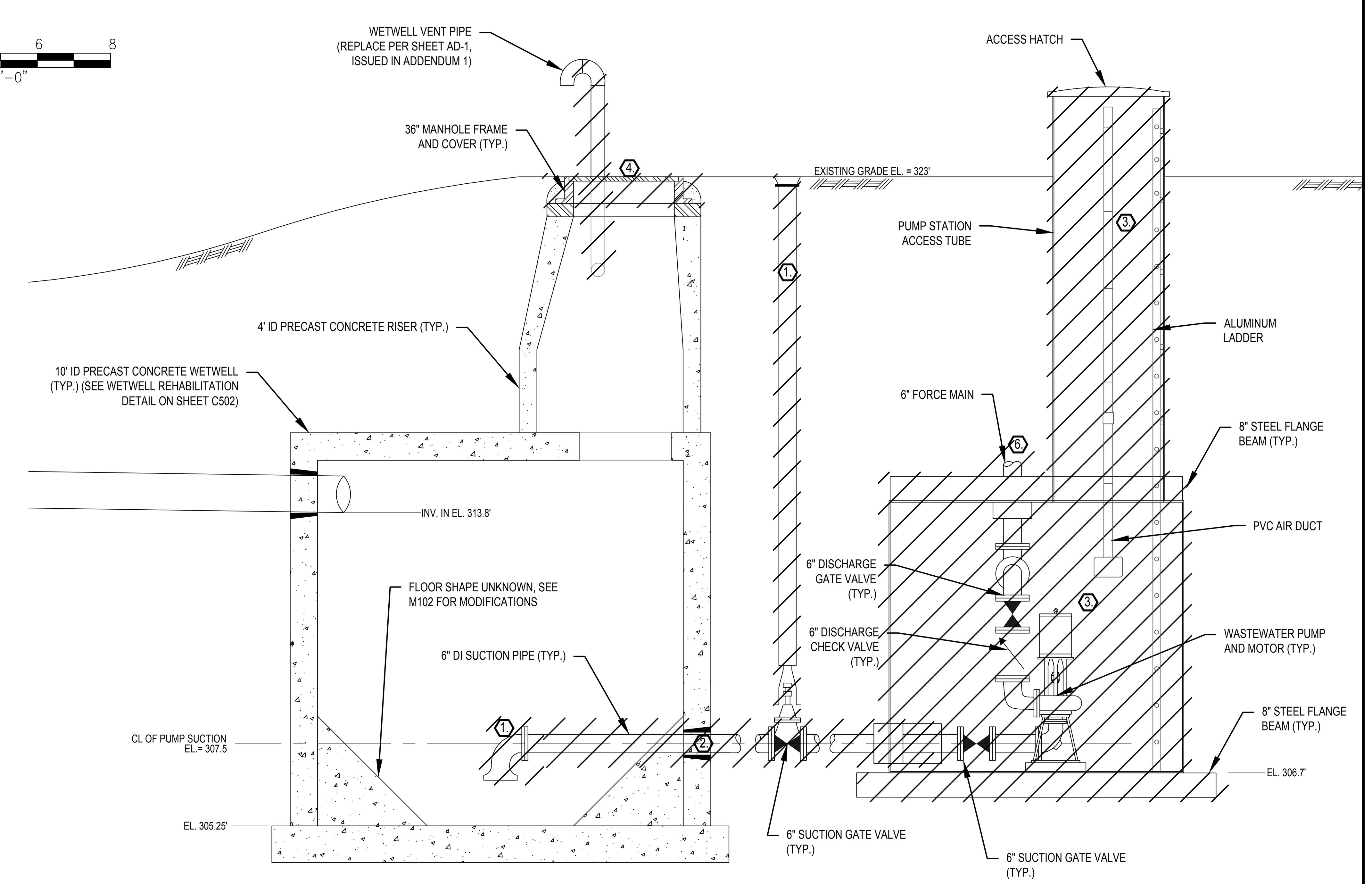
DEMOLITION NOTES:

1. REMOVE AND DISPOSE OF SUCTION PIPING IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO; PIPE, VALVES, VALVE BOXES, SUPPORTS, FITTINGS, AND ALL ASSOCIATED APPURTENANCES.
2. PLUG OR CAP HOLES IN WETWELL (RESULTING FROM SUCTION LINE REMOVAL) AS TO CREATE A PERMANENT GAS AND WATER TIGHT SEAL.
3. REMOVE AND DISPOSE OF EXISTING STEEL PUMP STATION IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO; ACCESS TUBE, ACCESS HATCH, 8' I.D. CAN STRUCTURE, STEEL FLANGE BEAM SUPPORTS, VENTILATION EQUIPMENT, LADDER, PUMPS, SUCTION & DISCHARGE PIPING (INCLUDING PIPE, VALVES, FITTINGS, SUPPORTS, AND ASSOCIATED APPURTENANCES). DEMOLITION WILL INCLUDE ITEMS NOT SHOWN ON DRAWINGS INCLUDING, BUT NOT LIMITED TO; ELECTRIC HEATER, DEHUMIDIFIER, PUMP CONTROL PANEL, SCADA ELECTRONICS, VENTILATION EQUIPMENT, SUMP PUMP, CONDUIT & WIRING, ETC.
4. REMOVE AND DISPOSE OF EXISTING MANHOLE FRAME AND COVER ON EACH WETWELL. TO BE REPLACED WITH CAST-IN-PLACE 3'X3' ALUMINUM ACCESS HATCH (SEE CIVIL DETAILS).
5. REMOVE AND DISPOSE OF EXISTING GENERATOR AND ABOVE GRADE ELECTRICAL PANEL.
6. REMOVE AND DISPOSE OF AIR RELEASE VALVE AND SECTION OF FORCE MAIN FROM EXISTING PUMP STATION TO AIR RELEASE VALVE (LIMITS SHOWN ON DRAWINGS).
7. REMOVE AND DISPOSE OF ALL EXISTING ELECTRICAL CONDUIT AND WIRING (NOT SHOWN ON MECHANICAL DRAWINGS).
8. REMOVE AND DISPOSE OF EXISTING WETWELL LEVEL CONTROL INSTRUMENTS (NOT SHOWN ON MECHANICAL DRAWINGS).
9. REMOVE AND DISPOSE OF VINYL FENCE, GATE, AND POSTS.

0 2 4 6 8
SCALE: 3/8"=1'-0"



SECTION A M101



SECTION B M101

Project:
CITY OF ROCHESTER, NH

TARA ESTATES SEWER PUMP STATION UPGRADE

724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson
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100 International Drive, Suite 152
Portsmouth, NH 03801
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STATE OF NEW HAMPSHIRE
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LICENSED PROFESSIONAL ENGINEER

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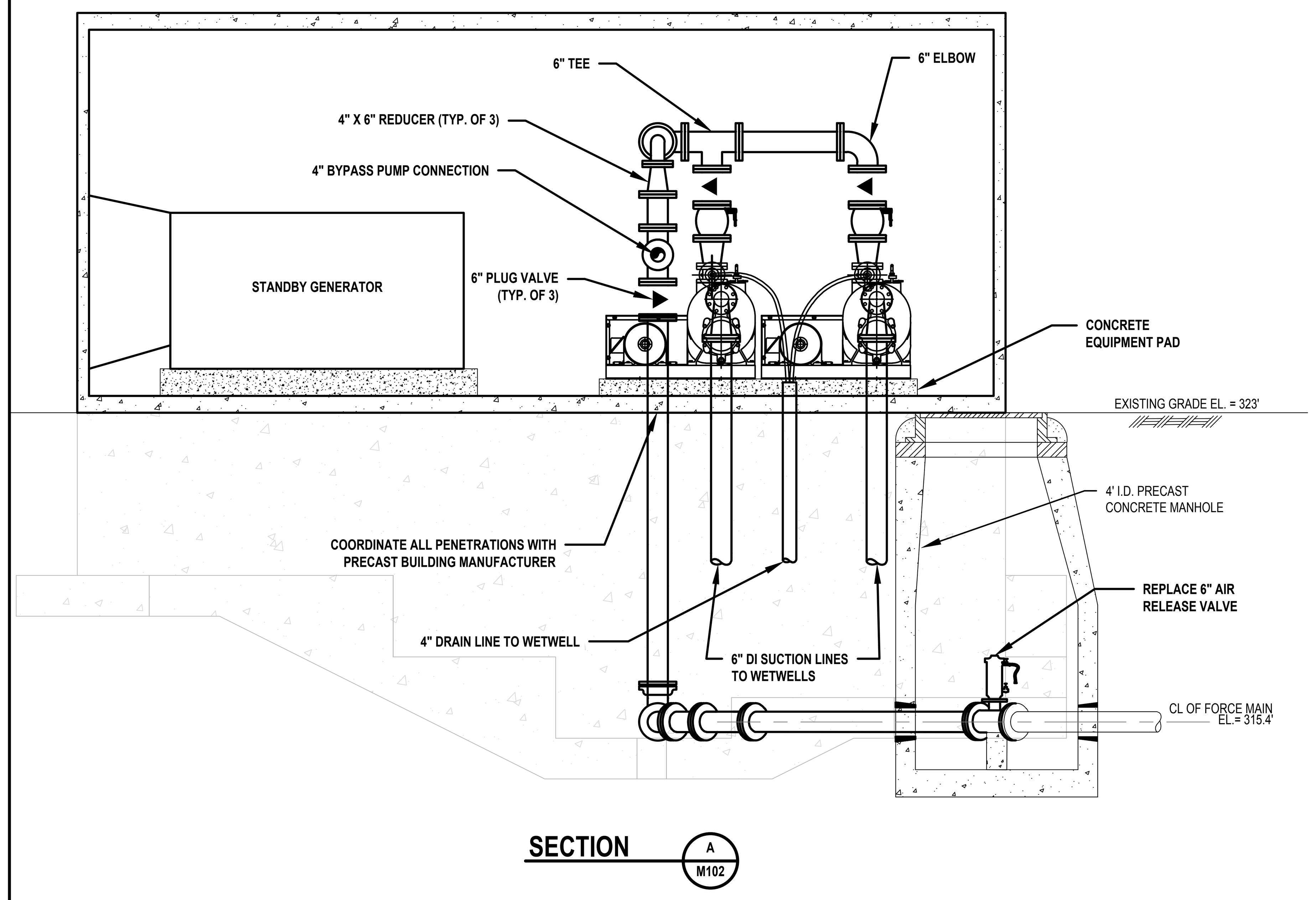
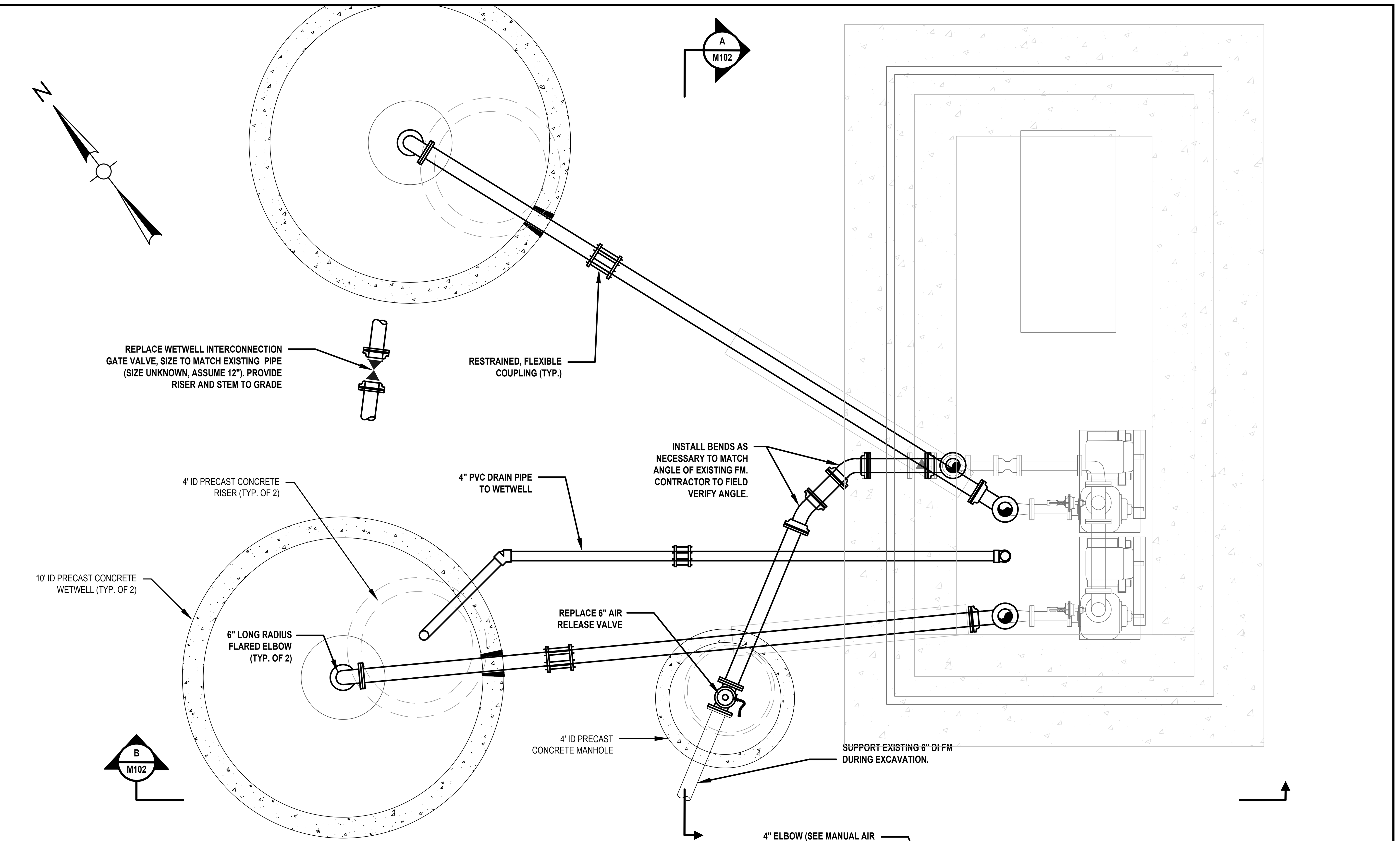
Sheet Number:
M101



SECTION A M102

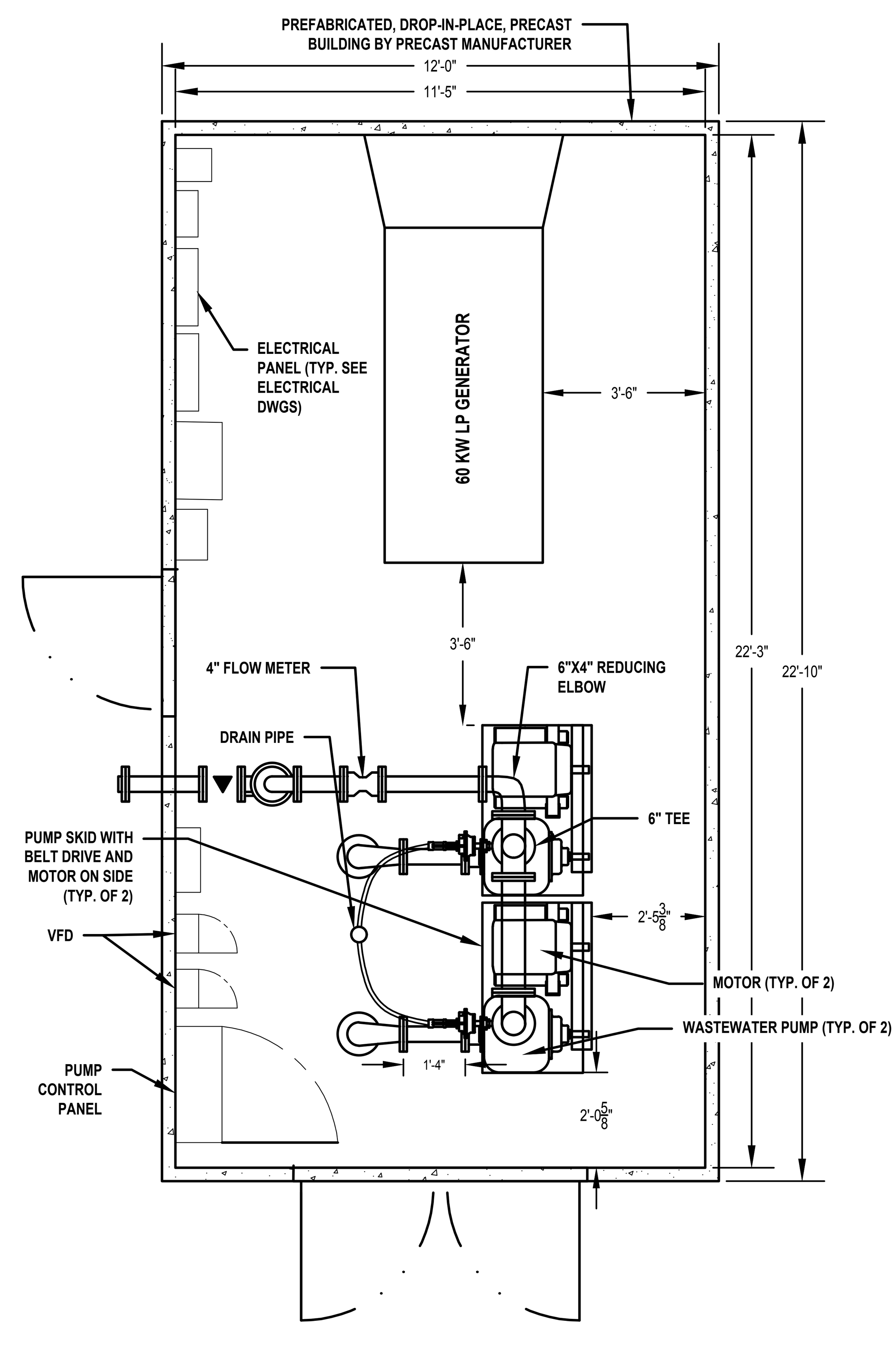


LOWER LEVEL PLAN

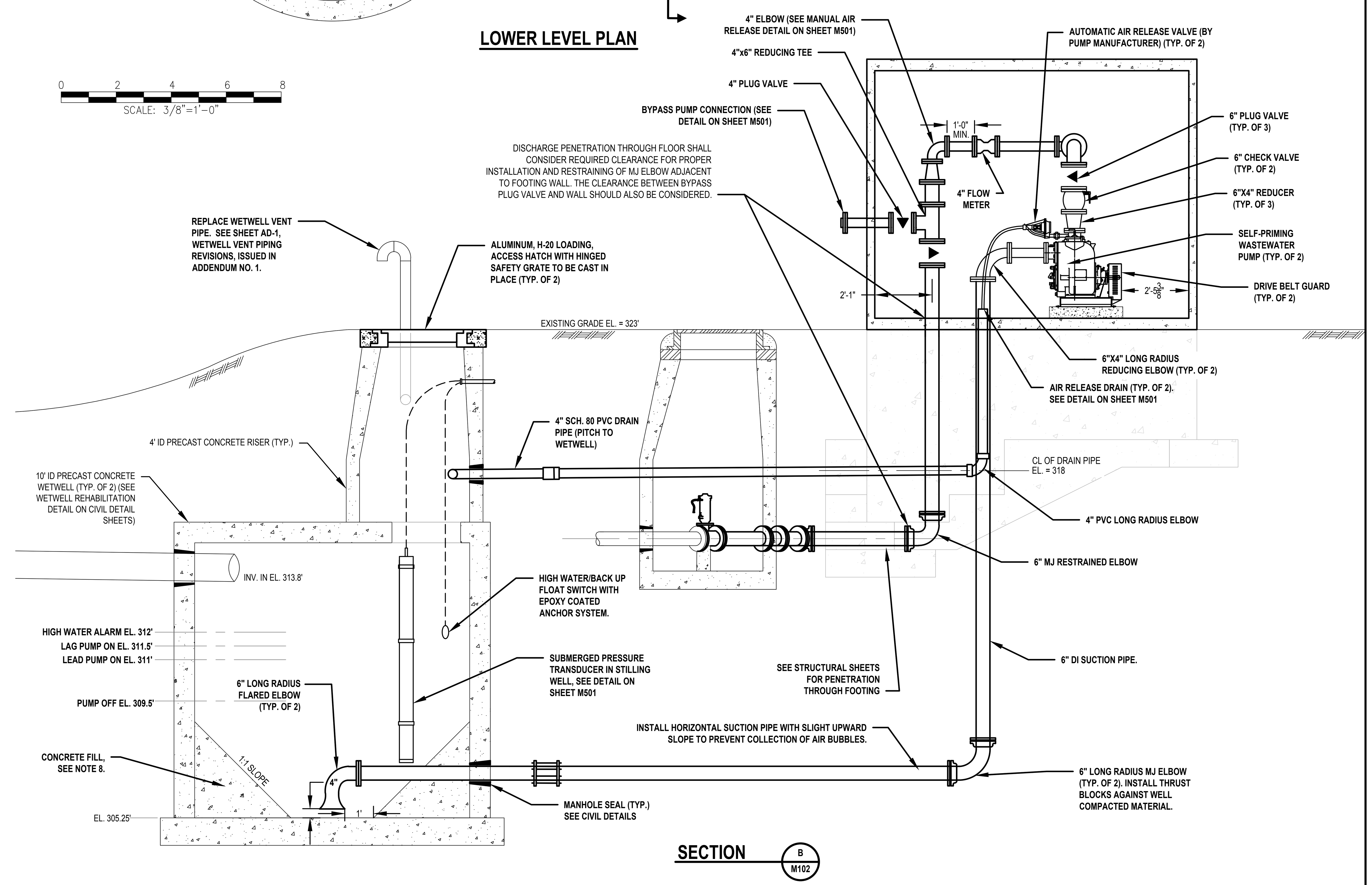
0 2 4 6 8
SCALE: 3/8"=1'-0"

NOTES:

1. LOCATIONS AND DIMENSIONS OF EXISTING UNDERGROUND UTILITIES, STRUCTURES AND EQUIPMENT BASED UPON BEST AVAILABLE RECORDS. CONTRACTOR TO FIELD LOCATE AND VERIFY ALL DIMENSIONS PRIOR TO PROPOSED WORK.
2. ELEVATIONS OF UNDERGROUND STRUCTURES BASED ON FIELD MEASUREMENTS AND GPS SURVEYED PAVEMENT ELEVATION OF 323' NAVD88 AT EXISTING PUMP STATION ENTRANCE.
3. CONTRACTOR TO VERIFY ELEVATION OF WETWELL GRAVITY INVERTS AND WETWELL FLOOR, AND NOTIFY ENGINEER IMMEDIATELY.
4. ALL CONDUIT AND PIPE PENETRATIONS/OPENINGS INTO THE WETWELLS SHALL BE EXPLOSION PROOF AND GAS AND WATER TIGHT. SEE SHEET C501 FOR MANHOLE SEAL DETAILS.
5. ALL PENETRATIONS THROUGH BUILDING FLOOR AND WALLS SHALL BE COORDINATED WITH PRECAST BUILDING MANUFACTURER.
6. ALL ABOVE GRADE PROCESS PIPE AND FITTINGS SHALL BE FLANGED DUCTILE IRON. ALL BELOW GRADE PROCESS PIPE AND FITTINGS SHALL USE MECHANICAL JOINT RESTRAINTS. DRAIN PIPE SHALL BE SCHEDULE 80 PVC.
7. ALL PIPES SHALL BE ADEQUATELY RESTRAINED AND SUPPORTED IN ACCORDANCE WITH THE DRAWINGS, AND PER MANUFACTURERS RECOMMENDATIONS.
8. EXISTING WETWELL FLOOR SHAPE UNKNOWN. CONTRACTOR TO POUR CONCRETE FILL AS NECESSARY TO ACHIEVE 1:1 FLOOR SLOPE OFFSET 12" FROM SUCTION FLARE. THIS SHOULD OCCUR AFTER WETWELL CLEANING AND PRIOR TO WETWELL COATING.
9. CONTRACTOR TO SUPPORT OR TEMPORARILY REMOVE AIR RELEASE VALVE MANHOLE DURING CONSTRUCTION. CONTRACTOR MAY CONNECT BYPASS PUMPS TO FM AT AIR RELEASE VALVE LOCATION.
10. DISCHARGE PENETRATION THROUGH FLOOR SHALL BE AS CLOSE TO NORTH-WEST WALL AS POSSIBLE WHILE ALLOWING FOR PROPER INSTALLATION AND RESTRAINING OF ELBOW BENEATH FLOOR SLAB. THE PROXIMITY OF BYPASS PLUG VALVE TO INTERIOR WALL SHOULD ALSO BE CONSIDERED.



STATION FLOOR PLAN



SECTION B M102

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CITY OF ROCHESTER, NH

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100 International Drive, Suite 152
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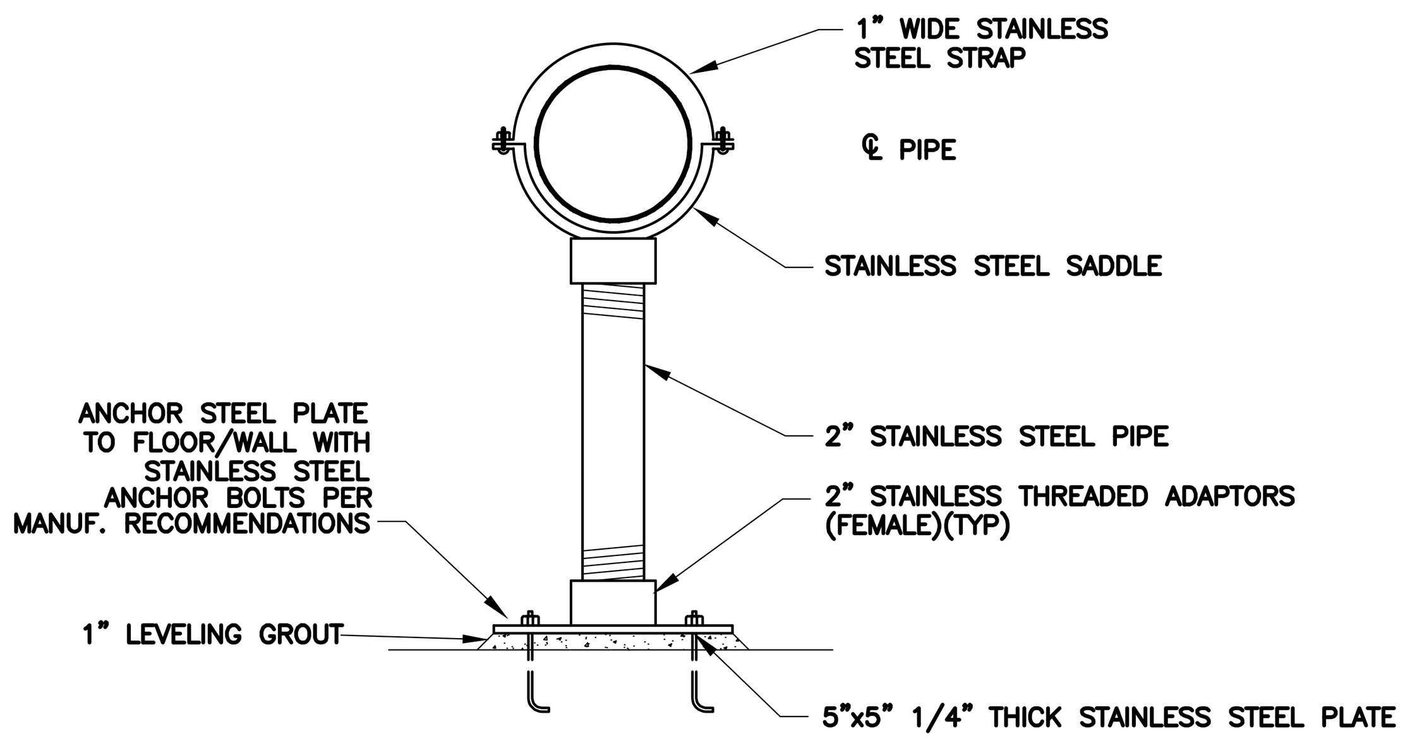
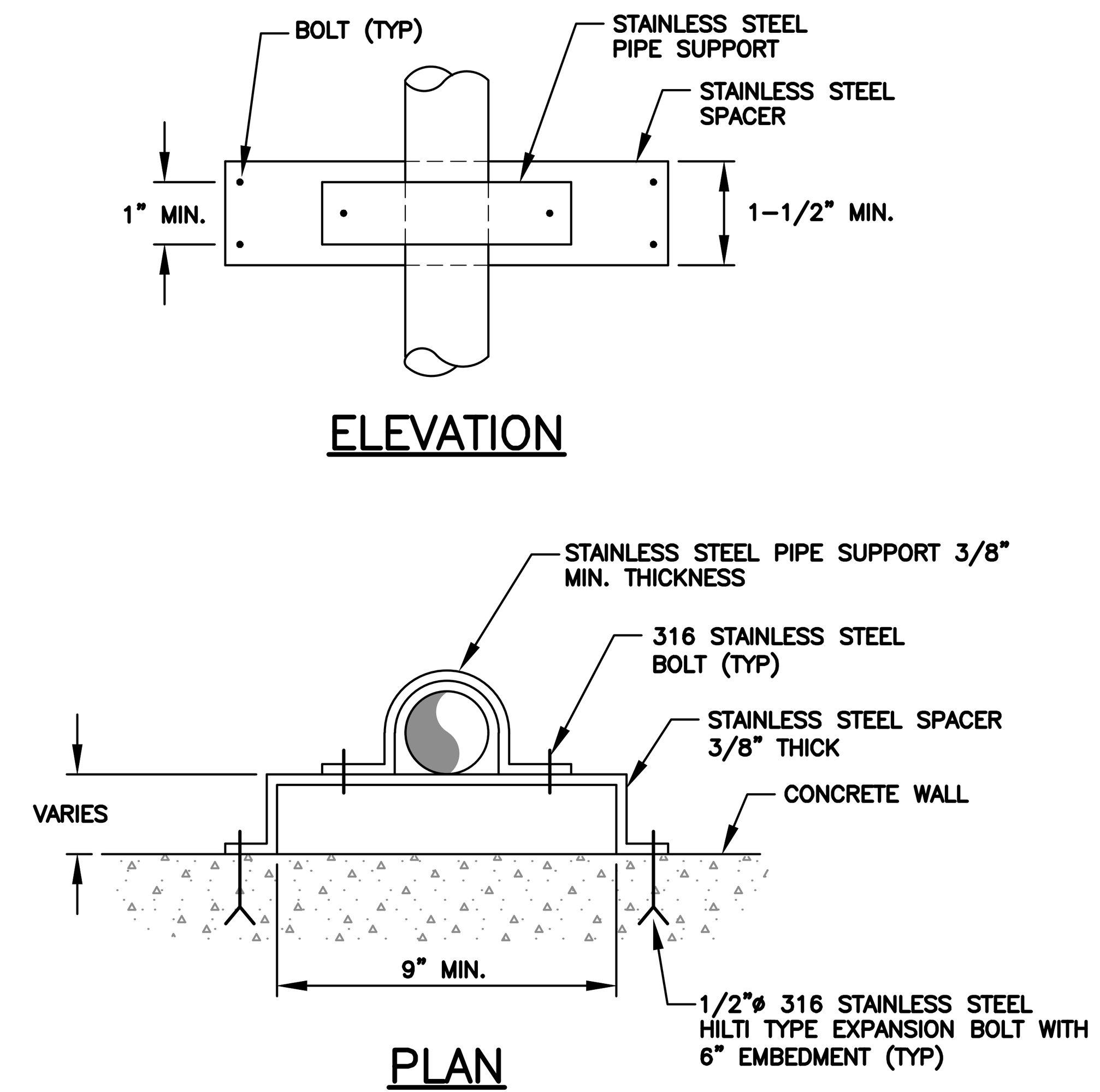


ADJUSTABLE STAINLESS STEEL PIPE SUPPORT

N.T.S.

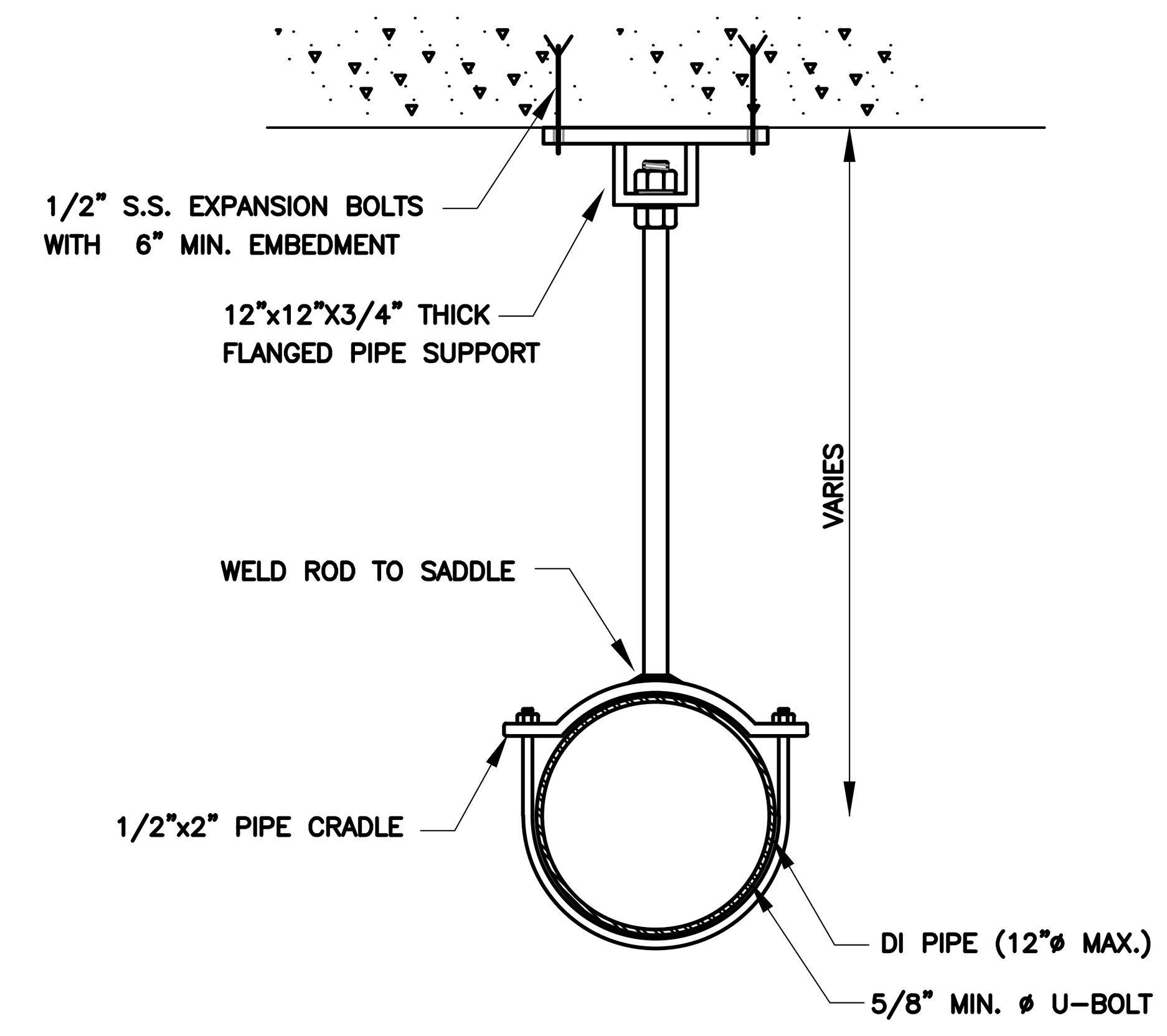
NOTES:
1. FOR PIPE SUPPORTS ON BASE TEES/BENDS, SADDLE TO BE REPLACED WITH SUITABLY SIZED STAINLESS STEEL BASE FLANGE PLATE.
2. FOR PIPE SUPPORTS ON FLANGES, SADDLE TO BE REPLACED WITH SUITABLY SIZED STAINLESS STEEL FLANGE ADAPTOR.



STAINLESS STEEL PIPE SUPPORT DETAIL (WALL)

N.T.S.

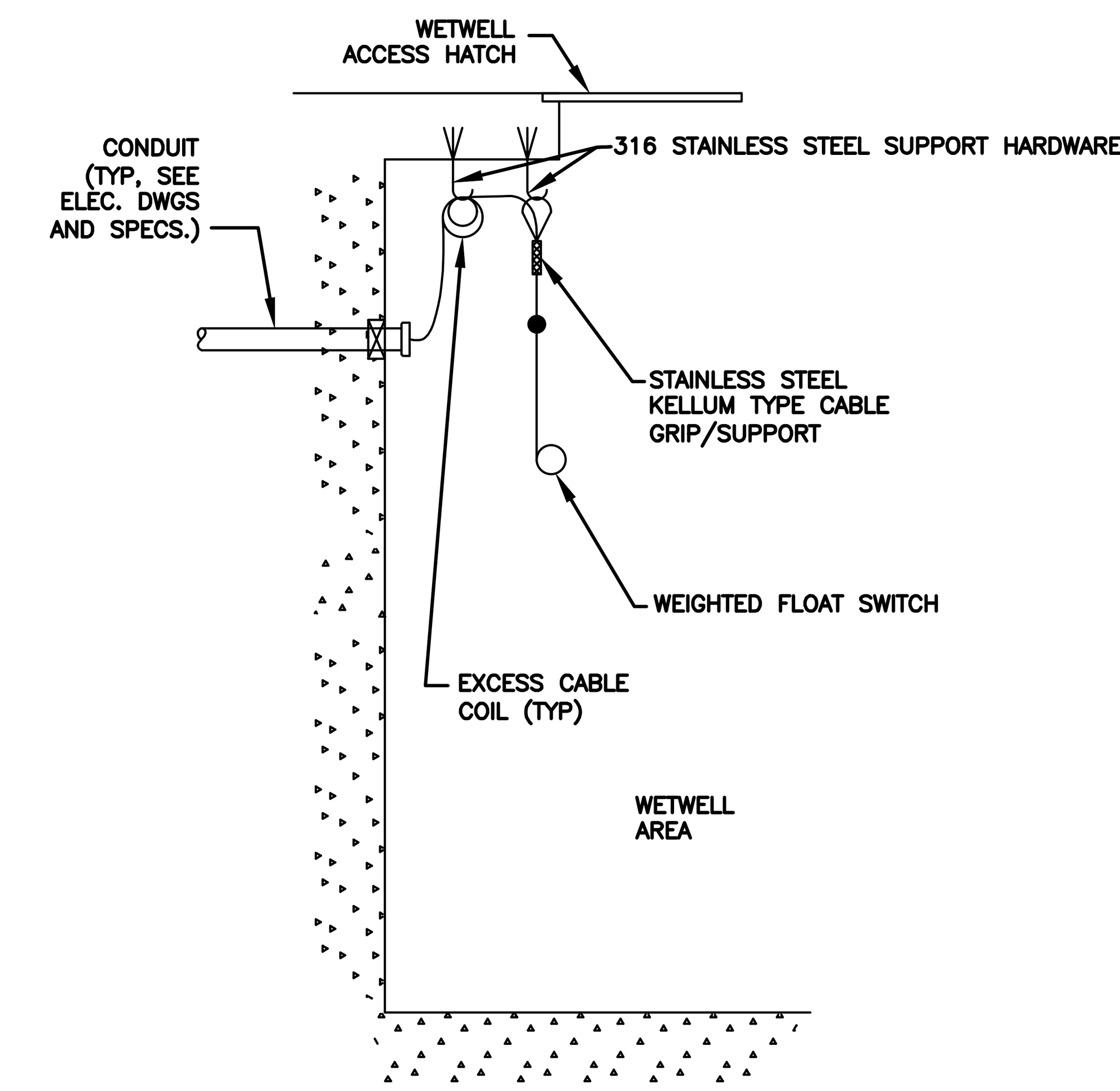
NOTES:
1. THESE SUPPORTS SHALL BE USED TO SUPPORT PIPING TO WALLS.



PIPE SUPPORT DETAIL (CEILING)

N.T.S.

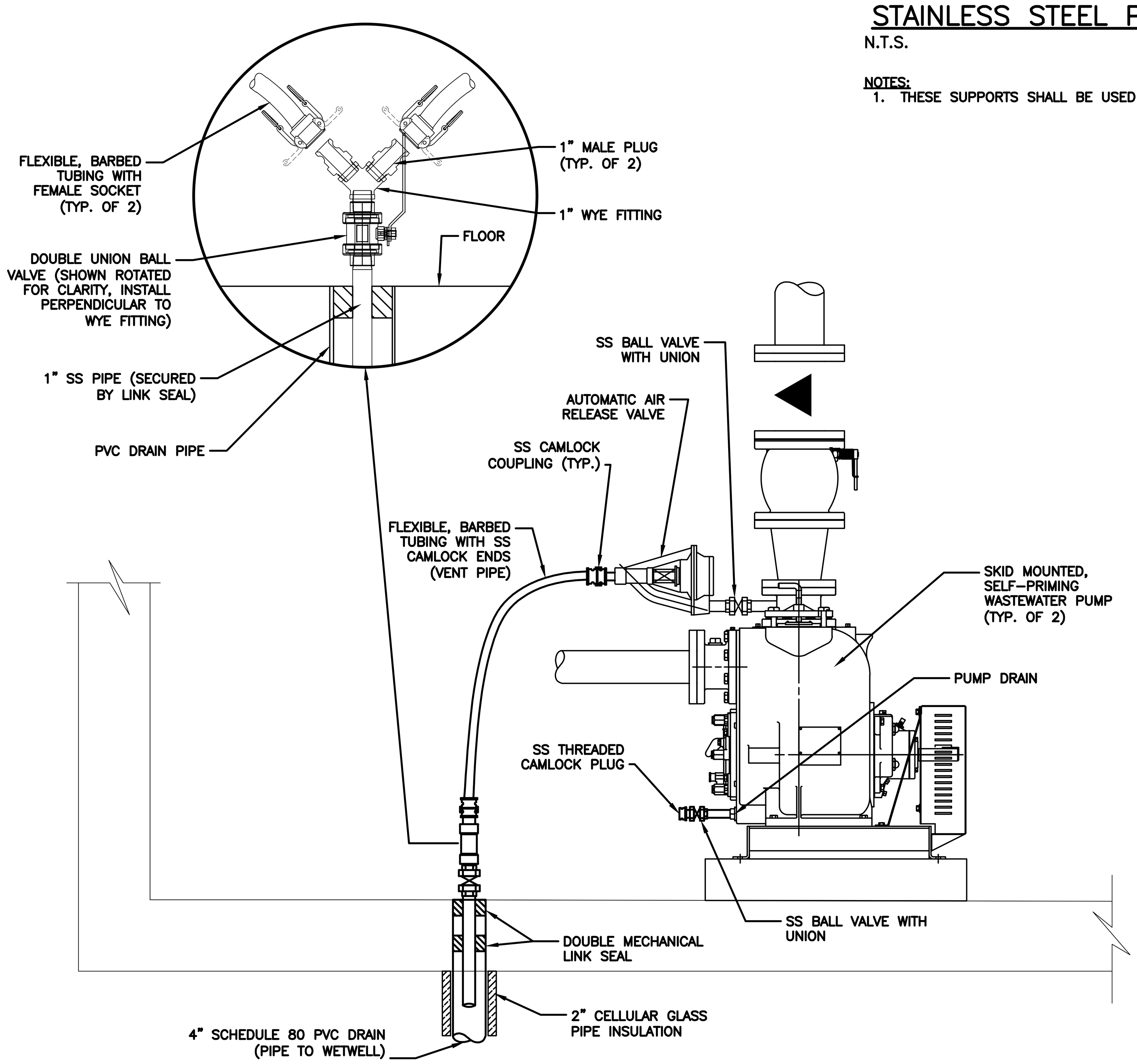
NOTES:
1. THESE SUPPORTS SHALL BE USED TO SUPPORT PIPING TO FLOOR OR CEILING. ALL MATERIALS SHALL BE CARBON STEEL, EXCEPT AS INDICATED.



FLOAT MOUNTING DETAIL

N.T.S.

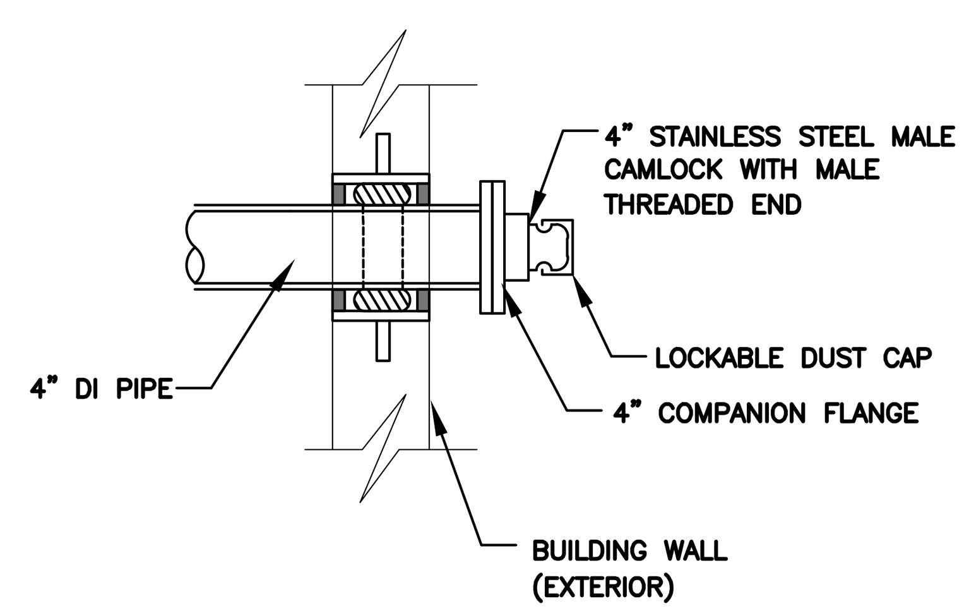
NOTES:
1. PROVIDE SUFFICIENT CABLE LENGTH TO ENSURE THE FLOATS CAN BE PULLED OUT FOR MAINTENANCE, CLEANING AND/OR REPLACEMENT.
2. MOUNT FLOATS SO THAT ACCESS TO THE INSTRUMENTS CAN BE MADE FROM THE ACCESS HATCH, WITHOUT ENTERING THE WETWELL.
3. PROVIDE LABELS AT UNISTRUT FOR EACH FLOAT CABLE.
4. FLOATS SHALL BE MOUNTED AT ELEVATIONS PROVIDED BY THE ENGINEER.



WASTEWATER PUMP AIR RELEASE AND DRAIN PIPING DETAIL

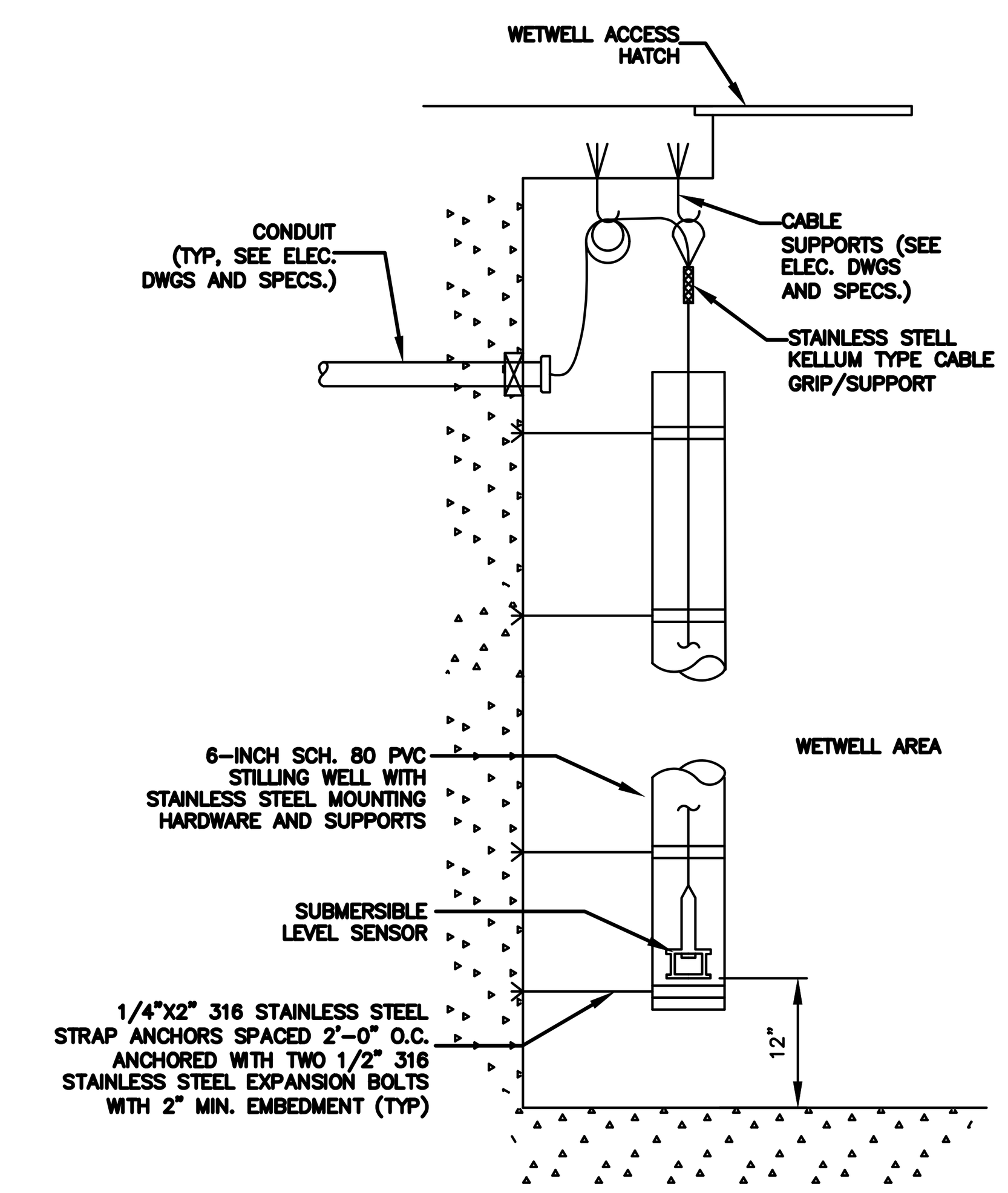
N.T.S

NOTES:
1. AUTOMATIC AIR RELEASE VALVE, VENT PIPING, AND VALVES/FITTINGS TO BE PROVIDED FOR BOTH PUMPS.
2. ONE WYE FITTING SHALL ACCEPT VENT PIPING FROM BOTH PUMPS.
3. USE 4" PVC DRAIN PIPE (PIPED TO WETWELL) AS SLEEVE FOR LINK SEAL.
4. ELEVATION OF HOSE CONNECTION ON WYE FITTING SHALL NOT EXCEED THE ELEVATION OF THE PUMP DRAIN (TO ALLOW PUMP CASING TO DRAIN BY GRAVITY INTO THE FLOOR DRAIN).
5. PUMP VENT AND PUMP CASING DRAIN PIPING SIZE SHALL BE SPECIFIED BY PUMP MANUFACTURER. PIPE AND FITTINGS SHOWN ARE 1" PIPE.
6. ADDITIONAL FITTINGS MAY BE REQUIRED BASED ON PUMP & PUMP SKID LAYOUT.
7. ALL PENETRATIONS INTO WETWELL AND PUMP ROOM SHALL BE MADE GAS AND WATER TIGHT.
8. AIR RELEASE VALVE AND VENT PIPING SHALL BE SUPPORTED BY ADEQUATE PIPE SUPPORT OR BRACKET. SUPPORT OF THE VALVE SOLELY BY THE VENT PIPE IS NOT ACCEPTABLE. METHOD OF SUPPORT SHALL BE APPROVED BY ENGINEER.
9. ALL BALL VALVES SHALL BE UNION TYPE OR HAVE UNIONS ON BOTH ENDS.
10. ALL DRAIN PIPE/FITTINGS (EXCEPT FLEXIBLE BARBED TUBING) SHALL BE SCHEDULE 40, 304 STAINLESS STEEL, AND NPT THREADED.



EMERGENCY PUMP CONNECTION DETAIL

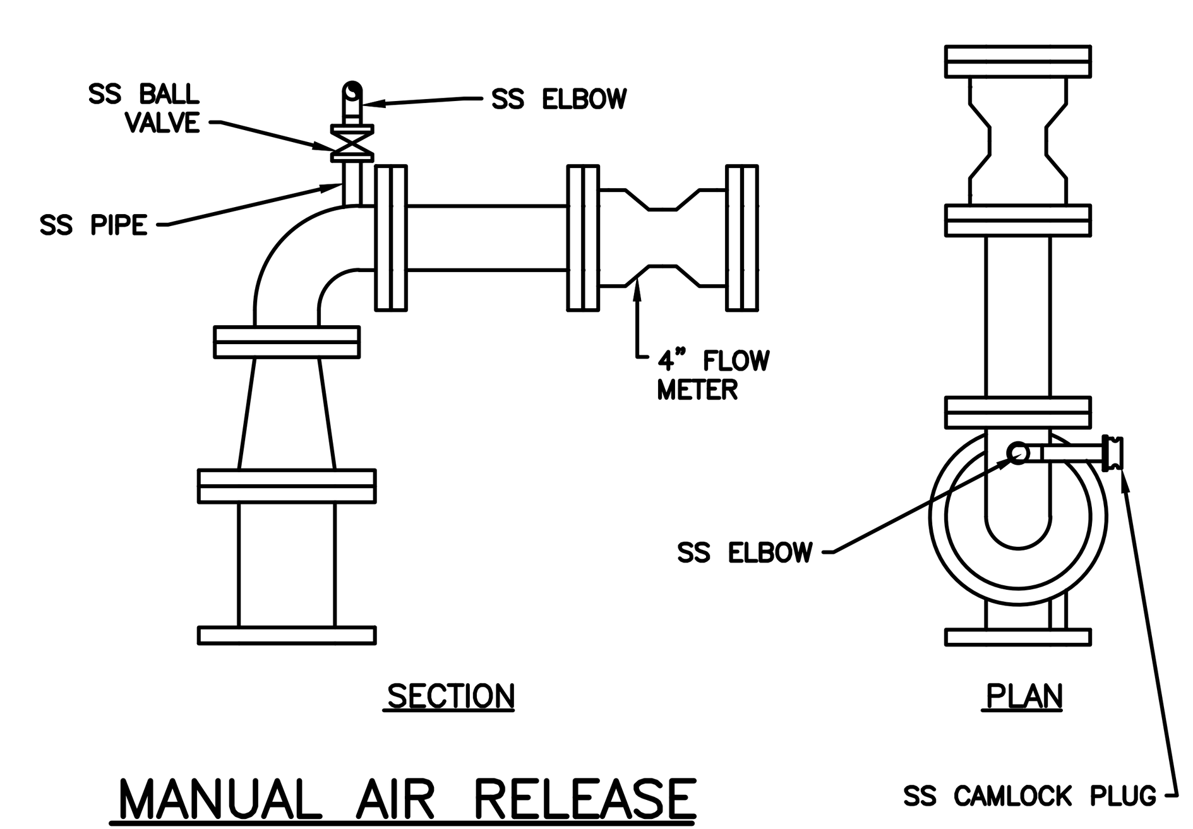
N.T.S.



SUBMERSIBLE LEVEL SENSOR/TRANSMITTER DETAIL

N.T.S.

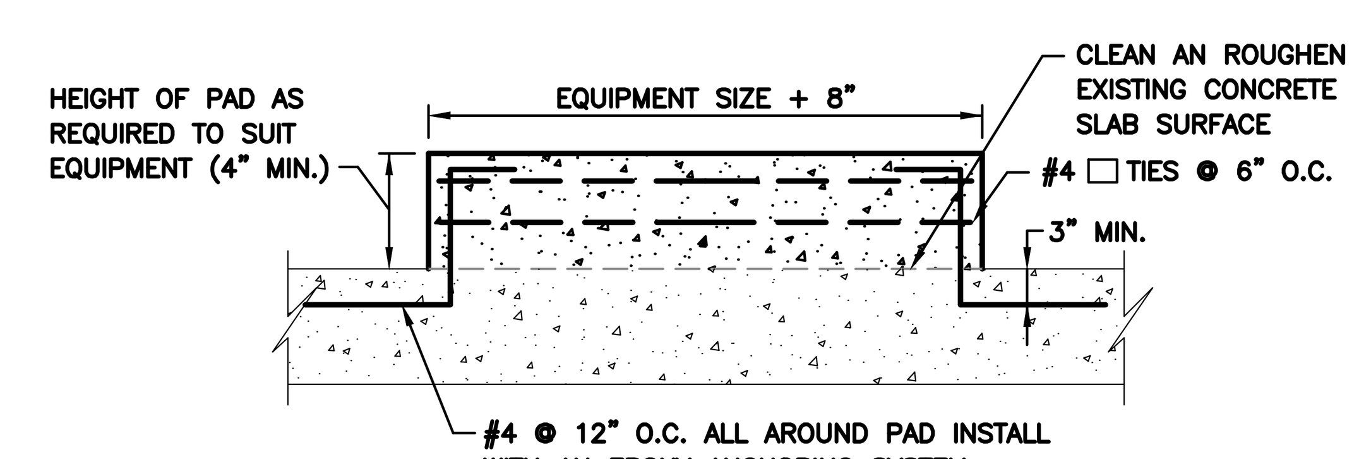
NOTES:
1. PROVIDE SUFFICIENT CABLE LENGTH TO ENSURE THE SENSOR CAN BE PULLED OUT FOR MAINTENANCE, CLEANING OR REPLACEMENT.
2. MOUNT STILLING WELL SO THAT ACCESS TO THE SENSOR CAN BE MADE FROM THE ACCESS HATCH, WITHOUT ENTERING THE WETWELL.



MANUAL AIR RELEASE

N.T.S

NOTES:
1. INSTALL MANUAL AIR RELEASE AT HIGH POINT OF THE 4" DI ELBOW DOWNSTREAM OF FLOW METER.
2. PIPE, VALVE, AND CAMLOCK FITTING SHALL MATCH SIZE OF PUMP AUTOMATIC AIR RELEASE VALVE VENT FITTINGS AND FLOOR DRAIN CONNECTION.
3. BALL VALVE SHALL BE UNION TYPE OR THREADED UNION SHOULD BE PRESENT ON BOTH ENDS OF VALVE.
4. CONTRACTOR SHALL SUPPLY HOSE OF SUFFICIENT LENGTH TO CONNECT MANUAL AIR RELEASE TO FLOOR DRAIN FITTING. HOSE SHALL HAVE PROPER CAMLOCK FITTINGS ON EACH END.



PUMP PAD DETAIL

N.T.S.

Project:
CITY OF ROCHESTER, NH

TARA ESTATES SEWER PUMP STATION UPGRADE

724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson
Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description
1	09/21/2022	REVISED FOR ADDENDUM 3

COA:

Seal:
STATE OF NEW HAMPSHIRE
CHRISTOPHER M. PERKINS
No. 12004
LICENSED PROFESSIONAL ENGINEER

Issued For:
BIDDING
ADDENDUM NO. 3

Scale: N.T.S.

Date:	09 / 21 / 2022
Drawn By:	GSP
Reviewed By:	JMS
Approved By:	CMP
W&S Project No.:	ENG21-0987
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Drawing Title:
MECHANICAL DETAILS

Sheet Number:
M501

ABBREVIATIONS

Ø	ROUND/DIAMETER	ID	INDIRECT
ABV	ABOVE	ID	INSIDE DIAMETER
ACT	ACOUSTICAL CEILING TILE	IN	INCH
ADD	ADDENDUM	IN WC	INCHES WATER COLUMN
ADDL	ADDITIONAL	IN WG	INCHES WATER GAUGE
AFF	ABOVE FINISHED FLOOR	KW	KILOWATT
AFUE	ANNUAL FUEL UTILIZATION EFFICIENCY	L	LENGTH
ALT	ALTERNATE	LAT	LEAVING AIR TEMPERATURE
AMB	AMBIENT	LB	POUND
AMP	AMPERE	LF	LINEAR FEET
APD	AIR PRESSURE DROP	LPG	LIQUEFIED PETROLEUM GAS
ARCH	ARCHITECT/ARCHITECTURAL	LVG	LEAVING
ATC	AUTOMATIC TEMPERATURE CONTROL	LVR	LOUVER
AVG	AVERAGE	MAX	MAXIMUM
BFC	BELOW FINISHED CEILING	MBH	ONE THOUSAND BTU PER HOUR
BHP	BRAKE HORSEPOWER	MCA	MINIMUM CIRCUIT AMPACITY
BLDG	BUILDING	MD	MOTORIZED DAMPER
BOS	BOTTOM OF STEEL	MECH	MECHANICAL
BTU	BRITISH THERMAL UNITS	MEZZ	MEZZANINE
BTUH	BRITISH THERMAL UNITS PER HOUR	MFR	MANUFACTURER
CA	COMBUSTION AIR	MIN	MINIMUM
CAP	CAPACITY	MISC	MISCELLANEOUS
CENT	CENTRIFUGAL	MOCP	MAXIMUM OVER CURRENT PROTECTION
CF	CUBIC FEET	N/A	NOT APPLICABLE
CFM	CUBIC FEET PER MINUTE	NC	NORMALLY CLOSED
CL	CENTERLINE	NO	NORMALLY OPEN
CLG	CEILING	NTS	NOT TO SCALE
CO	CLEAN OUT	O/A	OUTSIDE AIR
COL	COLUMN	OCC	OCCUPIED
CONC	CONCRETE	OD	OUTSIDE DIAMETER
D	DEPTH	ODP	OPEN DRIP PROOF
DB	DRY BULB	PD	PRESSURE DROP
DDC	DIRECT DIGITAL CONTROLS	PH	PHASE
DEG	DEGREE	PRV	PRESSURE REDUCING VALVE
DIA	DIAMETER	PSI	POUNDS PER SQUARE INCH
DIM	DIMENSION	PSIA	PSI ABSOLUTE
DN	DOWN	PSIG	PSI GAUGE
EA	EACH	QTY	QUANTITY
E/A	EXHAUST AIR	R	RADIUS
EAT	ENTERING AIR TEMPERATURE	RH	RELATIVE HUMIDITY
ECM	ELECTRONICALLY COMMUTATED MOTOR	RPM	REVOLUTIONS PER MINUTE
EER	ENERGY EFFICIENCY RATIO	S/A	SUPPLY AIR
EF	EXHAUST FAN	SF	SQUARE FOOT
EFF	EFFICIENCY	SF	SUPPLY FAN
EHC	ELECTRIC HEATING COIL	SP	STATIC PRESSURE
ELEC	ELECTRICAL	SPECS	SPECIFICATIONS
ELEV	ELEVATION	SS	STAINLESS STEEL
EQUIP	EQUIPMENT	SUP	SUPPLY
ESP	EXTERNAL STATIC PRESSURE	T	THERMOSTAT
EUH	ELECTRIC UNIT HEATER	T/A	TRANSFER AIR
EWT	ENTERING WATER TEMPERATURE	TAV	THERMOSTATIC AIR VENT
EXH	EXHAUST	TD	TEMPERATURE DROP
F	DEGREES FAHRENHEIT	TEMP	TEMPERATURE
FA	FREE AREA	TSP	TOTAL STATIC PRESSURE
FC	FLEXIBLE CONNECTION	TYP	TYPICAL
FLA	FULL LOAD AMPS	UH	UNIT HEATER
FPM	FEET PER MINUTE	UNO	UNLESS NOTED OTHERWISE
FT	FOOT/FEET	UNOCC	UNOCCUPIED
G	GAS	V	VOLTS
GA	GAUGE	VAR	VARIABLE
GAL	GALLON	VAV	VARIABLE AIR VOLUME
GALV	GALVANIZED	VD	VOLUME DAMPER
GC	GENERAL CONTRACTOR	VEL	VELOCITY
GRD	GRADE	VENT	VENTILATION
GUH	GAS UNIT HEATER	VFD	VARIABLE FREQUENCY DRIVE
HD	HEAD	VTR	VENT THROUGH ROOF
HP	HORSE POWER	W	WATT
HR	HOUR	W	WIDTH
HT	HEIGHT	W/	WITH
HTG	HEATING	W/O	WITHOUT
HTR	HEATER	WB	WET BULB
HW	HOT WATER	WC	WATER COLUMN
HZ	HERTZ	WG	WATER GAUGE
		WMS	WIRE MESH SCREEN
		ΔP	CHANGE IN PRESSURE
		ΔT	CHANGE IN TEMPERATURE
		°F	DEGREES FAHRENHEIT

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

SCOPE OF WORK
(INCLUDING BUT NOT LIMITED TO)

1. PROVIDE GAS-FIRED UNIT HEATER IN THE PUMP ROOM.
2. PROVIDE EXHAUST FAN FOR PUMP ROOM.
3. PROVIDE DAMPER INTERLOCKS TO GENERATOR.

HVAC GENERAL NOTES

1. MECHANICAL GENERAL NOTES APPLY TO ALL MECHANICAL DRAWINGS. THE WORD "CONTRACTOR" USED IN "HVAC" OR "MECHANICAL" WORK SHALL MEAN THE HVAC FILED SUB-BIDDER OR MECHANICAL CONTRACTOR.
2. FINAL PRODUCT SHALL BE A COMPLETE AND FUNCTIONING SYSTEM INCLUDING ALL INCIDENTAL ACCESSORIES NECESSARY TO MAKE THE HVAC WORK COMPLETE AND READY FOR OPERATION. FINAL PRODUCT SHALL CONFORM TO ALL REQUIREMENTS OF APPLICABLE FEDERAL, STATE, AND LOCAL CODES, INCLUDING BUT NOT LIMITED TO THE INTERNATIONAL BUILDING CODE AND INTERNATIONAL MECHANICAL CODE.
3. CARE SHALL BE TAKEN DURING THE INSTALLATION TO NOT DAMAGE OR INTERRUPT BUILDING SYSTEMS AND SERVICES THAT ARE ALREADY INSTALLED. DAMAGE TO SUCH SYSTEMS OR EQUIPMENT CAUSED BY THIS CONTRACTOR DURING INSTALLATION SHALL BE REPAIRED AND/OR REPLACED AT THIS CONTRACTOR'S EXPENSE TO THE COMPLETE SATISFACTION OF THE BUILDING OWNER.
4. LOCATIONS OF PIPING, DUCTWORK AND EQUIPMENT AS INDICATED ON THE DRAWING, ARE APPROXIMATE AND SUBJECT TO MINOR ADJUSTMENTS IN THE FIELD. WORK SHALL BE COORDINATED WITH ALL OTHER TRADES TO AVOID INTERFERENCE IN THE FIELD.
5. ALL WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED, INCLUDING BUT NOT LIMITED TO DIV 21, 22, AND 26. OFFSETS IN PIPING AND DUCTS (INCLUDING DIVIDED DUCTS) AND TRANSITIONS AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
6. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT AND/OR PIPE TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.
7. ALL MATERIALS AND EQUIPMENT UNLESS SPECIFICALLY INDICATED OTHERWISE, SHALL BE NEW.
8. INSTALL NEW ROOM THERMOSTATS AND SENSORS 4 FEET AFF OR AS DIRECTED OTHERWISE BY ARCHITECT.
9. WHEN SECTION OF DUCTWORK IS NOT LABELED FOR SIZE, THE LARGER SIZE INDICATED ON THE CONNECTED DUCT SHALL PREVAIL. SIZE OF DUCT RUN-OUTS TO DIFFUSER SHALL EQUAL DIFFUSER NECK SIZE.
10. THE FIRE PROOFING OF THE BUILDING STRUCTURE IS NOT TO BE REMOVED FOR THE INSTALLATION OF HANGERS, SUPPORTS, DUCTWORK, ETC. IF FIRE PROOFING IS DAMAGED, IT SHALL BE REPAIRED AT THE EXPENSE OF THE TRADE.
11. THE CONTRACTOR SHALL TEST AND CALIBRATE ALL CONTROLS AND VERIFY ALL ARE FULLY FUNCTIONAL AND SUBMIT DOCUMENTATION. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
12. THE CONTRACTOR SHALL COORDINATE ALL FRESH AIR INTAKE, FLUE TERMINATION, AND EXHAUST TERMINATION LOCATIONS WITH ALL OTHER TRADES BASED ON CLEARANCE REQUIREMENTS INDICATED IN THE 2015 IMC AND ALL OTHER APPLICABLE FEDERAL, STATE, AND LOCAL CODES.
13. REFER TO THE PROJECT SPECIFICATIONS FOR FURTHER REQUIREMENTS.
14. IN ACCORDANCE WITH SPECIFICATION FOR DIVISION 23, THE CONTRACTOR SHALL COORDINATE WITH ALL TRADES AND PREPARE COORDINATION DRAWINGS PRIOR TO INSTALLATION. COORDINATION DRAWINGS SHALL BE SUBMITTED TO THE OWNERS REPRESENTATIVE FOR REVIEW PRIOR TO INSTALLATION.
15. MINIMAL CONTROL POWER HAS BEEN IDENTIFIED ON THE ATC DRAWINGS. IF ANY ADDITIONAL POWER IS REQUIRED BASED ON SYSTEMS DESIGN BY THE CONTROLS CONTRACTOR THE ATC/BAS CONTRACTOR SHALL BE RESPONSIBLE TO SUPPLY THAT POWER. COORDINATE ALL POWER REQUIREMENTS WITH DIV 26.

CALLOUT SYMBOLS

A / H2.0	SECTION DESIGNATION
	SECTION SHEET NUMBER
1	REVISION NUMBER
T	THERMOSTAT, WALL MOUNTED
VAV-XX	EQUIPMENT TAG (REFER TO SCHEDULES FOR DETAILS)

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

DUCTWORK

ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE

SINGLE LINE		DOUBLE LINE
WxD	RECTANGULAR DUCT W = WIDTH, D = DEPTH	WxD, 10x6
DIA"Ø	ROUND DUCT (DIA = INSIDE DIAMETER)	DIA"Ø, 10"Ø
	ROUND DUCT UP	
	RECTANGULAR SUPPLY DUCT UP	
	RECTANGULAR RETURN/EXHAUST DUCT UP	
	RECTANGULAR SUPPLY DUCT DN	
	RECTANGULAR RETURN/EXHAUST DUCT DN	
	STANDARD RADIUS ELBOW (R = W) SUPPLY/RETURN/EXHAUST)	R, W=1
	FULL LENGTH SPLITTER VANES (R < W) SUPPLY/RETURN/EXHAUST	R, W=1
	HORIZONTAL OFFSET SUPPLY/RETURN/EXHAUST	
R/D	CHANGE OF ELEVATION (R) RISE OR (D) DROP SUPPLY/RETURN/EXHAUST	R/D
	45° TAP TAKE-OFF	
	90° TAP TAKE-OFF (45°, SQUARE TO ROUND, 45°TAKE-OFF TRANSITION TO ROUND, AND BELLMOUTH, RESPECTIVLEY)	
	SPLIT TAKE-OFF	
	RECTANGULAR WYE W/ RADIUS ELBOWS	
	RECTANGULAR WYE W/ 45° TAKE-OFFS	
10x6, 6"Ø	RECTANGULAR TO ROUND TRANSITION	10x6, 6"Ø
	ACOUSTICALLY LINED DUCTWORK	
	FLEXIBLE DUCTWORK	
	OPEN END DUCT W/ 1/2"x1/2" WMS	

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

DUCTWORK/RGD SYMBOLS

M	MOTORIZED DAMPER - AUTOMATIC W/ ACCESS DOOR
	RETURN OR EXHAUST AIRFLOW
	SUPPLY AIRFLOW

NOTE: SOME OR ALL OF THE SYMBOLS MAY BE USED ON THIS PROJECT

PIPING ABBREVIATIONS

LP	LIQUID PROPANE

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

PIPING LEGEND

	PLUG VALVE
	PRESSURE REDUCING VALVE
	UNION
	BLIND FLANGE
	PIPE - CAPPED
	PIPE CONNECTION - TOP
	PIPE CONNECTION - BOTTOM
	PIPE - DOWN
	PIPE - UP
R	PITCH OF PIPE - (R) RISE OR (D) DROP
	REDUCER - CONCENTRIC
	REDUCER - ECCENTRIC
	PIPE BREAK (SINGLE LINE)
	DIRT LEG
CO	CLEANOUT FOR CONDENSATE DRAIN PIPE
	PIPE - UP (DOUBLE LINE)
	PIPE - DOWN (DOUBLE LINE)
	PIPE BREAK (DOUBLE LINE)

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

Project:
CITY OF ROCHESTER, NH

TARA ESTATES SEWER PUMP STATION UPGRADE

724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson
Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description
1	09/21/2022	REVISED FOR ADDENDUM 3

Seal:
STATE OF NEW HAMPSHIRE – SCOTT E. HENRIKSEN – NO. 14562 – LICENSED PROFESSIONAL ENGINEER

Issued For:
BIDDING
ADDENDUM NO. 3

Scale: NTS

Key Plan:

Date:	09/21/2022
Draw By:	HJH
Reviewed By:	SEH
Approved By:	SEH
W&S Project No.:	ENG20-0987
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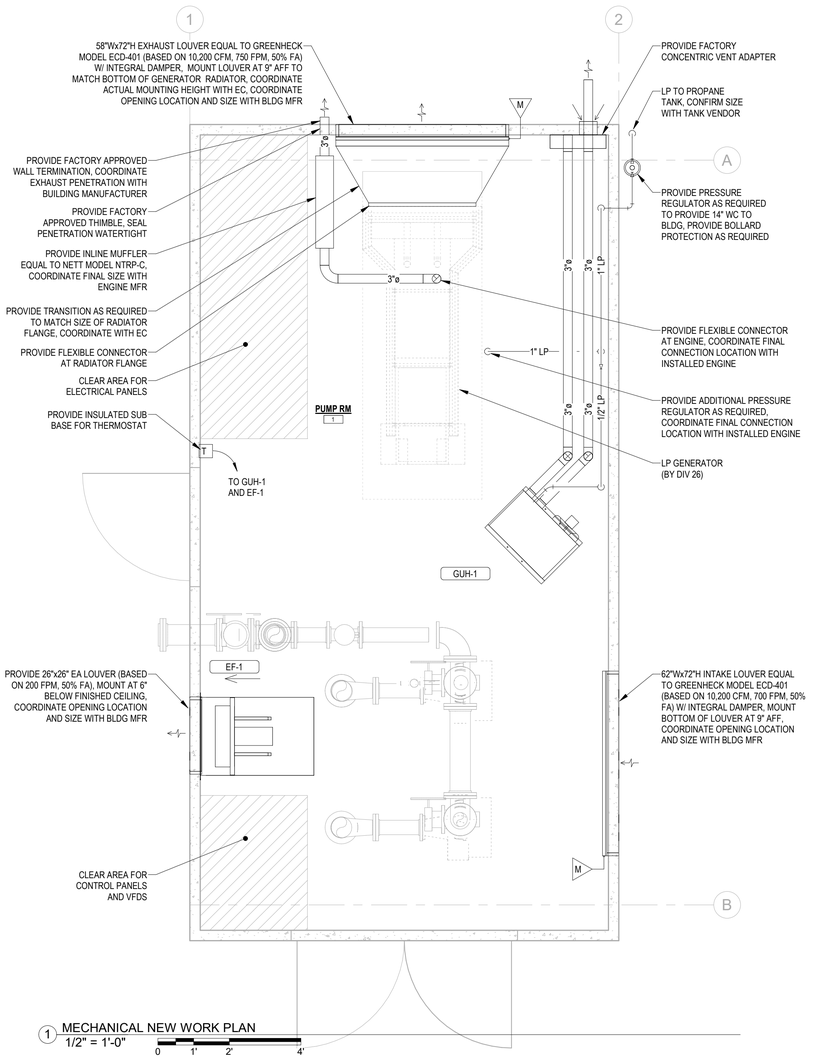
Drawing Title:
LEGENDS, NOTES, AND ABBREVIATIONS

Sheet Number:
H000



1 MECHANICAL NEW WORK PLAN
1/2" = 1'-0"
0 1' 2' 4'

EXHAUST FAN SCHEDULE

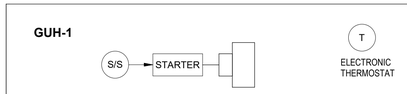
ID	LOCATION NAME	NO.	MANUFACTURER	MODEL NO.	TYPE	FAN AIRFLOW DESIGN	FAN VELOCITY OUTLET	FAN PRESS ESP	FAN RPM	FAN WHEEL TYPE	FAN WHEEL DIA	FAN DRIVE TYPE	FAN MOTOR BHP	FAN MOTOR HP	FAN MOTOR ECM	SOUND PRESS LEVEL (dBA)	WEIGHT (lb)	ELECTRICAL DATA FLA	V	PH	REMARKS
EF-1	PUMP RM	1	GREENHECK	AER-E20-605-VG	SIDEWALL	430	190	0.38	1024	AF	20"	DIRECT	0.07	0.25	Yes	59	160	2.9	120	1	1 THRU 5

NOTES:
1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DIAGRAMS FOR ADDITIONAL INFORMATION.
2. PROVIDE WITH BIRD SCREEN AND ULTRA LOW LEAKAGE MOTORIZED DAMPER WITH LOW VOLTAGE DAMPER ACTUATOR.
3. PROVIDE WITH ECM TYPE MOTOR WITH MOTOR MOUNTED SPEED CONTROL DIAL.
4. PROVIDE WITH SINGLE POINT POWER AND FACTORY TOGGLE TYPE DISCONNECT SWITCH.
5. PROVIDE LONG WALL HOUSING WITH OSHA GUARD AND FLUSH INTERIOR MOUNTING (FOR LOUVER APPLICATION).

GAS-FIRED UNIT HEATER SCHEDULE

ID	LOCATION NAME	NO.	MANUFACTURER	MODEL NO.	TYPE	MOTOR HP	MOTOR RPM	GAS BURNER INPUT (MBH)	GAS BURNER OUTPUT (MBH)	GAS BURNER EFF (%)	FUEL TYPE	FUEL PRESS (IN WC) MIN	FUEL PRESS (IN WC) MAX	AIRSIDE CFM	AIRSIDE EAT DB (°F)	AIRSIDE LAT DB (°F)	WEIGHT (lb)	ELECTRICAL DATA V	PH	REMARKS
GUH-1	PUMP RM	1	MODINE	HDS 45AS01	HORIZONTAL	0.07	1550	45.0	36.9	82	LP	11.0	14.0	720	50.0	96.0	60	120	1	1 THRU 4

NOTES:
1. REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DIAGRAMS FOR ADDITIONAL INFORMATION.
2. PROVIDE 22 GAUGE CASING WITH BAKED ON POWDER COATED FINISH.
3. PROVIDE STAINLESS STEEL HEAT EXCHANGER WITH SEPARATED COMBUSTION, PROPANE CONVERSION KIT, AND FACTORY CONCENTRIC VENT TERMINATION KIT.
4. PROVIDE SINGLE SPEED OPEN DRIP PROOF MOTOR.



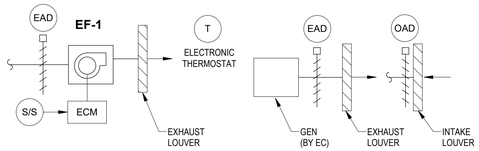
GAS UNIT HEATER CONTROLS:
GENERAL
1. UNIT HEATER SHALL BE STARTED AND STOPPED VIA DDC CONTROLLER.
2. ALL SETPOINTS SHALL BE ADJUSTABLE.
3. MOTOR RATED RELAYS SHALL BE PROVIDED TO INTERFACE MANUAL MOTOR STARTER WITH CONTROL WIRING TO SATISFY CONTROL SEQUENCE.
4. ALL TEMPERATURES LISTED ARE IN FAHRENHEIT.

OCCUPIED UNIT HEATER CONTROL
1. THE UNIT HEATER FAN SHALL BE DE-ENERGIZED. UPON A DROP IN SPACE TEMPERATURE BELOW THE SETPOINT OF 65°F (ADJ), THE GAS HEATER SHALL BE STAGED ON AND AFTER A TIME DELAY (PRESENT BY THE EQUIPMENT MANUFACTURER) THE FAN SHALL ENERGIZE TO MAINTAIN THE SPACE TEMPERATURE SET POINT.
2. THE REVERSE SHALL OCCUR ON A RISE IN SPACE TEMPERATURE ABOVE 62°F (ADJ).

UNOCCUPIED UNIT HEATER CONTROL
1. UPON A DROP IN SPACE TEMPERATURE BELOW THE SETPOINT OF 55°F (ADJ), THE GAS HEATER SHALL BE STAGED ON AND AFTER A TIME DELAY (PRESENT BY THE EQUIPMENT MANUFACTURER) THE FAN SHALL ENERGIZE TO MAINTAIN THE SPACE TEMPERATURE SET POINT.
2. THE REVERSE SHALL OCCUR ON A RISE IN SPACE TEMPERATURE ABOVE 62°F (ADJ).

ALARMS
1. IF THE ROOM TEMPERATURE FALLS BELOW 50°F (ADJ) FOR 10 MINUTES (ADJ) OR LONGER, SEND A DETAILED ALARM TO THE BMS AND OPERATOR WORKSTATION.

GAS-FIRED UNIT HEATER CONTROL SEQUENCE



CONTROLS:
GENERAL
1. EXHAUST FAN SHALL BE STARTED AND STOPPED VIA ELECTRONIC THERMOSTAT.
2. ALL SETPOINTS SHALL BE ADJUSTABLE. ALL TEMPERATURES LISTED ARE IN FAHRENHEIT.
3. MOTOR RATED RELAYS SHALL BE PROVIDED TO INTERFACE MANUAL MOTOR STARTER WITH CONTROL WIRING TO SATISFY CONTROL SEQUENCE.
4. ALL DAMPERS SHALL BE LOW-VOLTAGE TYPE UNLESS NOTED OTHERWISE.
5. GENERATOR (BY EC) SHALL BE INTERLOCKED WITH DAMPERS.
6. LOCAL HAND-OFF-AUTOMATIC SWITCH (H-O-A) FOR FANS SHALL OVERRIDE ALL OTHER COMMANDS. ALL HARDWIRED SAFETIES SHALL BE ACTIVE IN BOTH "H" AND "A" POSITIONS.

EXHAUST FAN CONTROL SEQUENCE
1. WHILE DE-ENERGIZED (OR OFF ON SAFETY OR MANUAL DISCONNECT) EXHAUST FAN SHALL BE OFF WITH THE OAD AND EAD CLOSED.
2. WHEN COMMANDED TO START, THE OAD AND EAD SHALL OPEN. THE EXHAUST FAN SHALL START. THE EXHAUST FAN SHALL RUN CONTINUOUSLY.

GENERATOR DAMPER CONTROL SEQUENCE
1. WHILE DE-ENERGIZED (OR OFF ON SAFETY OR MANUAL DISCONNECT) GENERATOR OAD AND EAD SHALL BE CLOSED.
2. WHEN THE GENERATOR STARTS, THE OAD AND EAD SHALL OPEN. THE REVERSE SHALL OCCUR WHEN POWER IS RESTORED.

EXHAUST FAN CONTROL SEQUENCE

PROPANE LOAD SUMMARY SCHEDULE

TAG	QTY	APPLIANCE	INPUT (CFH)	SUBTOTAL (CFH)	REQ'D PRESSURE (IN WC)	LOCATION
GEN	1	GENERATOR	309	309	11" - 14"	MECHANICAL ROOM
GUH-1	1	GAS UNIT HEATER	45	45	11" - 14"	MECHANICAL ROOM
		TOTAL (CFH)		**354**		
PIPE SIZING BASED ON A MAXIMUM DISTANCE OF 25' (40 EQUIVALENT FEET) @ 11" WC OR LESS INLET PRESSURE AND 0.5" WC PRESSURE DROP.			PIPE SIZE	1"		

HVAC NEW WORK NOTES

1. NEW WORK NOTES SHALL APPLY TO ALL HVAC DRAWINGS.
2. REFER TO HVAC GENERAL NOTES ON H000 FOR SCOPE OF WORK.
3. CONSTRUCT AND INSTALL ALL DUCTWORK IN ACCORDANCE WITH THE LATEST EDITION OF SMACNA STANDARDS.
4. LOCATE DUCTWORK, PIPING AND MECHANICAL EQUIPMENT OUTSIDE OF THE REQUIRED ELECTRICAL CLEARANCES ABOVE/AROUND ELECTRICAL PANELS. TRANSFORMERS, AND OTHER ELECTRICAL EQUIPMENT.
5. PROVIDE SLEEVES AND/OR OPENINGS TO RUN PIPES AND DUCTS THROUGH FOUNDATIONS, FLOORS, WALLS, AND ROOF.
6. ADJUST PIPING SIZES TO PROPERLY CONNECT TO MECHANICAL EQUIPMENT. PROVIDE SHUTOFF VALVES IN THE PIPING TO ALL EQUIPMENT TO ALLOW FOR SERVICING. UNIONS SHALL BE ARRANGED SUCH THAT EQUIPMENT CAN BE SERVICED WITHOUT CUTTING AND MINIMAL DISRUPTION OF PIPING SERVING THE EQUIPMENT.
7. FOR DETAILS, EQUIPMENT CONNECTIONS, AND PIPE SIZES NOT SHOWN ON THE SEGMENTS, REFER TO DETAILS, SCHEDULES, AND SPECIFICATIONS.
8. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH THE RESPECTIVE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS, AT A LEVEL OF QUALITY AND WORKMANSHIP CONSISTENT WITH THE SPECIFICATIONS.
9. INSTALL EXPOSED PIPING AND DUCTWORK AS HIGH AS PRACTICAL IN ROOMS WITHOUT CEILINGS.
10. PROVIDE LOW-VOLTAGE WIRING FROM ELECTRICAL SOURCE TO MISCELLANEOUS ATC DEVICES. REFER TO AND COORDINATE WITH DIVISION 26.
11. COORDINATE WITH THE GENERAL CONTRACTOR FOR ALL REQUIRED CUTTING AND PATCHING FOR WORK INDICATED.

CONTROL POINT DESCRIPTOR LEGEND

TAG	ATC CONTRACTOR PROVIDED DDC POINT AND HARDWARE
TAG	CONTROL DEVICE FURNISHED BY ELECTRICAL OR PLUMBING CONTRACTOR BUT INTERFACED TO DDC SYSTEM BY ATC CONTRACTOR (ELEC SHOWN)
TAG	ATC CONTRACTOR INTERFACE TO EQUIPMENT MANUFACTURER'S HARDWARE
TAG	ATC CONTRACTOR PROVIDED LOCAL CONTROL POINT

CONTROL ABBREVIATIONS

ACD	AUTOMATIC CONTROL DAMPER
ACV	AUTOMATIC CONTROL VALVE
ALM	ALARM
ATC	AUTOMATIC TEMPERATURE CONTROL
CLT	COIL LAT SENSOR
CT	CURRENT TRANSFORMER (STATUS FEEDBACK)
DDC	DIRECT DIGITAL CONTROL
EAD	EXHAUST AIR DAMPER
EAT	ENTERING AIR TEMPERATURE
ECM	ELECTRONICALLY COMMUTATED MOTOR
ES	END SWITCH
FA	FAULT ALARM
HE	HIGH EFFICIENCY
HOA	HANDS-OFF AUTOMATIC SWITCH
HS	HAND SWITCH
LAT	LEAVING AIR TEMP SENSOR
LEL	LOW EXPLOSIVE LIMIT
MD	MOTION DETECTOR
NC	NORMALLY CLOSED (ON LOSS OF POWER)
NO	NORMALLY OPEN (ON LOSS OF POWER)
OAD	OUTSIDE AIR DAMPER
OAT	OUTSIDE AIR TEMPERATURE SENSOR (DB)
RH	RELATIVE HUMIDITY
S	SWITCH
S/S	START/STOP
T	THERMOSTAT
TS	TEMPERATURE SENSOR
VFD	VARIABLE FREQUENCY DRIVE
VFDS	VFD SPEED
VFDO	VFD OUTPUT (FEEDBACK)

DIAGRAM EQUIPMENT SYMBOLS

GAS FURNACE	CENTRIFUGAL FAN
UNIT HEATER	INLINE CENTRIFUGAL FAN
	PARALLEL BLADE DAMPER (TWO POSITION)

NOTE: SOME OR ALL SYMBOLS MAY BE USED ON THIS PROJECT

GENERAL ATC NOTES

1. REFER TO SPECIFICATIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. ON-SITE TRAINING SHALL ALSO INCLUDE A MINIMUM OF 4 HOURS OF HANDS ON INSTRUCTION GEARED TOWARD OPERATION AND MAINTENANCE OF THE SYSTEMS, PRIOR TO TRAINING, THE NECESSARY LESSON PLANS, TRAINING DOCUMENTS, HANDOUTS, ETC. SHALL BE PROVIDED WITH THE CURRICULUM OUTLINED.
3. ALL TRAINING SHALL BE RECORDED AND COPIED TO DVD BY THE ATC CONTRACTOR. THREE COPIES OF THE RECORDED SESSIONS SHALL BE SUBMITTED TO THE OWNER FOR THEIR USE.
4. PROVIDE WIRING FROM ELECTRICAL SOURCE TO MISCELLANEOUS ATC DEVICES. REFER TO HVAC PLANS, HVAC MECHANICAL ROOM PLANS, AND ELECTRICAL PLANS FOR LOCATION OF POWER SOURCES FOR ATC SYSTEM.
5. LOCATION OF ALL NEW ATC CONTROL PANELS SHALL BE FIELD VERIFIED WITH THE SITE CONDITIONS BY THE CONTRACTOR AND WITH DIV 26.
6. ALL ATC CONTROLS SHALL BE HARDWIRED. NO WIRELESS TECHNOLOGY SHALL BE ALLOWED. ALL EXPOSED WIRING SHALL BE INSTALLED IN MINIMUM 1/2 INCH GALVANIZED EMT CONDUIT.

Project:
CITY OF ROCHESTER, NH
TARA ESTATES SEWER PUMP STATION UPGRADE
724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson
Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

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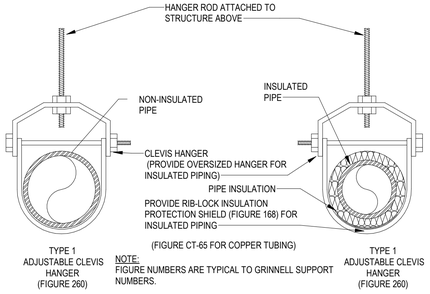
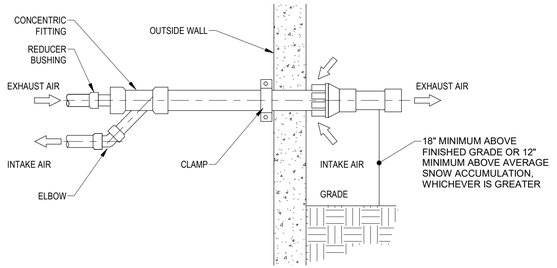
Drawing Title:
FIRST FLOOR NEW WORK PLAN, SCHEDULES, CONTROLS, AND NOTES

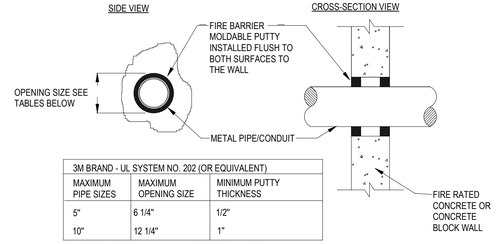
Sheet Number:
H101



1 H501 SINGLE PIPE CLEVIS HANGER
NOT TO SCALE



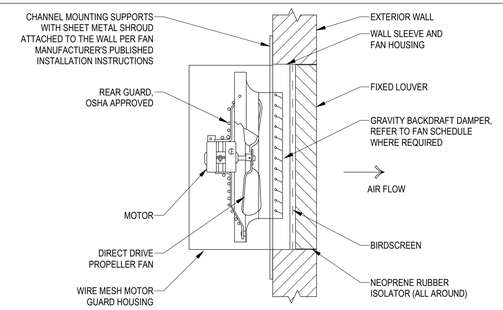
4 H501 CONCENTRIC TERMINATION THRU ROOF
NOT TO SCALE



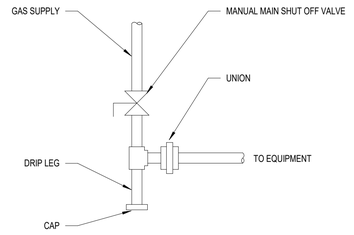
3M BRAND - UL SYSTEM NO. 202 (OR EQUIVALENT)		
MAXIMUM PIPE SIZES	MAXIMUM OPENING SIZE	MINIMUM PUTTY THICKNESS
5"	6 1/4"	1/2"
10"	12 1/4"	1"

NOTE: MAXIMUM ANNULAR SPACE BETWEEN PIPE AND OPENING NOT TO EXCEED 3/4 INCH.

7 H501 HORIZONTAL PENETRATION FIRESTOP DETAIL
NOT TO SCALE



2 H501 WALL MOUNTED PROPELLER FAN
NOT TO SCALE



5 H501 GAS PIPING EQUIPMENT CONNECTION DETAIL
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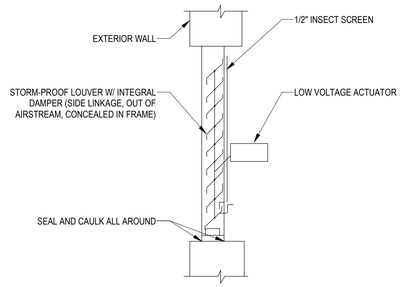
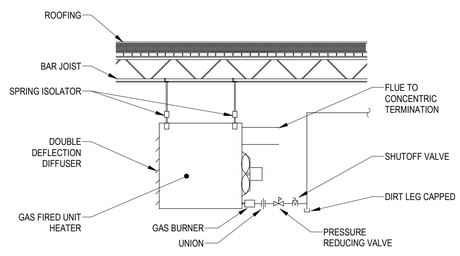


8 H501 LOUVER W/ INTEGRAL DAMPER
NOT TO SCALE



3 H501 GAS UH INSTALLATION
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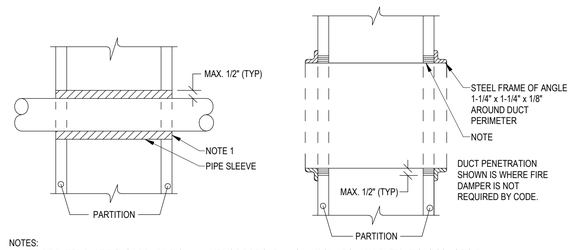
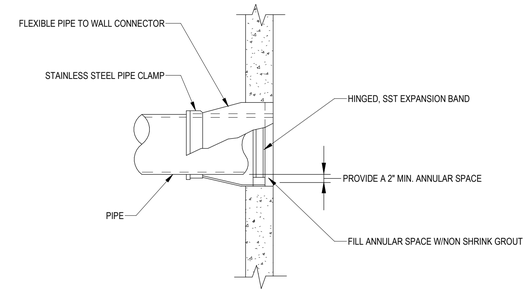
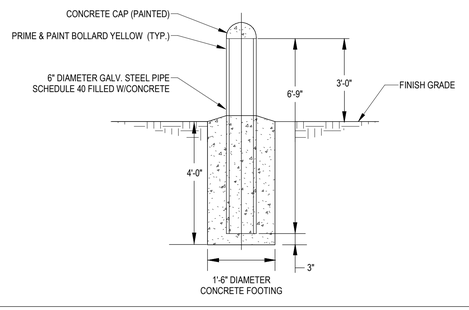


NOTES:
1. AT FIRE RATED PARTITIONS ADD ADDITIONAL LAYER OF FIRE SAFIN INSULATION AROUND PENETRATIONS SO AS TO FILL CAVITY.
2. DUCT AND PIPE PENETRATIONS THROUGH CORRIDOR WALLS ABOVE THE CEILING ARE TO BE FIRE STOPPED AROUND THE PENETRATION.

6 H501 DUCT & PIPE WALL PENETRATIONS
NOT TO SCALE



9 H501 PIPE PASSING THRU EXTERIOR WALL
NOT TO SCALE



10 H501 BOLLARD PROTECTION
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724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
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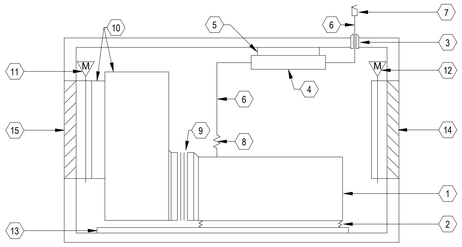
INDOOR GENERATOR NOTES

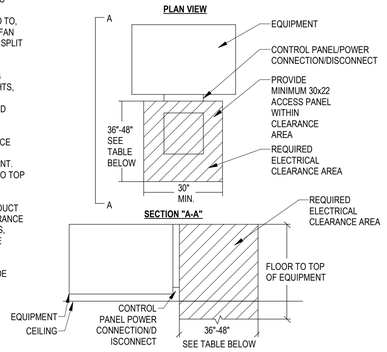
1. EMERGENCY GENERATOR FURNISHED AND INSTALLED BY DIVISION 26 CONTRACTOR.
2. SPRING ISOLATORS, FURNISHED AND INSTALLED BY DIVISION 26 CONTRACTOR.
3. EXHAUST FLUE ROOF THIMBLE. FURNISHED BY DIVISION 26 CONTRACTOR AND INSTALLED BY DIVISION 23 CONTRACTOR.
4. MUFFLER FURNISHED BY DIVISION 26 CONTRACTOR AND INSTALLED BY DIVISION 23 CONTRACTOR.
5. MUFFLER HANGERS BY DIVISION 26 CONTRACTOR AND INSTALLED BY DIVISION 23 CONTRACTOR.
6. EXHAUST FLUE. FURNISHED AND INSTALLED BY DIVISION 23 CONTRACTOR.
7. EXHAUST FLUE RAIN CAP. FURNISHED AND INSTALLED BY DIVISION 23 CONTRACTOR.
8. EXHAUST FLUE FLEX CONNECTION. FURNISHED AND INSTALLED BY DIVISION 23 CONTRACTOR.
9. DUCT TRANSITION AND FLEX CONNECTION. FURNISHED AND INSTALLED BY DIVISION 23 CONTRACTOR.
10. EXHAUST AIR DUCTWORK. FURNISHED AND INSTALLED BY DIVISION 23 CONTRACTOR.
11. EXHAUST AIR LOUVER WITH INTEGRAL MOTORIZED DAMPER SHALL BE FURNISHED AND INSTALLED BY BUILDING MANUFACTURER.
12. OUTSIDE AIR LOUVER WITH INTEGRAL MOTORIZED DAMPER SHALL BE FURNISHED AND INSTALLED BY BUILDING MANUFACTURER.
13. CONCRETE HOUSEKEEPING PAD. FURNISHED AND INSTALLED BY GENERAL CONTRACTOR.



1 INDOOR GENERATOR REQUIREMENTS
H502 NOT TO SCALE

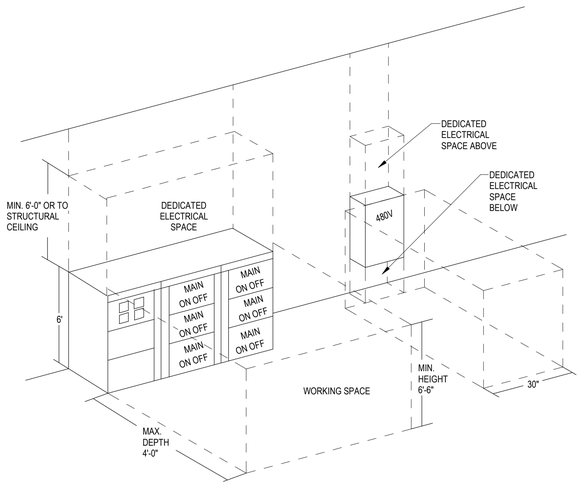
NOTES:

1. DETAIL APPLIES TO ALL MECHANICAL EQUIPMENT LOCATED ABOVE A CEILING THAT REQUIRES POWER, INCLUDING CONTROL POWER. EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO, FAN POWERED BOXES, VAV BOXES, FANS, FAN COIL UNITS, HEAT PUMPS, CRAC UNITS, DX SPLIT SYSTEMS, DUCT HEATERS, ETC.
2. ELECTRICAL CLEARANCE AREA (INCLUDING WITHIN CEILING) MUST BE FREE FROM LIGHTS, SPRINKLER HEADS, FIRE ALARM DEVICES, SPEAKERS, PIPING, DUCTWORK, BEAMS AND OTHER OBSTRUCTIONS.
3. THE HEIGHT OF THE ELECTRICAL CLEARANCE SHALL BE AS REQUIRED TO INSTALL AND PERFORM MAINTENANCE ON THE EQUIPMENT. MINIMUM HEIGHT SHALL BE FROM FLOOR TO TOP OF EQUIPMENT.
4. REFER TO SPECIFIC MANUFACTURER PRODUCT DATA FOR ADDITIONAL ACCESS AND CLEARANCE REQUIREMENTS FOR FANS, COMPRESSORS, VALVES, DAMPERS, FILTERS, ETC. PROVIDE ACCESS PANELS AS REQUIRED.
5. COORDINATE WITH ALL TRADES TO PROVIDE THESE MINIMUM REQUIRED CLEARANCES



MINIMUM ELECTRICAL CLEARANCES (NEC 2017 COMPLIANCE)			
VOLTAGE TO GROUND (SINGLE PHASE VOLTAGE)	CONDITION 1	CONDITION 2	CONDITION 3
0-150	36"	36"	36"
151-600	36"	42"	48"
CONDITION 1 - EXPOSED LIVE PARTS ON ONE SIDE OF THE WORKING SPACE AND NO LIVE OR GROUNDED PARTS ON THE OTHER SIDE OF THE WORKING SPACE, OR EXPOSED LIVE PARRTS ON BOTH SIDES OF THE WORKING SPACE THAT ARE EFFECTIVELY GUARDED BY INSULATING MATERIALS. CONDITION 2 - EXPOSED LIVE PARTS ON ONE SIDE OF THE WORKING SPACE AND GROUNDED PARTS ON THE OTHER SIDE OF THE WORKING SPACE. CONCRETE BRICK, OR TILE WALLS SHALL BE CONSIDERED AS GROUNDED CONDITION 3 - EXPOSED LIVE PARTS ON BOTH SIDES OF THE WORKING SPACE NOTE: CLEARANCE WIDTH SHALL BE 30" OR THE WIDTH OF THE CONTROL PANEL/POWER CONNECTION, WHICHEVER IS GREATER			

2 ELECTRICAL CLEARANCE ATC CEILING
H502 NOT TO SCALE



NOTES:

1. NO EQUIPMENT FOREIGN TO THE ELECTRICAL INSTALLATION (PIPING, DUCTS, ETC) SHALL ENTER THE DEDICATED SPACE ABOVE OR BELOW ELECTRICAL POWER EQUIPMENT INCLUDING SWITCHGEAR, SWITCHBOARDS, PANELBOARDS, & MOTOR CONTROL CENTERS.
2. NO EQUIPMENT SHALL PROTRUDE INTO WORKING SPACE.
3. PIPING SYSTEMS INSTALLED ABOVE THE DEDICATED ELECTRICAL SPACE SHALL BE ALLOWED WHERE DRIP PANS ARE INSTALLED TO CAPTURE LEAKS, RUPTURES OR CONDENSATION DRIPS. THE PIPING AND DRIP PANS SHALL BOTH BE OUTSIDE THE DEDICATED SPACE ENVELOPE.

3 ELECTRICAL WORK AND DEDICATED SPACE
H502 NOT TO SCALE

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724 SALMON FALLS ROAD
ROCHESTER, NH 03868

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100 International Drive, Suite 152
Portsmouth, NH 03801
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ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AC	ALTERNATING CURRENT
A	AMPERE
ATC	AUTOMATIC TEMPERATURE CONTROLS
ATS	AUTOMATIC TRANSFER SWITCH
BKR	BREAKER
C	CONDUIT
CKT	CIRCUIT
CB	CIRCUIT BREAKER
EC	ELECTRICAL CONTRACTOR
EMT	ELECTRIC METALLIC TUBING
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EF	EXHAUST FAN
FL	FLOOR
FLA	FULL LOAD AMPERE
GC	GENERAL CONTRACTOR
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
HOA	HAND OFF AUTOMATIC
HP	HORSEPOWER
IG	ISOLATED GROUND
JB	JUNCTION BOX
KVA	KILOVOLT AMPERES
KW	KILOWATT
MCB	MAIN CIRCUIT BREAKER
MLO	MAIN LUGS ONLY
MC	MECHANICAL CONTRACTOR
MTD	MOUNTED
MTG	MOUNTING
NMC	NON-METALLIC CONDUIT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NA	NOT APPLICABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PNL	PANELBOARD
PH	PHASE
PVC	POLYVINYL CHLORIDE CONDUIT
RSC	RIGID GALVANIZED STEEL CONDUIT
SF	SUPPLY FAN
SS	SAFETY SWITCH
TEL	TELEPHONE
TRF	TRANSFORMER
V	VOLTS
W	WATTS OR WIRE
WP	WEATHERPROOF
4WSN	4-WIRE SOLID NEUTRAL

RECEPTACLE ABBREVIATIONS

BF	BELOW FLOOR
CLG	CEILING MOUNTED
D	DEDICATED DEVICE ON INDIVIDUAL BRANCH CIRCUIT
E	EMERGENCY
GFI	GROUND FAULT CIRCUIT INTERUPTER, PERSONAL PROTECTION
IG	ISOLATED GROUND RECEPTACLE WITH SEPERATE GREEN GROUND CONDUCTOR TO ISOLATED GROUND BUS IN PANEL
SP	SURGE PROTECTION RECEPTACLE
WP	WEATHERPROOF RECEPTACLE WITH COVERPLATE LISTED FOR WET LOCATION WITH AN ATTACHMENT PLUG INSERTED.

DEMOLITION NOTES

1. THE ELECTRICAL CONTRACTOR WILL WORK IN CONJUNCTION WITH THE GENERAL CONTRACTOR TO DEMOLISH THE EXISTING ELECTRICAL SYSTEM. THE ELECTRICAL CONTRACTOR IS TO DEACTIVATE, DISCONNECT AND REMOVE THOSE SYSTEMS WHICH WILL BE DEMOLISHED. THE ELECTRICAL CONTRACTOR WILL REMOVE AND DISPOSE OF ALL ELECTRICAL SYSTEM MATERIALS INCLUDING DEVICES, FIXTURES, RACEWAYS, CABLE, MOTOR CONTROLS AND APPURTENANCES. SYSTEMS REQUIRING TOTAL AND/OR PARTIAL DEMOLITION SHALL CONSIST OF BUT NOT BE LIMITED TO THE FOLLOWING:
   A. NORMAL AND EMERGENCY POWER BRANCH CIRCUIT SYSTEM
   B. NORMAL LIGHTING SYSTEM
   C. EMERGENCY AND EXIT LIGHTING SYSTEM
   D. COMMUNICATIONS SYSTEM
   E. FIRE ALARM SYSTEM
   F. SECURITY SYSTEM
3. SYSTEMS WHICH PASS THROUGH THE AREA BEING DEMOLISHED BUT CONTINUE TO AREAS NOT WITHIN THE DEMOLITION SCOPE ARE TO REMAIN. THE ELECTRICAL CONTRACTOR IS TO IDENTIFY (SPRAY PAINT OR EQUIVALENT) AND PROTECT THOSE SYSTEMS WHICH ARE ACTIVE AND ARE TO REMAIN.
4. ALL EXISTING CAST IN PLACE RECEPTACLE, PULL, JUNCTION AND OTHER DEVICE BOXES WHICH CANNOT BE REMOVED OR EFFECTIVELY COVERED ARE TO BE PROVIDED WITH FINISHED PLATES AS APPROVED BY THE ARCHITECT.
5. ALL CONDUIT AND WIRE WHICH IS NO LONGER IN USE IS TO BE REMOVED. CONDUIT AND WIRE IS TO BE REMOVED BACK TO ITS SOURCE OR NEAREST DEVICE WHICH IS SCHEDULED TO REMAIN. COORDINATE THE REMOVAL OF ALL COMMUNICATIONS CONDUIT AND WIRE WITH THE COMMUNICATIONS CONTRACTOR. FIRE ALARM CABLING IS TO BE RETURNED TO THE NEAREST DEVICE SCHEDULED TO REMAIN, CONTROL PANEL, TERMINAL CABINET, ETC. UNDER NO CIRCUMSTANCES ARE ABANDONED CONDUIT AND WIRE OR SYSTEM COMPONENTS TO REMAIN.
6. MAKE ANY NECESSARY RE-CIRCUITING, EXTENSIONS OF EXISTING CIRCUITS AND RELOCATIONS REQUIRED TO PROPERLY RE-ENERGIZE REMAINING EXISTING SERVICES OR EQUIPMENT THAT MAY BE INTERFERED WITH BY NEW CONSTRUCTION, REMOVALS OR RELOCATIONS. ALL SHUTDOWNS TO RELOCATE ACTIVE FEEDERS OR BRANCH CIRCUITS WILL BE PERFORMED ON OFF HOURS AS MUTUALLY AGREED TO WITH THE OWNER.
7. PRIOR TO REMOVAL OF EQUIPMENT, CONFIRM THAT FEEDER AND BRANCH CIRCUITS ARE NO LONGER ACTIVE. SHOULD IT BE DISCOVERED THE FEEDER OR BRANCH CIRCUITS ARE ACTIVE, NOTIFY THE ARCHITECT IMMEDIATELY FOR DIRECTION.
8. ELECTRICAL CONTRACTOR IS TO REMOVE ALL LAMPS, BALLASTS AND OTHER ELECTRICAL COMPONENTS CLASSIFIED AS HAZARDOUS MATERIALS. ELECTRICAL CONTRACTOR IS TO OBTAIN THE SERVICES OF A LICENSED HAZARDOUS MATERIALS CONTRACTOR TO DISPOSE OF THE MATERIALS. PROVIDE WRITTEN DOCUMENTATION TO THE OWNER'S REPRESENTATIVE FROM THE HAZARDOUS MATERIALS CONTRACTOR.
9. ELECTRICAL DEMOLITION ABBREVIATIONS:

"EX" DENOTES EXISTING EQUIPMENT TO REMAIN

"RL" DENOTES EXISTING EQUIPMENT TO BE DISCONNECTED AND RELOCATED. ALL EXISTING CONDUIT AND WIRE SHALL BE REMOVED BACK TO ITS SOURCE AND ALL DEVICES ASSOCIATED WITH THE EQUIPMENT SHALL BE REMOVED OR ALL CONDUIT AND WIRE SHALL BE INTERCEPTED AND EXTENDED AS REQUIRED. ALL NEW CONDUIT AND WIRE SHALL MATCH EXISTING IN STYLE AND SIZE. ALL EXISTING ELECTRICAL DEVICES ASSOCIATED WITH THE EXISTING EQUIPMENT SHALL BE REMOVED AND NEW DEVICES AS SHOWN SHALL BE PROVIDED.

"NL" DENOTES NEW LOCATION OF RELOCATED EXISTING EQUIPMENT.

"RE" DENOTES EXISTING EQUIPMENT TO BE DISCONNECTED AND REMOVED ALL EXISTING CONDUIT AND WIRE SHALL BE REMOVED BACK TO ITS SOURCE AND ALL DEVICES ASSOCIATED WITH THE EQUIPMENT SHALL BE REMOVED.

GENERAL ELECTRICAL NOTES

1. DRAWINGS ARE DIAGRAMMATIC ONLY. THE EXACT LOCATION, MOUNTING HEIGHTS, SIZE OF EQUIPMENT AND ROUTING OF RACEWAYS SHALL BE COORDINATED AND DETERMINED IN THE FIELD.
2. THE EXACT LOCATION AND MOUNTING HEIGHTS OF ALL LIGHTING FIXTURES LOCATED IN MECHANICAL/ELECTRICAL EQUIPMENT SPACES SHALL BE COORDINATED IN THE FIELD BY THE ELECTRICAL CONTRACTOR BEFORE INSTALLATION OF SAME, SO AS TO AVOID INTERFERENCE WITH DUCTS, PIPING AND OTHER MECHANICAL/ELECTRICAL EQUIPMENT.
3. ALL STRAIGHT FEEDER, BRANCH CIRCUIT AND AUXILIARY SYSTEM CONDUIT RUNS SHALL BE PROVIDED WITH SUFFICIENT PULL BOXES TO LIMIT THE MAXIMUM LENGTH OF ANY SINGLE CABLE PULL TO 150 FEET. EXACT SIZES OF PULL BOXES AND LOCATIONS TO BE DETERMINED IN THE FIELD BY THE ELECTRICAL CONTRACTOR.
4. FURNISH ALL REQUIRED ACCESS PANELS AS REQUIRED TO SUIT FIELD CONDITIONS FOR THE PROPER OPERATION AND MAINTENANCE OF THE ELECTRICAL SYSTEM. THE EXACT SIZES AND PHYSICAL LOCATIONS SHALL BE TO SUIT ACCESSIBILITY AND CONSTRUCTION CONDITIONS. ALL ACCESS PANELS PROVIDED BY THE ELECTRICAL CONTRACTOR SHALL MATCH EXACTLY THE ACCESS PANELS FURNISHED AND INSTALLED BY THE GENERAL CONTRACTOR. THE ACCESS PANELS WILL BE INSTALLED BY THE TRADE CONTRACTOR UNDER THE APPROPRIATE SECTION OF THE SPECIFICATIONS FOR THE SURFACE IN WHICH THE PANELS ARE LOCATED.
5. THE ELECTRICAL CONTRACTOR SHALL COORDINATE WITH THE HVAC AND ELECTRICAL CONTRACTORS AS APPLICABLE AS TO THE EXACT LOCATION OF THEIR RESPECTIVE EQUIPMENT; THE POWER WIRING, CONTROL WIRING AND ALL ELECTRICAL CONNECTIONS AND CONDUIT TURN-UPS SHALL BE COORDINATED WITH THE RESPECTIVE CONTRACTORS BEFORE THE START OF CONSTRUCTION IN THE FIELD.
6. SLEEVES ARE TO BE UTILIZED FOR PASSAGE OF CONDUITS THROUGH FLOORS OR WALLS. CONDUITS AND BOXES ARE TO BE SUPPORTED BY THE USE OF PRESET FASTENERS INSTALLED IN FLOORS, WALLS OR COLUMNS. CONDUITS AND BOXES ARE TO BE INSTALLED CONCEALED IN MASONRY WALLS AND ABOVE HUNG CEILINGS. ALL SLEEVES ARE TO BE SEALED WITH APPROVED FIRE STOPPING SEALANT.
7. ALL LIGHTING FIXTURES, ELECTRICAL DEVICES, CABLES AND RACEWAYS ARE TO BE INDEPENDENTLY SUPPORTED OF THE CEILING SYSTEM. FIXTURES ARE TO BE SUPPORTED FROM THE STRUCTURE BY THE USE OF JACK CHAIN, THREADED ROD OR OTHER MEANS APPROVED BY THE ENGINEER. CEILING SYSTEM TIE WIRES AND GRID ARE NOT TO BE UTILIZED FOR THE SUPPORT OF ELECTRICAL DEVICES, CABLES AND RACEWAYS. APPROVED SUPPORTS, HANGERS, CLIPS, ETC. ARE TO BE UTILIZED.
8. COMBINED HOMERUNS OF TWO (2) OR THREE (3) CIRCUITS MAY BE UTILIZED. HOWEVER, THE NEUTRAL CONDUCTOR IS TO BE INCREASED TO #10AWG. COMBINED HOMERUNS ARE TO BE LIMITED TO 20A, LIGHTING AND POWER CIRCUITS.
9. INSTALLATION OF BACK TO BACK DEVICES ARE TO BE AVOIDED. ALLOW ONE WALL FRAMING MEMBER BETWEEN EACH BACK TO BACK DEVICE AS A MINIMUM.
10. WORK SHALL CONFORM TO THE 2020 NATIONAL ELECTRICAL CODE OR NEW HAMPSHIRE ELECTRICAL CODE, NEW HAMPSHIRE BUILDING CODE, NFPA AND REQUIREMENTS OF LOCAL AUTHORITIES HAVING JURISDICTION.
11. THE WORD "CONTRACTOR" AS USED IN THE "ELECTRICAL WORK" SHALL MEAN THE ELECTRICAL SUBCONTRACTOR.
12. CONTRACTOR SHALL PAY FOR ALL PERMITS, INSURANCE AND TESTS, AND SHALL PROVIDE LABOR AND MATERIAL TO COMPLETE THE ELECTRICAL WORK SHOWN.
13. CONTRACTOR SHALL PAY ELECTRIC UTILITY COMPANY BACKCHARGES
14. CONTRACTOR SHALL PROVIDE ALL REQUIRED COORDINATION WITH ELECTRIC AND DATA.
15. EXCEPT AS OTHERWISE NOTED, THE ELECTRICAL WORK SHALL INCLUDE DEMOLITION, PANELBOARDS, CIRCUIT BREAKERS, FEEDERS, WIRING, RACEWAYS, LIGHTING FIXTURES, DEVICES, TELEPHONE AND DATA OUTLETS, SAFETY SWITCHES, FIRE ALARM AND NURSE CALL SYSTEMS, TRANSFORMERS AND CONNECTION NECESSARY TO OPERATE MOTORS AND OTHER EQUIPMENT.
16. AUTOMATIC TEMPERATURE CONTROLS SHALL BE PROVIDED AND INSTALLED BY THE MECHANICAL SUBCONTRACTOR. STARTERS, VFD'S AND OTHER CONTROL DEVICES FOR EQUIPMENT SHALL BE FURNISHED BY THE MECHANICAL SUBCONTRACTOR FOR INSTALLATION AND CONNECTION BY THIS CONTRACTOR.
17. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY LIGHTING AND POWER AND THE GENERAL CONTRACTOR SHALL PAY ALL ENERGY CHARGES FOR TEMPORARY POWER AND LIGHTING.
18. DURING CONSTRUCTION, THE ELECTRICAL CONTRACTOR SHALL KEEP HIS PORTION OF THE WORK NEAT, CLEAN AND ORDERLY.
19. ALL SYSTEMS SHALL BE TESTED FOR SHORT CIRCUIT AND GROUNDS PRIOR TO ENERGIZING AND ANY DEFECTS SHALL BE CORRECTED.
20. ALL CUTTING AND PATCHING REQUIRED FOR ELECTRICAL WORK SHALL BE INCLUDED AS PART OF THIS SECTION.
21. COMPLETE SHOP DRAWINGS SHALL BE SUBMITTED FOR ELECTRICAL EQUIPMENT. WHERE SPECIFIED ELECTRICAL EQUIPMENT IS SUBSTITUTED, THE ELECTRICAL CONTRACTOR SHALL SUBMIT COMPLETE SPECIFICATIONS ON THE SUBSTITUTE AS WELL AS THE ITEM ORIGINALLY SPECIFIED.
22. MATERIALS SHALL BE SPECIFICATION GRADE AND UL LISTED.
23. WHERE MATERIAL IS CALLED OUT IN THE LEGEND BY MANUFACTURER, TYPE OR CATALOG NUMBER, SUCH DESIGNATIONS ARE TO ESTABLISH STANDARDS OR DESIRED QUALITY. ACCEPTANCE OR REJECTIONS OF PROPOSED SUBSTITUTIONS SHALL BE SUBJECT TO THE APPROVAL OF THE OWNER.
24. WORK SHALL BE COORDINATED WITH THAT OF OTHER TRADES TO ELIMINATE INTERFERENCES.
25. ELECTRICAL WORK SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL COMPLETION.
26. WORK SHALL BE GROUNDED IN ACCORDANCE WITH CODE REQUIREMENTS. COMPLETE EQUIPMENT (INSULATED GREEN WIRE) GROUNDING SYSTEM SHALL BE INSTALLED.
27. WIRING METHODS: (MUST BE EDITED ANS COORDINATED WITH SPEC)
   A. EXTERIOR UNDERGROUND FEEDERS SHALL BE PVC SCHEDULE 80 FOR DIRECT BURIED AND PVC SCHEDULE 40 FOR CONCRETE ENCASED.
   B. EXTERIOR ABOVE GRADE FEEDERS SHALL BE RGS CONDUIT.
   C. INTERIOR FEEDERS EXPOSED OR BURIED IN CONCRETE WALLS/SLABS SHALL BE RGS CONDUIT.
   D. INTERIOR CONDUITS SHALL BE RGS
29. NO CONDUIT OR WIRE SHALL BE RUN IN OR BELOW SLAB WITHOUT ENGINEER APPROVAL OR NOTED OTHERWISE ON THE PLANS.
30. CONDUIT SHALL BE SUPPORTED ON GALVANIZED WALL BRACKETS. TRAPEZE HANGERS OR PIPE STRAPS SECURED BY MEANS OF TOGGLE BOLTS OR INSERTS IN WOOD CONSTRUCTION.
31. FEEDERS SHALL BE ROUTED TIGHT TO THE UNDERSIDE OF THE BUILDING STRUCTURE. CONDUIT SHALL BE INSTALLED PARALLEL AND PERPENDICULAR TO MAIN BUILDING SUPPORTS.
32. CONDUIT PASSING THROUGH FIRE RATED WALLS AND FLOORS SHALL BE PROVIDED WITH ALL NECESSARY MATERIALS TO ENSURE THAT THE FIRE RATED INTEGRITY IS MAINTAINED.
33. FEEDER TAPS WILL NOT BE ALLOWED IN PANELBOARD GUTTERS.
34. CONTRACTOR SHALL CHECK EXISTING CONDITIONS TO DETERMINE EXACT EXTENT OF WORK TO BE PERFORMED PRIOR TO BIDDING. DIMENSIONS RELEVANT TO EXISTING WORK SHALL BE VERIFIED IN THE FIELD.
35. IN AREAS NOT AFFECTED BY THIS RENOVATION, THIS SUBCONTRACTOR SHALL MAINTAIN CONTINUITY OF ELECTRIC SERVICE.
36. ELECTRICAL SHUTDOWN SHALL BE AT A TIME AND DATE APPROVED BY THE OWNER.
37. PROVIDE AS-BUILT "CADD" DRAWINGS AT THE COMPLETION OF THE PROJECT.
38. ELECTRICAL CONTRACTOR SHALL LABEL ALL ELECTRICAL DEVICES INCLUDING BUT NOT LIMITED TO RECEPTACLES, DISCONNECT SWITCHES, PANELBOARDS, THERMAL MOTOR SWITCHES, CONTROL PANELS, JUNCTION BOXES, ETC.
   M. RECEPTACLES - PANEL NAME AND CIRCUIT DESIGNATION
   N. DISCONNECTS - PANEL NAME, CIRCUIT DESIGNATION AND EQUIPMENT SERVING.
   O. THERMAL MOTOR SWITCHES - PANEL NAME, CIRCUIT DESIGNATION AND EQUIPMENT SERVING.
   P. ENCLOSED CIRCUIT BREAKERS - PANEL NAME, CIRCUIT DESIGNATION AND EQUIPMENT SERVING.
   Q. PANELBOARDS - PANEL NAME, VOLTAGE, AMPERAGE, PHASE AS WELL AS PANEL AND CIRCUIT IT IS FED FROM.
   R. CONTROL PANEL - PANEL NAME AND CIRCUIT DESIGNATION
   S. JUNCTION BOXES - PANEL NAME AND CIRCUIT DESIGNATION
45. ADDRESS QUESTIONS TO THE ENGINEER IN WRITING BEFORE AWARD OF CONTRACT, OTHERWISE ENGINEER INTERPRETATION OF MEANING AND INTENT OF DRAWINGS SHALL BE FINAL.
46. ALL LIGHTING SHALL MEET EVERSOURCE ENERGY EFFICIENCY RATING.

ELECTRICAL LEGEND

RACEWAY AND WIRING

- LP1B-1,3 — HOMERUN TO PANELBOARD. PROVIDE 1/2"C., 2#12 & 1#12GND, NUMERALS 1 AND 3 INDICATE CIRCUITS IN PANELBOARD. RACEWAYS LARGER THAN 1/2" AND CONDUCTORS LARGER THAN #12 AWG SHALL BE INDICATED ON THE DRAWINGS.
- RACEWAY RUN UNDERGROUND/SLAB
- RACEWAY RUN EXPOSED

LIGHTING FIXTURES

- A — 1' X 4' PENDANT OR SURFACE MOUNTED LED FIXTURE "A" DENOTES FIXTURE TYPE; NUMERAL DENOTES CIRCUIT NUMBER. "a" SUBSCRIPT DENOTES SWITCH CONTROL WHERE SHOWN
- AE — 1' X 4' PENDANT OR SURFACE MOUNTED EMERGENCY LED FIXTURE WITH EMERGENCY BATTERY BACKUP BALLAST. PROVIDE THIRD WIRE FOR EMERGENCY MODE BYPASS IF SWITCHED (TYPICAL). "AE" DENOTES FIXTURE TYPE; NUMERAL DENOTES CIRCUIT NUMBER. "a" SUBSCRIPT DENOTES SWITCH CONTROL WHERE SHOWN
- WALL MOUNTED EXIT SIGN. ARROWS DENOTE DIRECTION OF EGRESS. NUMERAL DENOTES CIRCUIT NUMBER. SHADED CHEVRONS DENOTE EXIT FACES.

LIGHTING CONTROL SWITCHES

(MOUNT 4'-0" AFF UNLESS NOTED OTHERWISE.)

- SINGLE POLE SWITCH (120/277V) MOUNTED 4'-0" ABOVE FINISHED FLOOR. ALL OTHER MOUNTING HEIGHTS SHALL BE AS NOTED ON THE DRAWINGS. "a" SUBSCRIPT DENOTES CIRCUITS CONTROLLED.

RECEPTACLES

(MOUNT 18" AFF TO CENTER LINE UNLESS NOTED OTHERWISE)

- DUPLEX CONVENIENCE OUTLET RATED 20A, 125V, U-SLOT GROUNDED TYPE MOUNTED 18" ABOVE FINISHED FLOOR TO CENTER LINE. ALL OTHER MOUNTING HEIGHTS SHALL BE AS NOTED ADJACENT TO THE SYMBOL. REFER TO RECEPTACLE ABBREVIATIONS FOR SPECIAL PURPOSE RECEPTACLES.
- DOUBLE DUPLEX CONVENIENCE OUTLET RATED 20A, 125V, U-SLOT GROUNDED TYPE MOUNTED 18" ABOVE FINISHED FLOOR TO CENTER LINE. ALL OTHER MOUNTING HEIGHTS SHALL BE AS NOTED ADJACENT TO THE SYMBOL. REFER TO RECEPTACLE ABBREVIATIONS FOR SPECIAL PURPOSE RECEPTACLES.

ONE-LINE POWER DIAGRAM SYMBOLS

- CIRCUIT BREAKER
- AUTOMATIC TRANSFER SWITCH

POWER DISTRIBUTION EQUIPMENT

- DISTRIBUTION PANEL
- PANELBOARD-SURFACE MOUNTED
- T — DRY TYPE TRANSFORMER
- SAFETY SWITCH - RATING AND TYPE AS NOTED ON THE DRAWING.
- CB 100A/70A — ENCLOSED CIRCUIT BREAKER - SIZE AS INDICATED (100 AMP FRAME, 70 AMP TRIP, 3 POLE).
- 1 — MOTOR, NUMERAL DENOTES HORSE POWER
- ON/OFF PUSHBUTTON STATION
- VFD — VARIABLE SPEED DRIVE
- M — UTILITY METER

MISCELLANEOUS POWER

- J — JUNCTION BOX WITH BLANK COVERPLATE, SIZE AS REQUIRED BY N.E.C.
- PB — PULL BOX. TYPE AS NOTED ON THE DRAWINGS OR AS REQUIRED BY N.E.C.
- S — 120V SMOKE DETECTOR WITH SOUNDER BASE
- 120V CARBON MONOXIDE DETECTOR
- SM — MOTOR THERMAL SWITCH
- D — MOTORIZED DAMPER
- FM — FLOW METER
- FM — FLOW INDICATING TRANSMITTER

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Weston & Sampson
Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

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STATE OF NEW HAMPSHIRE — ROBERT F. McALEER No. 14054 — LICENSED PROFESSIONAL ENGINEER

Issued For:
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ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS

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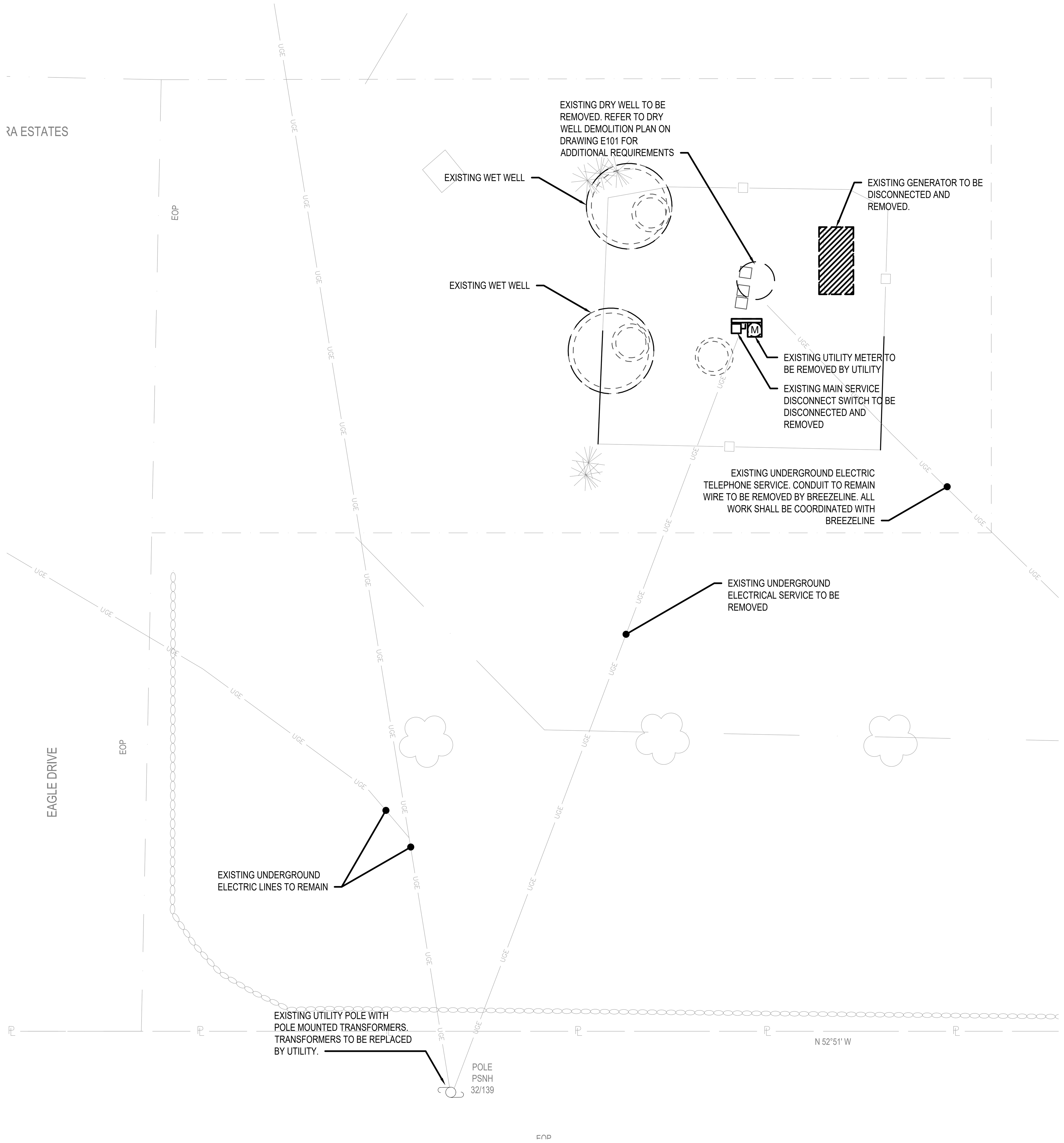
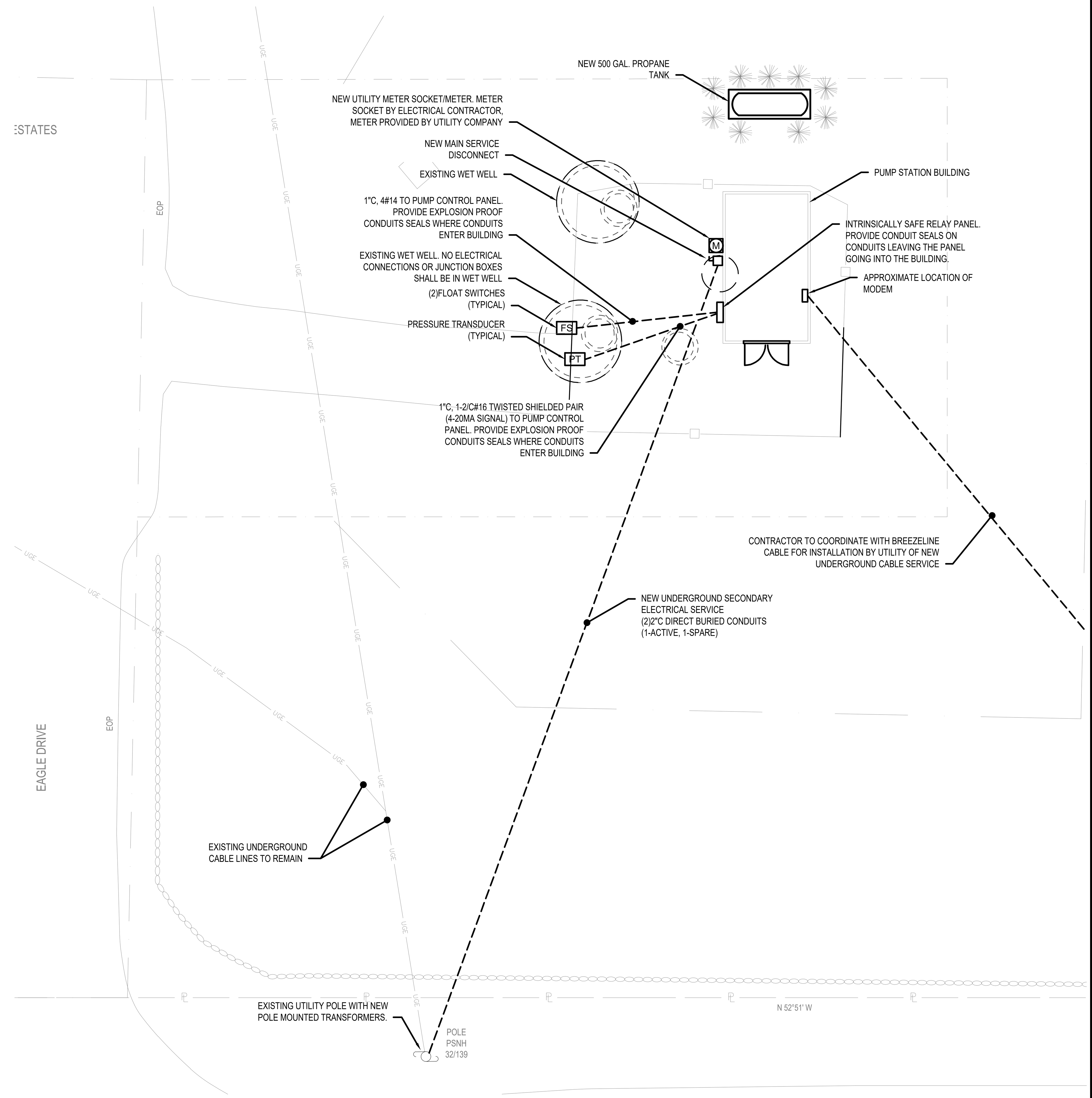


1 ELECTRICAL DEMOLITION SITE PLAN

SCALE: 1" = 10'-0"

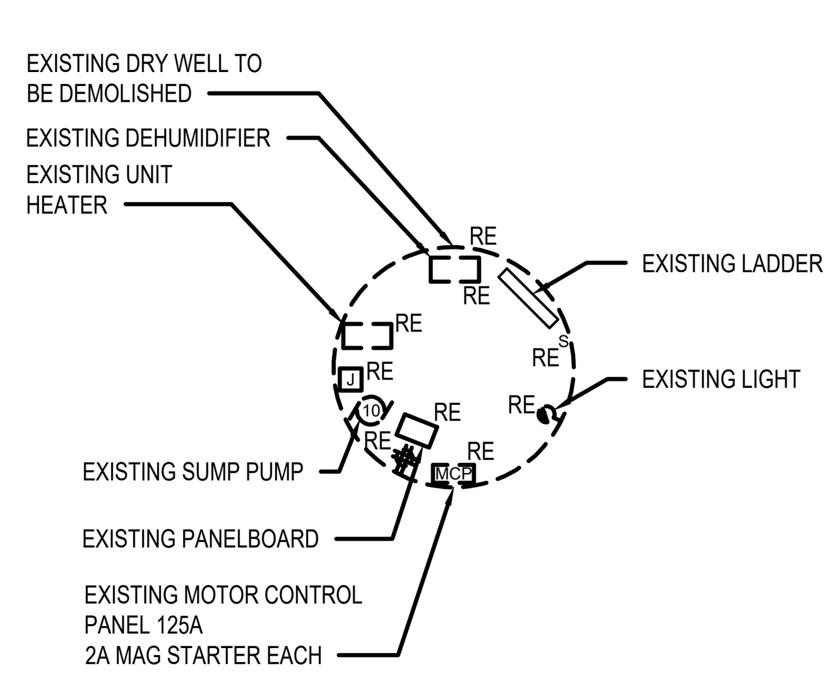
10 5 0 10 20
SCALE: 1"=10'



2 ELECTRICAL NEW WORK SITE PLAN

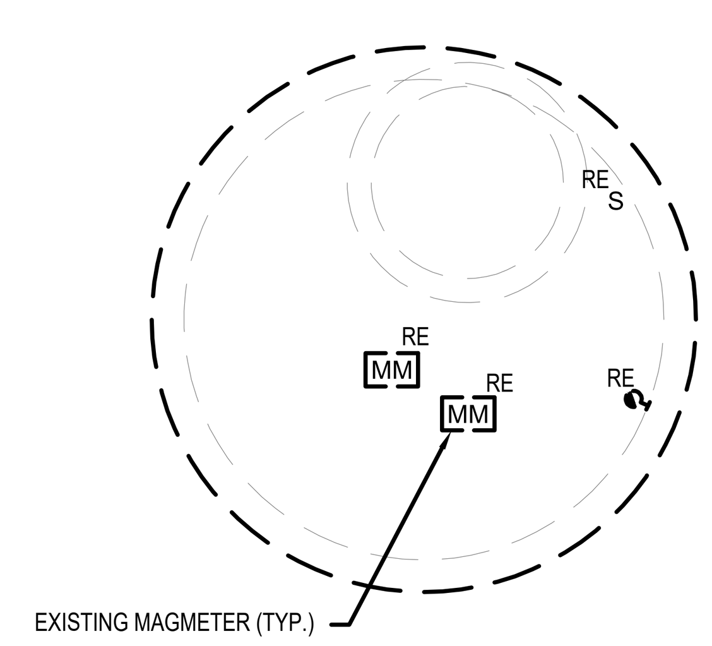
SCALE: 1" = 10'-0"

10 5 0 10 20
SCALE: 1"=10'



EXISTING VALVE VAULT/DRY WELL ELECTRICAL DEMOLITION PLAN

SCALE: 1/4" = 1'-0"



EXISTING WET WELL ELECTRICAL DEMOLITION PLAN (TYP. 2)

SCALE: 1/4" = 1'-0"

CITY STANDARD PORTABLE GENERATOR PLUG

SCALE: 1/4" = 1'-0"

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ROCHESTER, NH 03868

Weston & Sampson
Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

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ROBERT F. McALEER
No. 14054
LICENSED PROFESSIONAL ENGINEER

Issued For:
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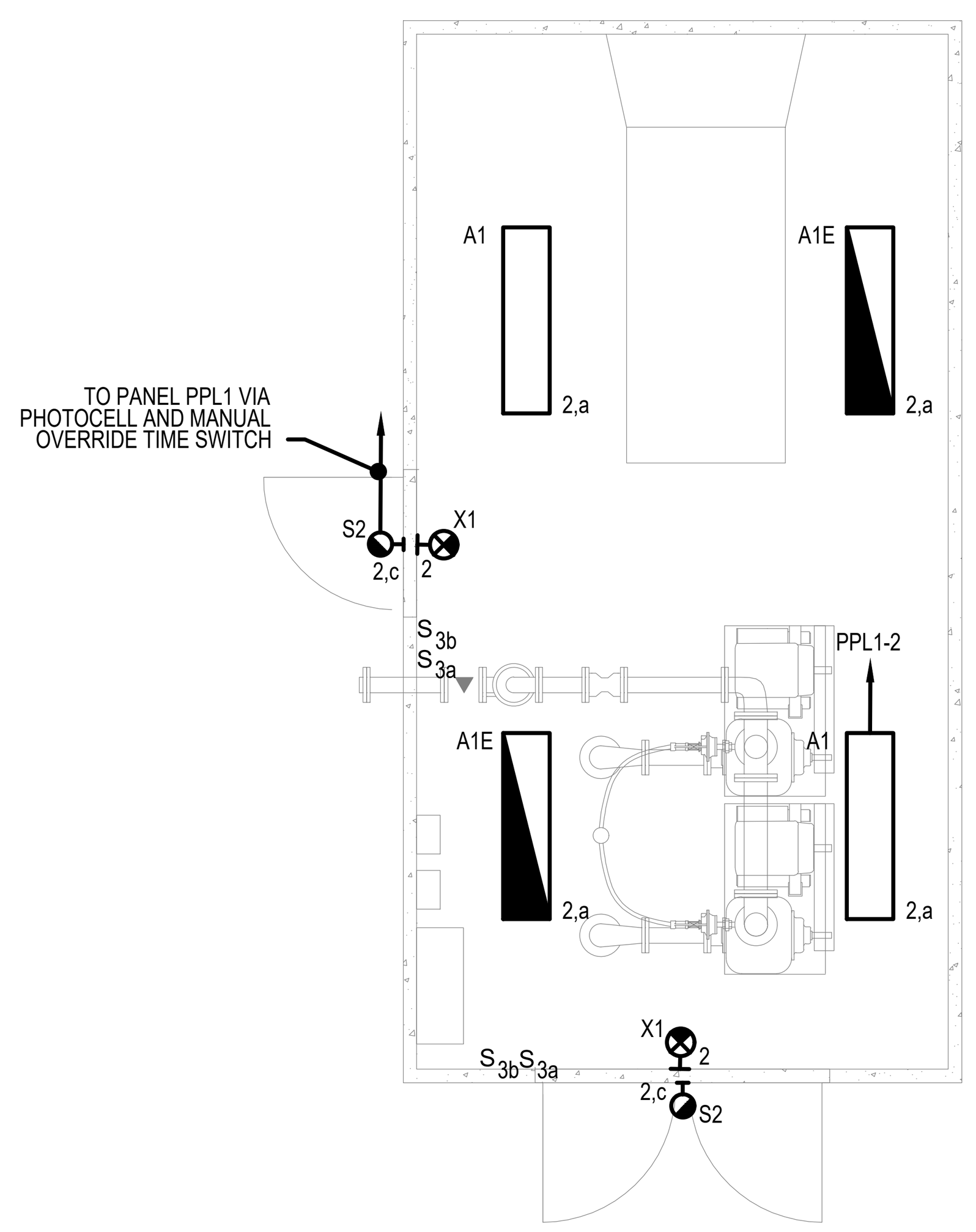
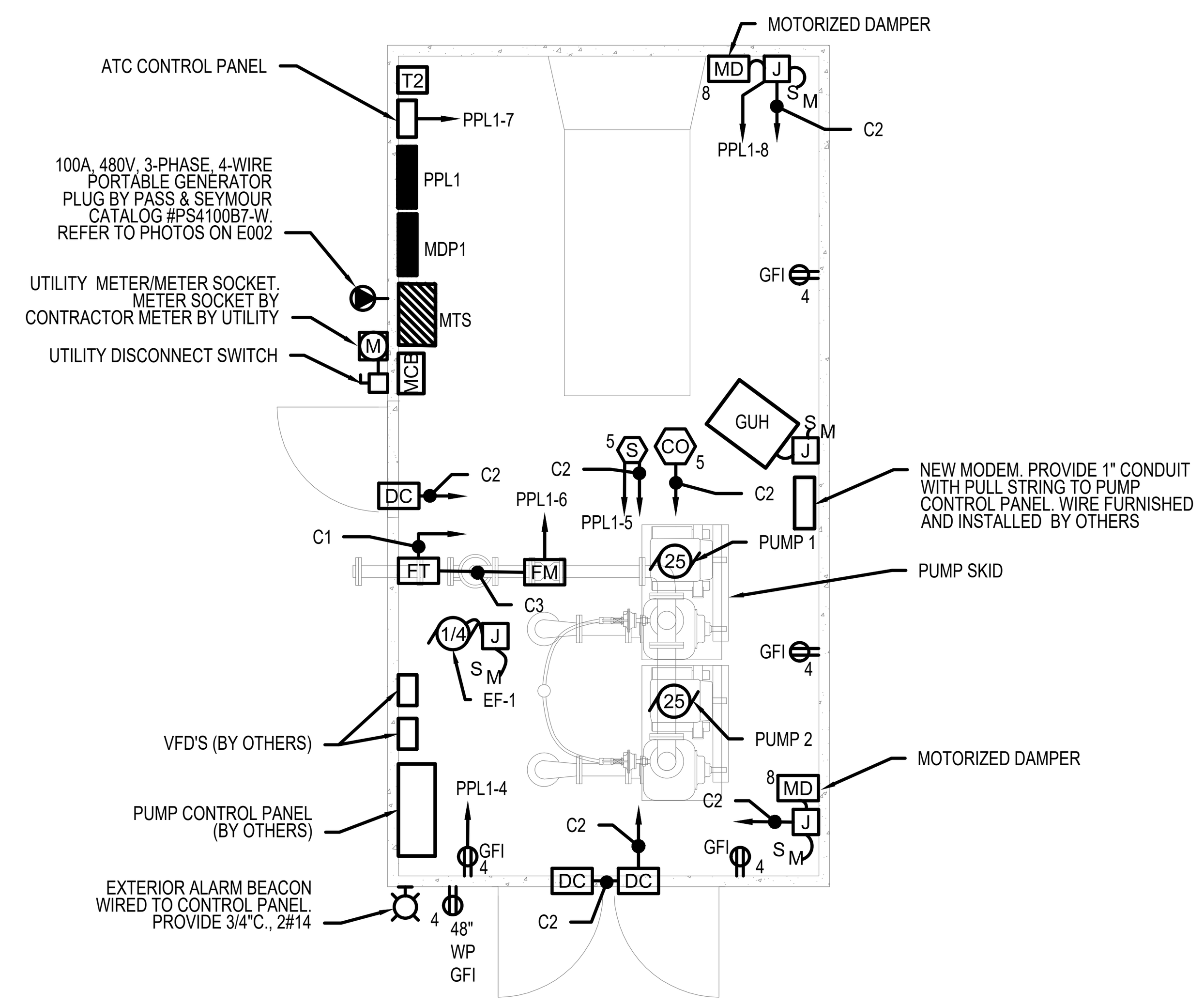


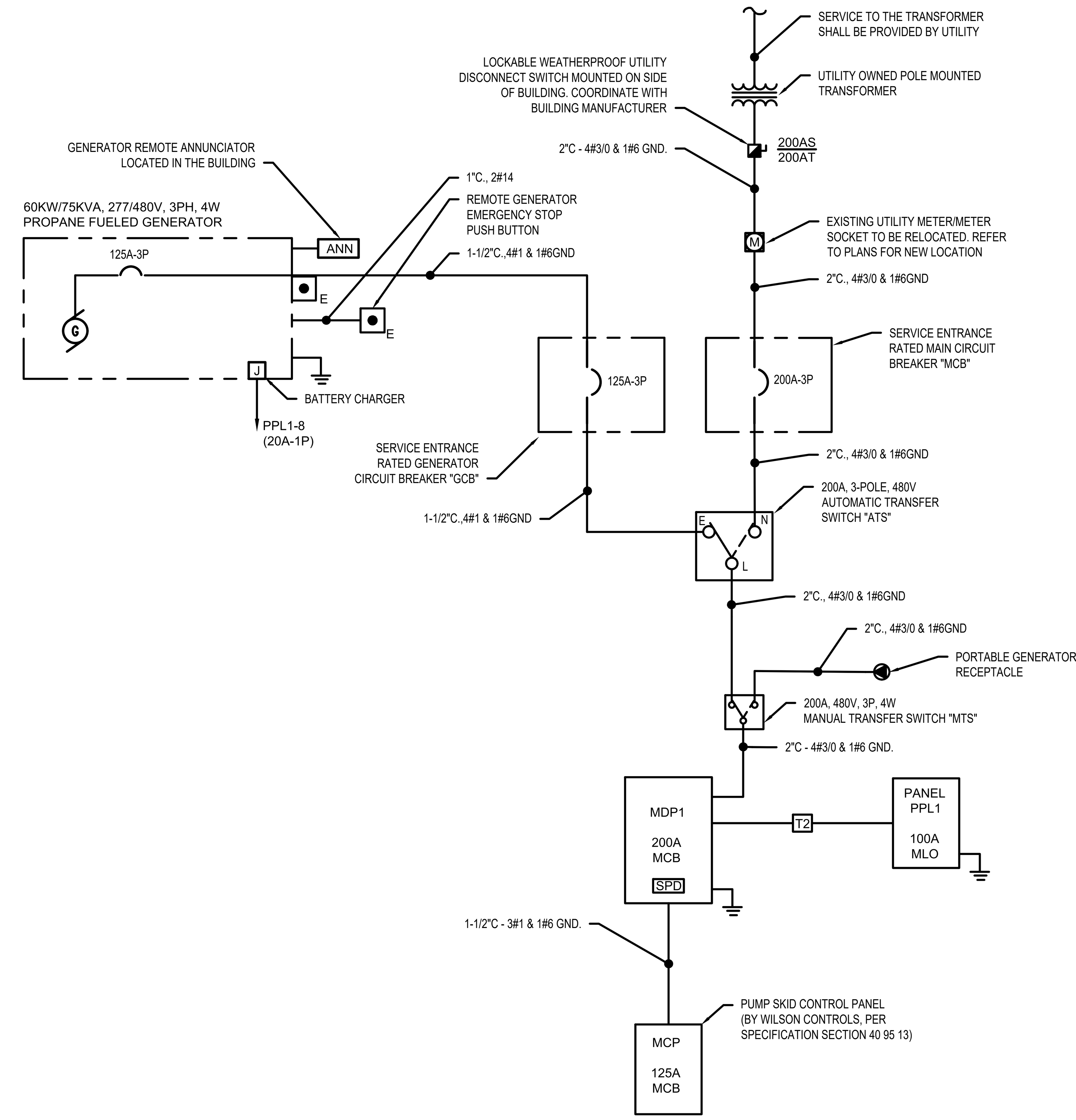
ELECTRICAL LIGHTING PLAN

SCALE: 1/4" = 1'-0"



ELECTRICAL POWER PLAN

SCALE: 1/4" = 1'-0"



NEW ONE LINE DIAGRAM

NOT TO SCALE

CONDUIT AND WIRE SCHEDULE

CONDUIT TAG	FEEDER	TO
C1	3/4"C., 1-2/C#16 TWISTED SHIELDED PAIR	PUMP CONTROL PANEL
C2	3/4"C., 2#14	PUMP CONTROL PANEL
C3	1"C., VENDOR FURNISHED CABLE	FLOW METER

PANELBOARD SCHEDULE

PANEL NAME: MDP1 — S.C. RATING: 42,000A RMS SYM. — REMARKS:

LOCATION: PUMP BUILDING — SERVICE: 480/277V, 3PH, 4W

RATING: 200 AMPS — MOUNTING: SURFACE

MAIN: 200 AMP MCB — NUMBER OF POLES: 18

CKT. NO.	LOAD DESIGNATION	BREAKER TRIP	BREAKER POLE	PHASE A	PHASE B	BREAKER POLE	BREAKER TRIP	LOAD DESIGNATION	CKT. NO.
1	-	-					-	-	2
3	TRANSFORMER T2	30					30	TVSS	4
5	-	-					-	-	6
7	-	-					20	SPARE	8
9	CONTROL PANEL MCP	125					-	SPACE	10
11	-	-					-	SPACE	12
13	SPACE	-					-	SPACE	14
15	SPACE	-					-	SPACE	16
17	SPACE	-					-	SPACE	18

PANELBOARD SCHEDULE

PANEL NAME: PPL1 — S.C. RATING: 10,000A RMS SYM. — REMARKS:

LOCATION: PUMP BUILDING — SERVICE: 120/208V, 3PH, 4W

RATING: 100 AMPS — MOUNTING: SURFACE

MAIN: 100 AMP MLO — NUMBER OF POLES: 18

CKT. NO.	LOAD DESIGNATION	BREAKER TRIP	BREAKER POLE	PHASE A	PHASE B	BREAKER POLE	BREAKER TRIP	LOAD DESIGNATION	CKT. NO.
1	EF-1	20					20	PUMP BUILDING LIGHTING	2
3	GUH-1 CONTROLS	20					20	RECEPTACLES	4
5	SMOKE DETECTOR	20					20	MAGNETIC FLOW METER	6
7	ATC CONTROL PANEL	20					20	GENERATOR BATTERY CHARGER	8
9	SPARE	20					20	SPARE	10
11	SPACE	-					20	SPARE	12
13	SPACE	-					-	SPACE	14
15	SPACE	-					-	SPACE	16
17	SPACE	-					-	SPACE	18

MECHANICAL EQUIPMENT SCHEDULE

EQUIP. TAG	EQUIPMENT	CHARACTERISTICS	VOLTS	PH.	PANEL	CKT. BRK.	FEEDER	CONNECTION: S	CONNECTION: ⊠	CONNECTION: VFD	CONNECTION: (starter)	CONNECTION: (combination starter)	CONNECTION: ∿	CONNECTION: WP	REMARKS
EF-1	EXHAUST FAN	REFER TO SHEET H601	120	1	PPL1	1	3#12, 1#12 GND	X					X		
GUH-1	GAS UNIT HEATER	REFER TO SHEET H601	120	1	PPL1	3	3#12, 1#12 GND	X					X		

MECHANICAL EQUIPMENT SCHEDULE NOTES:

1. STARTERS (FVNR, VFD, RVNR, ETC..) SHALL BE FURNISHED BY MECHANICAL CONTRACTORS AND INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR. FOR EXACT LOCATIONS REFER TO MECHANICAL DRAWINGS.

2. E.C. SHALL COORDINATE FUSE SIZE AND OVERCURRENT PROTECTION FOR ALL MECHANICAL EQUIPMENT W/ MANUFACTURER'S RECOMMENDATION

DRY TYPE TRANSFORMER SCHEDULE 480-120/208V

SIZE	KVA	PRIMARY AMPS	SECONDARY AMPS	480 VOLT OVERCURRENT	208 VOLT OVERCURRENT	480V FEEDER CODE	120/208V FEEDER CODE	GROUND SIZE
T2	15	18	42	30A, 3P	50A, 3P	3/4"C., 3#10 & 1#10GND	1"C., 4#6 & 1#8GND	#8-3/4"C

LIGHTING FIXTURE SCHEDULE

TYPE	TYPE	MANUFACTURER	CATALOG NUMBER	LAMP NO.	LAMP TYPE	MOUNTING	VOLTAGE	LOAD	REMARKS
A1	1'x4' ENCLOSED AND GASKETED, WET LOCATION LISTED LED STRIP FIXTURE	LITHONIA	FEM4-4L-35-IMAFL- MVOLT	-	4000 LUMEN 3500K LED	PENDANT	120	61	
A1E	1'x4' ENCLOSED AND GASKETED, WET LOCATION LISTED LED STRIP FIXTURE	LITHONIA	FEM4-4L-35-IMAFL- MVOLT	-	4000 LUMEN 3500K LED	PENDANT	120	61	PROVIDE WITH INTEGRL EMERGENCY LED DRIVER
SW1	EXTERIOR WALL MOUNTED LUMINAIRE	STREETWORKS	GAW-SA1A-735-U-T2-GM	-	4883 LUMEN 3500K LED	WALL	120	0.3	MOUNT 8'-6" AFG
X1	LED EXIT SIGN	COOPER/ISOLITE	RL-EM-R-WW	1	LED	UNIVERSAL	120	2.4	

POWER DISTRIBUTION DIAGRAM NOTES:

1. REFER TO DRAWING E001 FOR LEGEND, SYMBOLS AND GENERAL NOTES THAT MAY PERTAIN TO THIS DRAWING.
2. THIS DRAWING IS INTENDED TO ILLUSTRATE MAJOR EQUIPMENT AND REQUIRED INTERCONNECTIONS. REFER TO THE FLOOR PLANS FOR EXACT LOCATIONS AND THE SPECIFICATIONS FOR ADDITIONAL INSTALLATION REQUIREMENTS.
3. THE SERVICE AND ALL SEPARATELY DERIVED SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF ARTICLE 250 OF THE NEC. BOND ALL ELECTRICALLY CONDUCTIVE MATERIALS SUCH AS METAL PIPING SYSTEMS AND STRUCTURAL STEEL TO THE GROUNDING SYSTEM. REFER TO DETAILS FOR ADDITIONAL INFORMATION.
4. PANELBOARDS AND ELECTRICAL EQUIPMENT SHALL BE FIELD MARKED TO WARN QUALIFIED PERSONS OF POTENTIAL ARC FLASH HAZARDS. THE MARKING SHALL BE LOCATED SO AS TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING OR MAINTENANCE OF THE EQUIPMENT.
5. REFER TO THIS SHEET FOR PANELBOARD SCHEDULES.

Project:

CITY OF ROCHESTER, NH

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724 SALMON FALLS ROAD
ROCHESTER, NH 03868

Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

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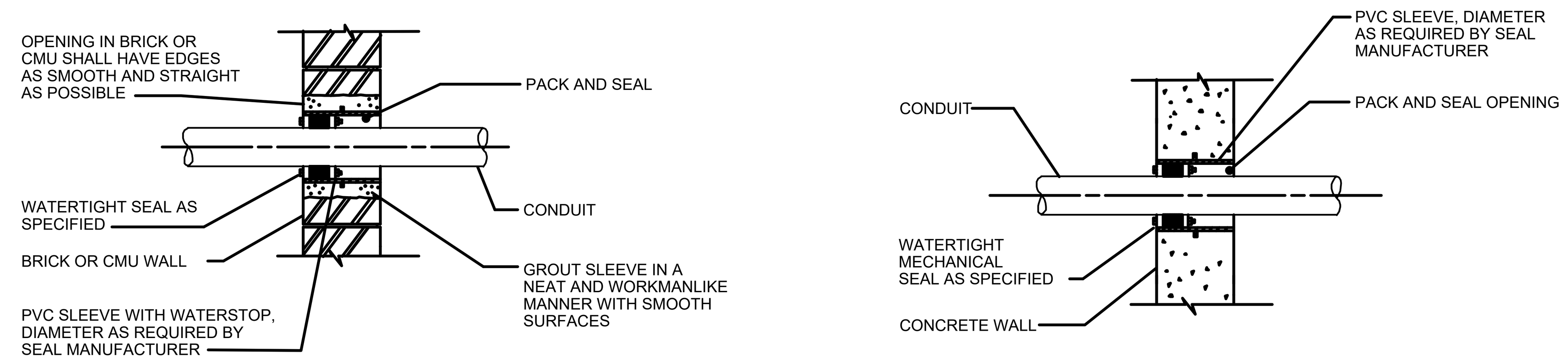
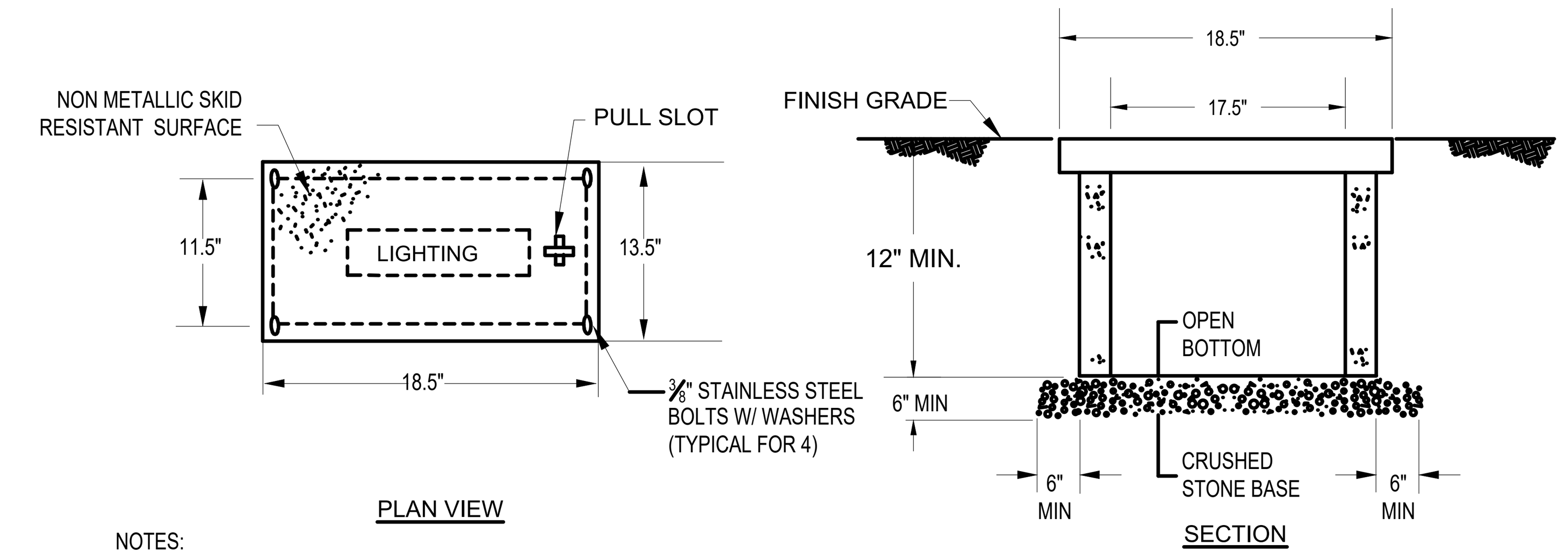
ELECTRICAL PLANS, PHOTOS, AND SCHEDULES

Sheet Number: E101



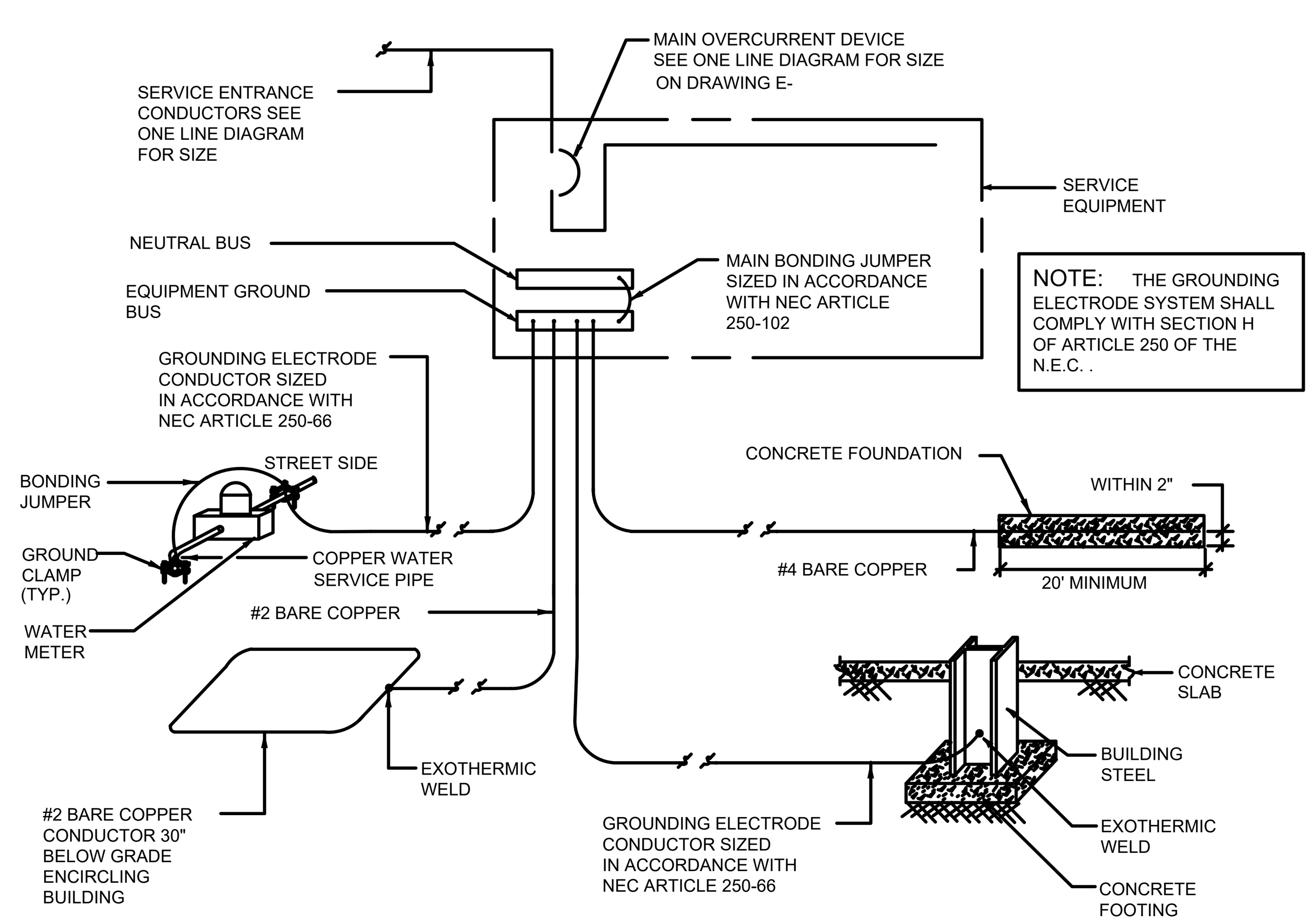
1	WATERTIGHT CONDUIT PENETRATIONS	NO SCALE



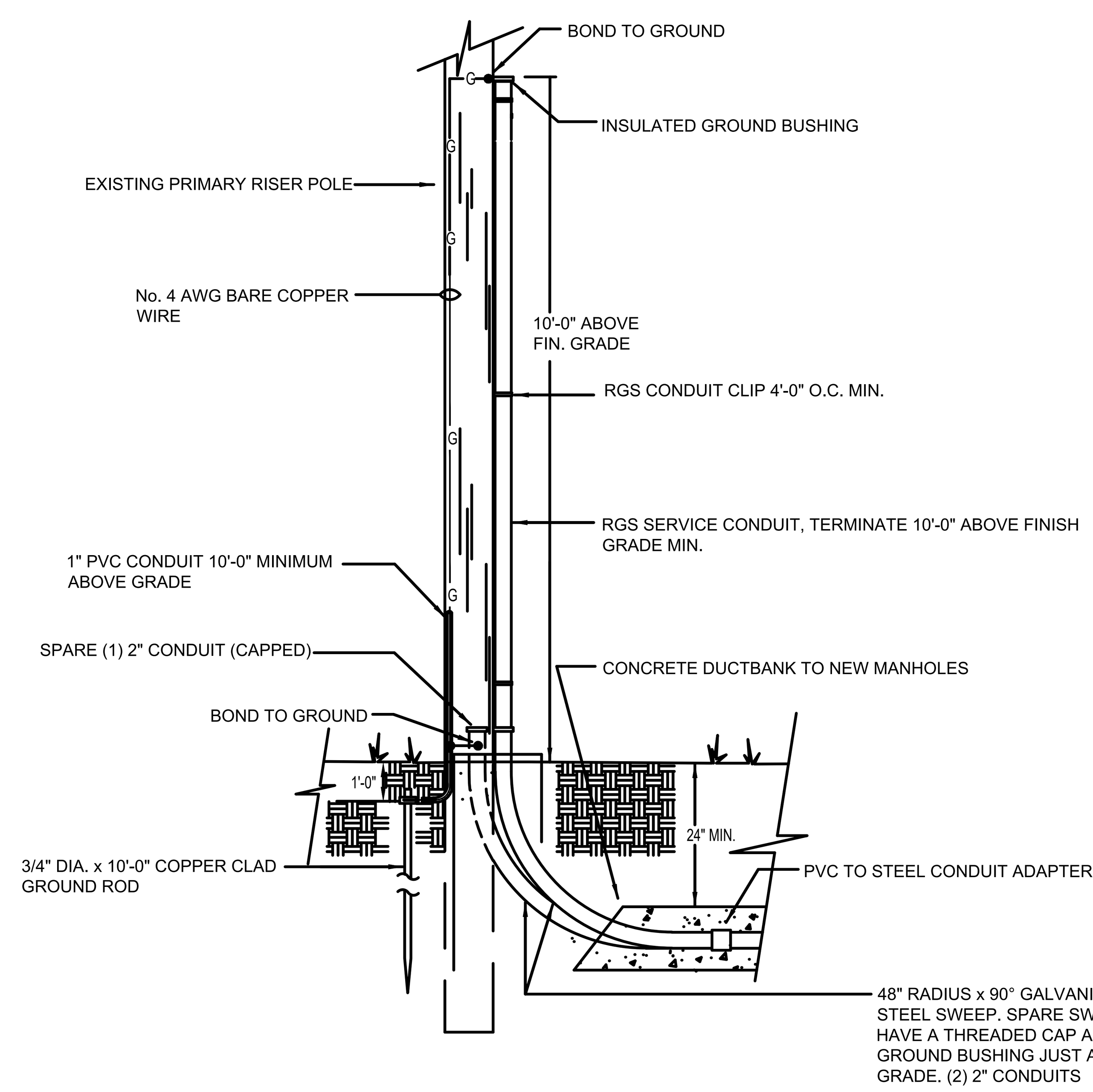
NOTES:

1. THIS HANDHOLE IS INTENDED FOR NON-DELIBERATE VEHICULAR TRAFFIC ONLY.
2. HANDHOLE SHALL BE PREFABRICATED POLYMER CONCRETE AGGREGATE EQUAL TO QUAZITE OR EQUAL PRE CAST CONCRETE CONSTRUCTION.

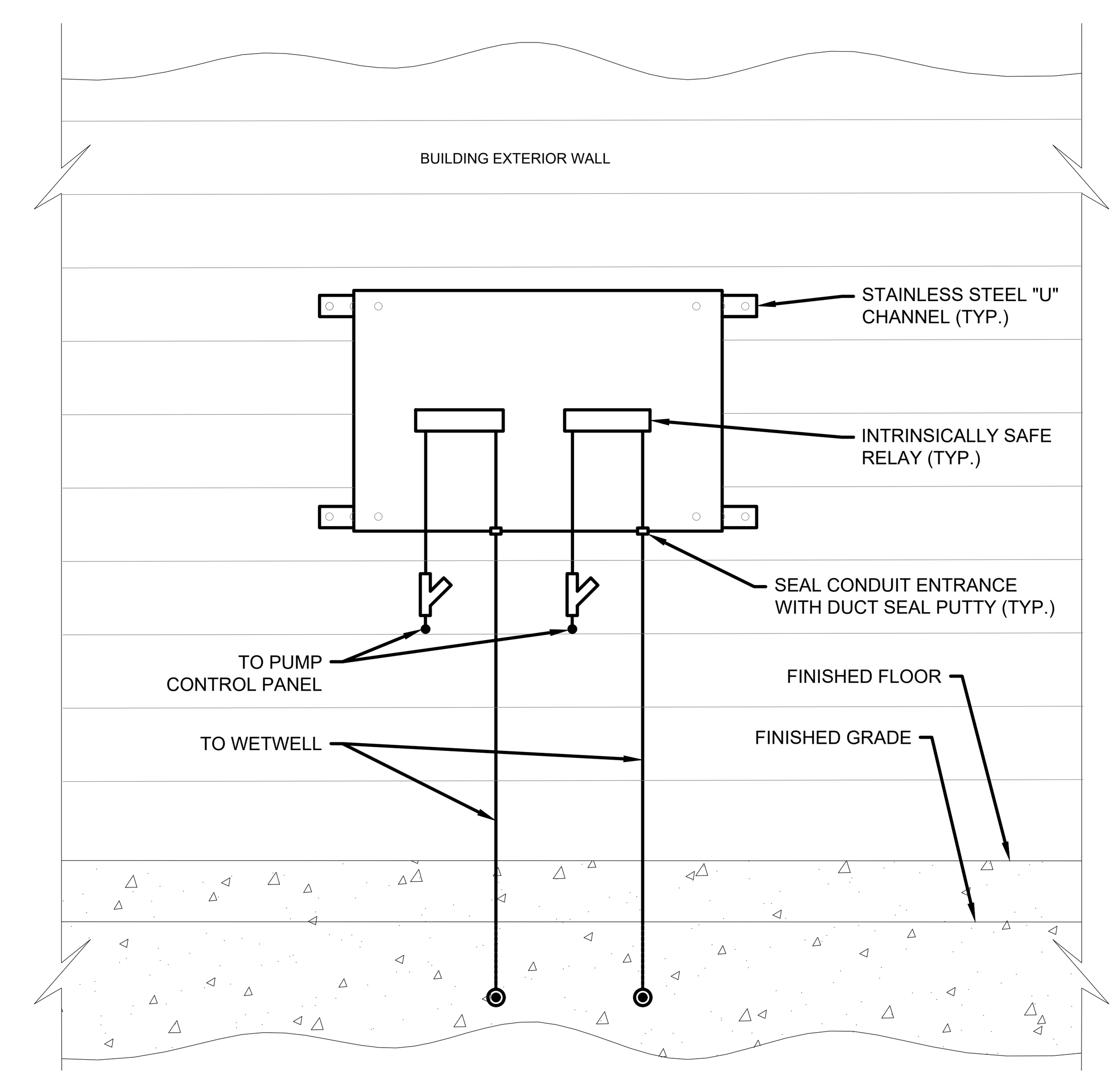
2	PREFABRICATED HANDHOLE DETAIL "HH"	NO SCALE



3	SERVICE GROUNDING DETAIL	NO SCALE



4	TYPICAL RISER POLE DETAIL	NO SCALE



NOTES:

1. EC SHALL INSTALL NEMA "4X" TERMINAL PANEL WITH HINGED LOCKABLE COVER. PANEL SHALL BE SIZED APPROPRIATELY TO CONTAIN INTRINSICALLY SAFE RELAYS FOR LEVEL SWITCH AND LEVEL SENSOR WIRING. TERMINAL PANEL AND RELAYS TO BE SUPPLIED BY WILSON CONTROLS.
2. TERMINAL PANEL SHALL BE MOUNTED TO BUILDING EXTERIOR WALL
3. EC SHALL FURNISH/INSTALL PVC COATED ALUMINUM CONDUIT, "EYS" SEALING FITTINGS AND WIRING. FOR SIZES, REFER TO THE ELECTRICAL SITE PLAN AND ONE LINE DIAGRAM.
4. EC SHALL CORE DRILL THE WALL (OR COORDINATE PENETRATIONS WITH BUILDING MANUFACTURER) AND FURNISH/INSTALL CONDUIT WALL SEAL (W/SS HARDWARE), 4" PVC COATED ALUM CONDUIT, INSULATED BUSHINGS AND CONDUIT/CABLES SEAL (W/SS HARDWARE). EC SHALL FURNISH/INSTALL SS CABLES SUPPORTS IN THE WETWELL PLUS SS CABLE "KELLUM" TYPE SUPPORTS.
5. REFER TO MECHANICAL DETAILS FOR LEVEL SWITCH AND LEVEL SENSOR WETWELL MOUNTING DETAIL.

5	WETWELL LEVEL SENSORS WIRING DETAIL	NO SCALE

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Consultants:

Revisions:

No.	Date	Description
1	09/21/2022	REVISED FOR ADDENDUM 3

COA:

Seal:
STATE OF NEW HAMPSHIRE
ROBERT F. McALEER
No. 14054
LICENSED
PROFESSIONAL ENGINEER

Issued For:
BIDDING ADDENDUM NO. 3

Scale: NO SCALE

Date:	09 / 21 / 2022
Drawn By:	DNM
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