



ADDENDUM NO. 02



TO
DRAWINGS, CONTRACT DOCUMENTS, AND SPECIFICATIONS
FOR
Well No. 6 at Sam Bass Field
Brushy Creek Municipal Utility District
Date of Addendum: January 19, 2017

Bid Date: January 25, 2017, 1:00 PM

This Addendum will be considered part of the Contract Documents and is issued to change, amplify, add to, delete from, or otherwise explain the Contract Documents. Where provisions of this Addendum differ from those of the original Contract Documents, this Addendum will take precedence and govern. Bidders are hereby notified that they will incorporate this Addendum into their bids, and it will be construed that the Contractor's bid will reflect with full knowledge all items, changes, and modifications to the Contract Documents herein specified. Bidders will specifically acknowledge receipt of this Addendum on the front of the Bidder's Sealed Bid Envelope and in the space provided on the Bid Form. All items in conflict with this Addendum are hereby deleted.

GENERAL:

1. A current planholder's list is attached to this addendum.

SPECIFICATION SECTIONS:

1. Table of Contents: Replace with the attached revised Table of Contents.
2. Section 0111 – Invitation to Bid:
 - a. Page i, Line 7: Change the bid date from January 23, 2017 to January 25, 2017.
3. Section 00200 – Instructions to Bidders, Article 19.03.B – Evaluation of Bids:
 - a. Lines 26-30: Delete the following two sentences: “To determine the Bid prices for purposes of comparison, Owner shall announce to all bidders a “Base Bid plus alternates” budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded.”
 - b. Add the following sentence immediately after the deleted sentences: “The lowest responsive Base Bid will be the basis of evaluation, while taking into account any deductions and or alternatives.”
4. Section 00410 – Bid Form, Article 7.01 – Attachments to this Bid:
 - a. Add the following after line 15: “G. Bidder's Questionnaire.”
5. Section 00520 – Agreement, Article 4.02.A:
 - a. Line 24, delete the words “seventy-five (75)” and replace with the words “three hundred (300).”
 - b. Line 27, delete the words “ninety (90)” and replace with the words “three hundred and thirty (330).”
 - c. Add the following sentence at the beginning of the paragraph: “The work, consisting of drilling a pilot hole, geophysical logging, and the step-draw down test, will be completed within 45 days of Notice to Proceed.”

6. Section C-800 – Supplementary Conditions, Article 7.02.B:
 - a. Line 2, delete the words “any or all hours of the day” and replace with the words “7 am to 7 pm.”
7. Section 01060 – Special Conditions, Paragraph 1.6. B:
 - a. Line 37, delete the words “for a fee.” Add the following sentence to the end of the paragraph: “Owner will provide a meter and back flow preventer.”
8. Section 02580 – Production Well:
 - a. Paragraph 3.1.5.j, line 16: Delete the entire sentence and replace with: “Conduct constant rate pumping test per Paragraph 3.2.D.c.”
 - b. Paragraph 3.2.D.c, line 43: Delete the entire sentence and replace with: “Conduct constant rate pumping test as follows: 1.) The pumping rate remains constant for at least four hours, and the pumping period has been a minimum of 24 HRS, or 2.) The pumping rate remains constant for at least four hours, and a straight line trend is observed on plot of water level verses a logarithm of time during pumping and recovery.”
 - c. Add paragraph 3.2.D.d: “Pump test must comply with Section 5.1 of AWWA Standard A100-06.”
9. Section 11072 (Revised AD-01) – Submersible Well Pumps: Delete the Specification 11072 that was revised in AD-01 and replace with the attached reissued Specification 11072.
10. Delete the following specifications and references to:
 - a. Section 16441 - Panelboards.
 - b. Section 16442 - Motor Control Equipment.
 - c. Section 16460 - Dry Type Transformers.
11. Add the following specification sections:
 - a. Section 13448 – Control Panels & Enclosures.
 - b. Section 16140 – Wiring Devices.
 - c. Section 16410 – Safety Switches.
 - d. Section 16500 – Interior and Exterior Lighting.

DRAWINGS:

1. Replace Sheets 01D-101 and 01E-301 with the attached sheets (revised pump station detail).
2. Replace Sheets 01E-101, 01E-501 and 01E-601 with the attached sheets (revised equipment rack detail).

END OF ADDENDUM NO. 02

Issued By: _____
Peter Newell, P.E., Texas No. 108054

HDR Engineering, Inc.
Texas P.E. Firm Registration No. F-754
4401 West Gate Blvd., Suite 400
Austin, TX 78745
512-912-5100
www.hdrinc.com



Brushy Creek Municipal Utility District

Type	Company Name	Contact Person	Address	City, State	Zip Code	Phone Number
Project Owner	Brushy Creek MUD	Joey Miller	16318 Great Oaks Dr	Round Rock, TX	78681	(512) 255-7871 x408
Engineer	HDR Engineering, Inc.	Peter Newell, P.E.	4401 West Gate Blvd., Suite 400	Austin, TX	78745	(512) 498-4703
Planhouse	Virtual Builder's Exchange	Erica Draper	4047 Naco Perrin, Suite 100	San Antonio, TX	78217	(877) 221-6418
Planhouse	Amtek	John Rugh	7801 North Lamar	Austin, TX	78752	(512) 323-0508
Contractor	Alsay, Inc.	Steve Bell	3359 Southeast Loop 410	San Antonio, TX	78222	(210) 628-1090
Contractor	Associated Drilling Co.	Gail	PO Box 673/2520 W. Hwy 290	Dripping Springs, TX	78620	(512) 894-3535
Contractor	Central Texas Water Maintenance, LLC	Amy Gray	PO Box 636	Buda, TX	78610	(512) 243-2281
Sub-Contractor	T. Morales Company	Gilbert Cabledue				
Supplier	Hydro-Resources	Tyler Sutliff				
Sub-Contractor	J & K Utility Services	Reagan Gray				(512) 243-9892
			\$25 per set of half-size plans/specs			
			Checks payable to HDR Engineering, Inc.			
			Engineer's Estimate: ~\$356,299.00			
			Engineer: Peter Newell, P.E.			
			Addendum #1 issued 01-07-2017			
			Addendum #2 issued 01-19-2017			



Table of Contents

DIVISION 00 – CONTRACTS AND CONDITIONS

<i>C-111</i>	<i>EJCDC ADVERTISEMENT FOR BIDS (REVISED AD-02)</i>
<i>C-200</i>	<i>EJCDC INSTRUCTIONS TO BIDDERS (REVISED AD-02)</i>
<i>C-410</i>	<i>EJCDC BID FORM (REVISED AD-02)</i>
<i>C-430</i>	<i>EJCDC BID BOND (PENAL SUM)</i>
<i>C-520</i>	<i>EJCDC AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)(REVISED AD-02)</i>
<i>C-700</i>	<i>EJCDC GENERAL CONDITIONS</i>
<i>C-800</i>	<i>EJCDC SUPPLEMENTARY CONDITIONS (REVISED AD-02)</i>
<i>00303</i>	<i>BIDDER'S QUESTIONNAIRE</i>
<i>00830</i>	<i>PREVAILING WAGE RATES</i>

DIVISION 01 - GENERAL REQUIREMENTS

<i>01060</i>	<i>SPECIAL CONDITIONS (REVISED AD-02)</i>
<i>01061</i>	<i>BID ITEMS: SCOPE OF WORK</i>
<i>01340</i>	<i>SUBMITTALS</i>
<i>01560</i>	<i>ENVIRONMENTAL PROTECTION AND SPECIAL CONTROLS</i>
<i>01600</i>	<i>PRODUCT DELIVERY, STORAGE, AND HANDLING</i>
<i>01640</i>	<i>PRODUCT SUBSTITUTIONS</i>
<i>01650</i>	<i>FACILITY STARTUP</i>
<i>01710</i>	<i>CLEANING</i>

DIVISION 02 - SITE WORK

<i>02110</i>	<i>SITE CLEARING</i>
<i>02200</i>	<i>EARTHWORK</i>
<i>02221</i>	<i>TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES</i>
<i>02260</i>	<i>TOPSOILING AND FINISHED GRADING</i>
<i>02444</i>	<i>CHAIN LINK FENCE AND GATES</i>
<i>02580</i>	<i>PRODUCTION WELL (REVISED AD-02)</i>
<i>02930</i>	<i>SEEDING</i>

DIVISION 03 - CONCRETE

<i>03002</i>	<i>CONCRETE</i>
--------------	-----------------

DIVISION 09 - FINISHES

<i>09905</i>	<i>PAINTING AND PROTECTIVE COATINGS</i>
--------------	---

DIVISION 11 - EQUIPMENT

<i>11005</i>	<i>EQUIPMENT: BASIC REQUIREMENTS</i>
<i>11060</i>	<i>PUMPING EQUIPMENT: BASIC REQUIREMENTS</i>
<i>11072</i>	<i>PUMPING EQUIPMENT: SUBMERSIBLE WELL PUMPS (REVISED AD-01 & REISSUED AD-02)</i>

DIVISION 13 - SPECIAL CONSTRUCTION

13448 *CONTROL PANELS AND ENCLOSURES (ADDED AD-02)*

DIVISION 15 - MECHANICAL

15010 MECHANICAL: BASIC REQUIREMENTS
15060 PIPE AND PIPE FITTINGS: BASIC REQUIREMENTS
15062 PIPE: DUCTILE
15100 VALVES: BASIC REQUIREMENTS
15101 GATE VALVES
15104 BALL VALVES
15106 CHECK VALVES
15114 MISCELLANEOUS VALVES AND ACCESSORIES
15183 PIPE INSULATION

DIVISION 16 - ELECTRICAL

16010 ELECTRICAL: BASIC REQUIREMENTS
16060 GROUNDING AND BONDING
16080 ACCEPTANCE TESTING
16120 WIRE AND CABLE: 600 VOLT AND BELOW
16130 RACEWAYS AND BOXES
16135 ELECTRICAL: EXTERIOR UNDERGROUND
16140 *WIRING DEVICES (ADDED AD-02)*
16265 VARIABLE FREQUENCY DRIVES: LOW VOLTAGE
16410 *SAFETY SWITCHES (ADDED AD-02)*
16441 *PANELBOARDS (DELETED AD-02)*
16442 *MOTOR CONTROL EQUIPMENT (DELETED AD-02)*
16460 *DRY-TYPE TRANSFORMERS (DELETED AD-02)*
16490 OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES
16491 LOW VOLTAGE SURGE PROTECTION DEVICES (SPD)
16500 *INTERIOR AND EXTERIOR LIGHTING (ADDED AD-02)*

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

SECTION 11072

PUMPING EQUIPMENT: SUBMERSIBLE WELL PUMPS (REVISED AD-01 & REISSUED AD-02)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vertical turbine pumps.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 - General Requirements.
 - 3. Section 11005 - Equipment: Basic Requirements.
 - 4. Section 11060 - Pump Equipment: Basic Requirements.
 - 5. Section 15060 – Pipe and Pipe Fittings: Basic Requirements.
 - 6. Section 15101 – Gate Valves.
 - 7. Section 15106 – Check Valves.
 - 8. Section 15114 – Miscellaneous Valves and Accessories.
 - 9. *Section 16265 - Variable Frequency Drives - Low Voltage.*
 - 10. *Section 13448 – Control Panels and Enclosures*

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Iron and Steel Institute (AISI).
 - 2. American National Standard Institute (ANSI):
 - a. B16.1, Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
 - b. B16.5, Pipe Flanges and Flanged Fittings.
 - 3. ASTM International (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
 - b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - c. A108, Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
 - d. Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless for Ordinary Uses.
 - e. A276, Standard Specification for Stainless Steel Bars and Shapes.
 - f. B505, Standard Specification for Copper-Base Alloy Continuous Castings.
 - g. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
 - 4. American Water Works Association (AWWA):
 - a. E101, Deep Well Vertical Turbine Pumps - Line Shaft and Submersible Types
 - 5. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 6. National Sanitation Foundation (NSF).
 - 7. International Organization for Standardization (ISO):
 - a. ISO 1940, Mechanical Vibration – Balance Quality Requirements for Rotors in a Constant (Rigid) State.
- B. *Provide single source coordination responsibility through the pump manufacturer for the entire system including but not limited to the following:*
 - 1. *Pump.*
 - 2. *Motor.*
 - 3. *Control panel including VFD.*

1 **1.3 SUBMITTALS**

2 A. Shop Drawings:

- 3 1. See Specification Section 1340 for requirements for the mechanics and administration of the
4 submittal process.
- 5 2. Product technical data including:
- 6 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 7 b. Manufacturer's installation instructions.
- 8 c. Pump:
- 9 1) Manufacturer and model.
- 10 2) Speed.
- 11 3) Number of stages.
- 12 4) Component materials.
- 13 5) Shaft and column size.
- 14 6) Outside diameter of pump bowls.
- 15 7) Painting and coatings.
- 16 d. Motor:
- 17 1) Manufacturer and model.
- 18 2) Rated size (horsepower).
- 19 3) Type of bearings.
- 20 4) Efficiency.
- 21 e. Materials, parts, devices, and accessories.
- 22 f. Complete performance data and curves:
- 23 1) Capacity.
- 24 2) Head.
- 25 3) NPSH requirements.
- 26 4) Brake horsepower requirements.
- 27 g. Shop Drawings:
- 28 1) Fabrication.
- 29 2) Assembly.
- 30 3) Installation.
- 31 4) Type, number, and size of anchor bolts.
- 32 5) Dimensions.
- 33 h. Factory Test Report:
- 34 1) Submit certified copies of factory test report and receive Engineers approval before
35 shipping equipment.
- 36 2) Report shall include:
- 37 a) Test log.
- 38 b) Description of test piping, equipment and set-up.
- 39 c) Test procedure.
- 40 d) Certified performance curve, plotted against capacity:
- 41 (1) Head.
- 42 (2) Brake horsepower.
- 43 (3) Efficiency.
- 44 (4) Speed.
- 45 (5) Net positive suction head required.
- 46 (6) Plot curve to be easily read at scales consistent with performance
47 requirements.
- 48 i. Field Test Reports:
- 49 1) Motor test report.
- 50 2) Vibration test report.
- 51 j. *For variable speed applications, submit:*
- 52

- 1 1) *Certification that the pump manufacturer is bearing coordination responsibility for*
2 *the pump(s) and VFD(s) for their specific application to avoid overheating and*
3 *harmonic vibrations caused by rotational speed and carrier-frequency-induced*
4 *rotational "cogging."*
- 5 B. Contract Closeout Information:
6 1. Operation and Maintenance Data:
7 See Specification Section 1340 for requirements for the mechanics, administration, and the
8 content of Operation and Maintenance Manual submittals.

9 **PART 2 - PRODUCTS**

10 **2.1 ACCEPTABLE MANUFACTURERS**

- 11 A. Subject to compliance with the Contract Documents, the following manufacturers are
12 acceptable:
13 1. *Submersible Vertical Turbine Pumps:*
14 ~~a. Christensen.~~
15 b. Fairbanks Morse.
16 c. Flowserve.
17 d. Goulds
18 ~~e. Layne Bowler~~
19 f. Floway
20 ~~g. Peerless~~
21 h. Grunfos
22 ~~i. Byron Jackson~~
23 2. Motors:
24 a. ~~General Electric.~~
25 b. Franklin
26 ~~c. Baldor/Reliance Electric~~
27 ~~d. Teco/Westinghouse~~
28 ~~e. Nidec/U.S. Motor-Pleuger~~
29 f. Grunfos
30 g. Hitachi

31 ~~B. Specifications are based on Peerless Pump.~~

32 C. Submit requests for substitution in accordance with Specification Section 01640.

33 **2.2 MATERIALS**

- 34 A. Intermediate Bowl, Top Bowl and Flange: Ductile Iron ASTM A536, Grade 60-42-10.
35 B. Bearings: Bronze, ASTM B584.
36 C. Pump Shaft: Stainless steel, ASTM A276, Grade 316.
37 D. Pump Impeller: Bronze, ASTM B584.
38 E. Impeller Lock Collet: Stainless Steel ASTM A276 ,Type 316.
39 F. Suction Case: Ductile Iron ASTM A536, Grade 60-42-10.
40 G. Strainer: Stainless steel, ASTM A240, Type 316.
41 H. Sand Collar, Strainer Interconnector Bearings: Bronze ASTM B584.
42 I. Strainer Interconnector, Suction Interconnector: Ductile Iron ASTM A536, Grade 60-42-10.
43 J. Pump Motor Coupling: Stainless steel ASTM A276, Type 410.
44 K. Power Cable: Copper with synthetic rubber.

- 1 L. Power Cable Guard: Stainless steel ASTM A240, Type 304.
- 2 M. Cable Clamp and Cable Guard: Stainless steel.
- 3 N. Wear Rings: Bronze, ASTM B148, Alloy 953.
- 4 O. Surface Plate: Steel ASTM A36.

5 **2.3 PERFORMANCE AND DESIGN REQUIREMENTS**

6 A. Performance Parameters:

7 1. Submersible Well Pump:

- 8 a. Primary design conditions: 1000 GPM at 175 FT TDH and greater than 80 percent
- 9 efficiency.
- 10 b. ~~Maximum~~ Pump speed: 1800 rpm.
- 11 c. ~~Maximum~~ Pump horsepower: 60 HP.
- 12 d. Minimum shutoff condition: 0 gpm at 246FT.
- 13 e. ~~Minimum~~ Column size: 8 IN.
- 14 f. ~~Minimum~~ Discharge flange: 8 IN.
- 15 g. Type of discharge head: above ground.
- 16 h. Bottom of motor assembly:
 - 17 1) To be determined by Motor Manufacture.

18 B. Pump/Motor Shroud: To be determined by Motor Manufacture.

- 19 1. *Diameter as necessary for motor cooling requirements. Coordinate with well casing*
- 20 *diameter.*

21 C. Provide pumps with increasing head characteristics from design condition to shutoff condition.
 22 Provide pumps with net positive suction head requirements (NPSHR) less than the net positive
 23 suction head available (NPSHA) at all operating conditions.

24 **2.4 ACCESSORIES**

25 A. See Sections 11005.

26 B. *Control Panel:*

- 27 1. *Furnish and install locally mounted automatic control panel at location indicated on*
- 28 *Drawings.*
- 29 2. *Include interior-mounted variable frequency drive (VFD) with 480V to 120V control power*
- 30 *transformer (CPT) with both primary and secondary fusing. See Section 16265.*
- 31 a. *CPT to be sized for control panel air conditioning in addition to a load of 1000 VA for*
- 32 *a programmable logic controller (PLC) (furnished by others), flowmeter and level*
- 33 *transmitter, and other miscellaneous items.*
- 34 b. *Toggle switches with fused protection for individual 120V AC circuits shall be provided*
- 35 *off the CPT for the PLC, flowmeter, level transmitter, air conditioner, area light, and*
- 36 *GFCI 15A, 120V duplex receptacle and control panel interior light.*
- 37 3. *Provide the following features:*
- 38 a. *NEMA 4X stainless steel watertight double-door enclosure with continuous hinge,*
- 39 *neoprene gasket in cover and continuous seam weld. Include locking mechanism*
- 40 *complete with padlock.*
- 41 1) *Enclosure to be free-standing with mounting feet, minimum 60 IN wide, height and*
- 42 *depth as required.*
- 43 2) *Left hand interior side of enclosure shall include VFD and all power components*
- 44 *required, while the right hand interior side of enclosure shall be provided with a*
- 45 *backplate for mounting of future PLC.*
- 46 b. *Lightning/surge protection on the incoming 480V power supply.*
- 47 4. *See Section 13448 for additional details.*

1 **2.5 COMPONENTS**

2 A. General:

- 3 1. Furnish units consisting of a vertical turbine bowl assembly, direct connected to a
4 submersible water filled motor.
5 2. Weight of revolving parts of pump including unbalanced hydraulic thrust of impeller is
6 carried by thrust bearing in driver.
7 3. Make provision at driver shaft for adjusting impeller with reference to bowls.
8 4. Pump and motor to be NSF approved for potable water service.

9 B. Column:

- 10 1. The column pipe shall be API-5L or ASTM A53 Grade B pipe.
11 2. The column pipe shall be furnished in interchangeable sections not exceeding ~~40~~ 20 feet in
12 length ~~and shall be connected with extra strong, straight threaded, sleeve type couplings.~~
13 *The pipe threads should be 3/4 inch tapered (NPT) threaded.*
14 3. The couplings shall be designed to provide the required strength, with a safety factor 2
15 should the pump be lowered and stages added to meet future conditions.

16 C. Pump Bowl:

- 17 1. Pump bowl castings shall be free of blowholes, sand holes, and other detrimental defects.
18 2. Finished bowls shall be capable of withstanding a hydrostatic pressure equal to twice the
19 head at rated capacity of 1.5 times the shutoff head, whichever is greater.
20 3. Provide bowl and suction bell constructed of close grained cast iron, free from
21 imperfections and accurately machined and fitted.
22 4. All intermediate bowls shall have enamel or epoxy lined waterways for maximum
23 efficiency and wear protection and shall be of identical design for interchangeability.
24 5. Coat pump bowl water passages with an abrasion-resistant baked enamel, phenolic or
25 epoxy.
26 6. Provide NSF certified coating suitable for potable water service.
27 7. Design to ensure easy removal of bearings and impeller.

28 D. Motor Adapter:

- 29 1. A motor adapter of close-grained cast iron with rabbeted fits shall be supplied to connect the
30 submersible motor to the bowl assembly. It shall include the motor adapter bearing
31 assembly and a corrosion resistant metal strainer whose free area shall be at least ~~three~~ *four*
32 times the impeller suction eye area. The maximum strainer opening shall not be more than
33 75 percent of the minimum opening of water passage through the bowl or impeller.
34 2. Provide 2-piece jaw type rigid coupling or spline capable of transferring the pump thrust to
35 the motor up and down thrust bearings

36 E. Bearings:

- 37 1. Provide units with heavy-duty sleeve bearings in each bowl and in strainer.
38 2. In bowl, provide main bronze bearing immediately above and a lower bronze bearing
39 immediately below each impeller.
40 3. Provide for lubrication of bowl bearings with pumped liquid.
41 4. Furnish double sleeve bearings in strainer.
42 5. Provide sand cap on strainer bearing to prevent abrasives from entering bearing.

43 F. Bowl Shaft and Impeller:

- 44 1. Impeller shall always be enclosed.
45 2. Provide pump unit shaft constructed of rolled and ground 416 stainless steel.
46 3. The shaft shall be based on a diameter per AWWA E101.
47 4. Furnish impellers securely attached to pump shaft with keys, taper bushings, lock nuts, or
48 set screws.
49 5. Ensure impeller is accurately fitted and statically and dynamically balanced to a minimum
50 of ISO 1940 grade G6.3.
51 6. The outer tips of the impeller blades shall not be feathered and shall be of sufficient
52 thickness to withstand considerable wear before affecting pump performance.

- 1 G. Surface Plate:
- 2 1. Design surface plate assembly for 150 psi working pressure and 250 psi test pressure.
- 3 2. Supply surface plate with a minimum of two lifting lugs capable of supporting weight of
- 4 entire unit.
- 5 3. The surface plate shall support the entire weight of the suspended parts when filled with
- 6 water.
- 7 4. The surface plate shall provide suitable openings for the power cable, well vent, power
- 8 cable, and water-level indicator as required per the Contract Documents.
- 9 5. Provide surface plate for above ground mounting constructed of fabricated steel with
- 10 integral discharge flange.
- 11 6. Provide surface plate with long radius 90 degree elbow with an ANSI B16.5 125/150 LB
- 12 slip on, flat faced flanged outlet.
- 13 7. Provide NEMA 4 junction box for power cable.
- 14 8. Provide surface plate with a power cable splice box that conforms to the NEC.

- 15 ~~H. Suction Strainer:~~
- 16 ~~1. Supply basket type strainer constructed of stainless steel with net open area of not less than~~
- 17 ~~three times the impeller inlet area.~~
- 18 ~~2. Maximum opening shall not be more than 75 percent of the minimum opening of the water~~
- 19 ~~passage through the bowl or impeller.~~

- 20 I. Data Plates:
- 21 1. Provide stainless steel data plate securely attached to pump.
- 22 2. Include manufacturer's name, pump size and type, serial number, speed, impeller diameter,
- 23 capacity and head rating, and other pertinent data.

- 24 ~~J. Discharge Head Assemblies:~~
- 25 ~~1. Specifier: Three types of discharge head assemblies are available. Applications for each~~
- 26 ~~type are described below.~~
- 27 ~~2. Cast surface discharge head: This type is standard on all short coupled and well type~~
- 28 ~~pumps with discharge size up to and including 12 IN.~~
- 29 ~~3. Fabricated surface discharge head: This type is selected for discharge pressures exceeding~~
- 30 ~~cast discharge head limitations. Check with supplier on pressure limitations if you feel use~~
- 31 ~~of type (1) head might not be feasible.~~
- 32 ~~4. Underground discharge. This is commonly used in municipal water systems where below~~
- 33 ~~floor discharge is required; in systems where driver must be removed from the discharge~~
- 34 ~~centerline due to flooding and/or system design; or in permanent dewatering installations~~
- 35 ~~such as dams. These type of heads may require bracing/ restraint in wet pit installations.~~
- 36 ~~5. Specifier: Edit the following for your application.~~
- 37 ~~6. Design discharge head assembly for an operating pressure of 150 psi and a transient~~
- 38 ~~pressure of 250 psi. Discharge head assembly shall be designed for both operating pressure~~
- 39 ~~and transient pressure acting simultaneously. Test pressure for the discharge head shall be~~
- 40 ~~250 psi.~~
- 41 ~~7. Provide discharge head for above ground mounting constructed of fabricated steel A53.~~
- 42 ~~Grade B and A36 with integral discharge flange.~~
- 43 ~~8. Furnish discharge flange with flat face drilling (bolt circle and bolt hole) to match those of~~
- 44 ~~ANSI/ASME B16.5 class 150 flanges.~~
- 45 ~~9. Mount discharge head on fabricated steel base plate which is of sufficient size to span~~
- 46 ~~opening in support structure.~~
- 47 ~~10. Sole plate shall be of one piece construction machined flat on the topside and a minimum~~
- 48 ~~thickness of 1 1/2 inches after machining.~~
- 49 ~~11. Level sole plate to within 0.002 IN/FT of span in two planes at 90 degree angles to one~~
- 50 ~~another prior to grouting.~~

- 51 ~~K. Use Sonneborne E-Grout, high strength chemical resistant epoxy grout to fill void between sole~~
- 52 ~~plate and concrete support pad. Follow manufacturer's procedures to obtain best performance~~
- 53 ~~from grouting system. Grouting shall cure for five (5) days prior to operating any equipment.~~

- 1 L. Submersible Motor:
- 2 1. Squirrel cage, induction type, water cooled motor, and inverter duty rated.
- 3 2. 460 V, 60 HZ, three phase, 1,800 rpm, and a 1.15 service factor.
- 4 3. Provide double mechanical or single non-pressurized motor seal.
- 5 4. Size motor to drive pump continuously over the complete head capacity range without the
- 6 load exceeding 100 percent of the nameplate rating.
- 7 5. The motor efficiency shall not be less than specified in Paragraph 2.3 of this Section at full
- 8 load.
- 9 6. Design motor for 70 DegF, ambient water temperature.
- 10 7. Dynamically balanced rotor and shaft.
- 11 8. Provide sleeve bearings on the rotor.
- 12 9. Provide thrust bearing to support weight of rotating parts and hydraulic thrust of pump for
- 13 the operating conditions specified.
- 14 10. Maximum diameter is 8 inches

- 15 M. Submersible Cable:
- 16 1. The power cable shall be sized such that the voltage drop will not exceed 5 percent at the
- 17 motor rated full load current and voltage.
- 18 2. Cables shall be designed specifically for submersible pump service and shall consist of four
- 19 individual conductors individually insulated and the whole covered with an outer jacket.
- 20 3. Furnish wire power cable sized per manufacturer's recommendations and of length
- 21 sufficient to reach the junction box on the surface plate, and one additional foot for each 50
- 22 FT of total pump setting compensate for possible twist or sag during installation. An
- 23 additional 10 FT shall be provided beyond the surface plate.
- 24 4. Each conductor shall be insulated by synthetic rubber or plastic insulation suitable for
- 25 continuous immersion in water.
- 26 5. When three or more single conductors are used, each shall be jacketed. The jacket materials
- 27 shall be oil and water resistant synthetic rubber, metal, or other suitable mechanically
- 28 protective material.
- 29 ~~6. A flat cable with plug in terminal and stainless steel guard will connect the minimum~~
- 30 ~~6 AWG ground cable to the motor~~
- 31 7. *Motor lead cable shall be directly connected to the motor windings.*

- 32 N. Pump/Motor Shroud:
- 33 1. Thin wall PVC fabricated to form a flow inducer sleeve to force water inflow past the motor
- 34 and to the pump intake.
- 35 2. *Centered to ensure equal flow past motor*

36 2.6 MAINTENANCE MATERIALS

- 37 A. Extra Materials:
- 38 1. Furnish the Owner the following spare parts for each pump service category:
- 39 a. ~~Lower bearing assembly: One (1) set.~~
- 40 b. Upper bowl bearing: One (1) set.
- 41 c. Wearing rings: One (1) set.

42 PART 3 - EXECUTION

43 3.1 INSTALLATION

- 44 A. Pump supplier shall install the equipment and must have a Well Pump Installer's license though
- 45 the State of Texas.

46 3.2 FIELD QUALITY CONTROL

- 47 A. See Section 11060.
- 48 B. Provide equipment and apparatus required for performing inspections and tests. Correct defects
- 49 and repeat the respective inspections and tests.

- 1 C. Prior to initial operation, the piping system shall be inspected for conformance to Drawings,
2 Specifications, and ANSI B31.1.
- 3 D. Factory Testing:
4 1. Pumps shall be factory tested and accepted prior to shipment.
- 5 E. Field Testing:
6 1. After installation of the equipment, the system shall be given an operating test in the
7 presence of the Engineer, during which it shall demonstrate its ability to operate without
8 vibration or overheating, and to deliver its rated capacity under the specified conditions.
9 2. All defects or defective equipment revealed by or noted during the tests shall be corrected or
10 replaced promptly at the expense of the Contractor.
11 3. The Contractor shall furnish all labor, piping, equipment, and materials necessary for
12 conducting the tests.
13 4. All adjustments necessary to place the equipment in satisfactory working order shall be
14 made at the time of the above tests.
15 5. Tests shall include head and discharge measurements sufficient to duplicate the head-
16 discharge curve submitted with the Shop Drawings

17

END OF SECTION

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

SECTION 13448
CONTROL PANELS AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Requirements for control panels and enclosures.
- B. This Section is only applicable to panels furnished with Division 11 equipment packages when so stated in the applicable Division 11 Specification Section.
- C. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 - General Requirements..
 - 3. Division 11 - Equipment.
 - 4. Division 16 - Electrical.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American National Standards Institute (ANSI).
 - 2. ASTM International (ASTM):
 - a. B75, Standard Specification for Seamless Copper Tube.
 - 3. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. ICS 4, Industrial Control and Systems: Terminal Blocks.
 - 4. National Fire Protection Association (NFPA):
 - a. 70, National Electric Code (NEC).
 - 5. Underwriters Laboratories, Inc. (UL):
 - a. 508A, Standard for Safety Industrial Control Panels.
- B. Miscellaneous:
 - 1. Approved supplier of Industrial Control Panels under provisions of UL 508A.
 - a. Entire assembly shall be affixed with a UL 508A label "Listed Enclosed Industrial Control Panel" prior to shipment to the jobsite.
 - b. Control panel(s) without an affixed UL 508A label shall be rejected and sent back to the Contractor's factory.

1.3 DEFINITIONS

- A. The term "panel" refers to control panels or enclosures listed in the schedule included in this Specification Section.
- B. Foreign Voltages: Voltages that may be present in circuits when the panel main power is disconnected.
- C. Intrinsically Safe:
 - 1. A device, instrument or component that will not produce sparks or thermal effects under normal or abnormal conditions that will ignite a specified gas mixture.
 - 2. Designed such that electrical and thermal energy limits inherently are at levels incapable of causing ignition.
- D. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.
- E. Instrumentation Cable:
 - 1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.

- 1 2. Instrumentation cable is typically either TSP (twisted-shielded pair) or TST (twisted-
2 shielded triad), and is used for the transmission of low current or low voltage signals.
- 3 F. Ground Fault Circuit Interrupter (GFCI): A type of device (e.g., circuit breaker or receptacle)
4 which detects an abnormal current flow to ground and opens the circuit preventing a hazardous
5 situation.
- 6 G. Programmable Logic Controller (PLC): A specialized industrial computer using programmed,
7 custom instructions to provide automated monitoring and control functions by interfacing
8 software control strategies to input/output devices.

9 **1.4 SUBMITTALS**

- 10 A. Shop Drawings:
- 11 1. See Section 01340 for requirements for the mechanics and administration of the submittal
12 process.
- 13 2. Prepared with computer aided design (CAD) software.
- 14 3. Printed on 11 by 17 IN sheets.
- 15 4. Drawings shall include a title block containing the following:
- 16 a. Plant or facility name where panel(s) are to be installed.
- 17 b. Drawing title.
- 18 c. Drawing number.
- 19 d. Revision list with revision number and date
- 20 e. Drawing date.
- 21 f. Drawing scale.
- 22 g. Manufacturer name, address, and telephone number.
- 23 5. Cover sheet for each drawing set shall indicate the following:
- 24 a. Plant or facility name.
- 25 b. Project name.
- 26 c. Submittal description.
- 27 d. Revision number.
- 28 e. Issue date.
- 29 6. Table of contents sheet(s) shall indicate the following for each drawing in the set:
- 30 a. Drawing number.
- 31 b. Drawing title.
- 32 c. Sheet number.
- 33 7. Legend and abbreviation sheet shall indicate the following:
- 34 a. Description of symbols and abbreviations used.
- 35 b. Panel construction notes including enclosure NEMA rating, finish type and color, wire
36 type, wire color strategy, conductor sizes, and wire labeling strategy.
- 37 c. Confirmation that the panel(s) are to be affixed with a UL 508A label prior to shipment
38 from the factory.
- 39 8. Bill of Material for each panel shall include the following component information:
- 40 a. Instrument tag number.
- 41 b. Quantity.
- 42 c. Functional name or description.
- 43 d. Manufacturer.
- 44 e. Complete model number.
- 45 f. Size or rating.
- 46 9. Panel exterior layout drawings to scale and shall indicate the following:
- 47 a. Panel materials of construction, dimensions, and total assembled weight.
- 48 b. Panel access openings.
- 49 c. Conduit access locations.
- 50 d. Front panel device layout.
- 51 e. Nameplate schedule:
- 52 1) Nameplate location.
- 53 2) Legend which indicates text, letter height and color, and background color.

- 1 10. Panel interior layout drawings shall be drawn to scale and shall indicate the following:
- 2 a. Sub-panel or mounting pan dimensions.
- 3 b. Interior device layouts.
- 4 c. PLC general arrangement layouts.
- 5 d. Wire-way locations, purpose, and dimensions.
- 6 e. Terminal strip designations.
- 7 f. Location of external wiring.
- 8 g. Location of lighting fixtures, switches and receptacles.
- 9 11. Wiring diagrams shall consist of the following:
- 10 a. Panel power distribution diagrams.
- 11 b. Control and instrumentation wiring diagrams.
- 12 c. Wiring diagrams shall identify each wire as it is to be labeled.
- 13 B. Manufacturer catalog cut sheets for enclosure, finish, panel devices, control auxiliaries, and
- 14 accessories.
- 15 C. Electrical load calculations for each panel:
- 16 1. Total connected load.
- 17 2. Peak electrical demand for each panel.
- 18 D. Climate control calculations for each panel.
- 19 1. Verify that sufficient dissipation and/or generation of heat is provided to maintain interior
- 20 panel temperatures within the rated operating temperatures of panel components.
- 21 E. Miscellaneous:
- 22 1. Record Drawings:
- 23 a. Updated panel drawings delivered with the panel(s) from the Contractor's factory.
- 24 b. Drawings shall be enclosed in transparent plastic and firmly secured within each panel.
- 25 F. Operation and Maintenance Manuals:
- 26 1. See Section 01340 for requirements for:
- 27 a. The mechanics and administration of the submittal process.
- 28 b. The content of Operation and Maintenance Manuals.

29 **PART 2 - PRODUCTS**

30 **2.1 ACCEPTABLE MANUFACTURERS**

- 31 A. Subject to compliance with the Contract Documents, the following manufacturers are
- 32 acceptable:
- 33 1. Enclosures:
- 34 a. Hoffman Engineering Co.
- 35 b. Rittal.
- 36 c. Hammond Manufacturing.
- 37 2. Air conditioners:
- 38 a. Hoffman Enclosures, Inc.
- 39 b. Rittal.
- 40 c. Hammond Manufacturing.
- 41 3. Internal corrosion inhibitors:
- 42 a. Hoffman Enclosures, Inc.; Model A-HCI.
- 43 b. Northern Technologies International Corporation (NTIC); Model Zerust VC.
- 44 c. Cortec Corporation; Model VpCI Emitting Systems.
- 45 B. Submit request for substitution in accordance with Specification Section 01640.

46 **2.2 FABRICATION**

- 47 A. General:
- 48 1. Fabricate panels with instrument arrangements and dimensions identified in the Contract
- 49 Documents.

- 1 2. Provide panel(s) with the required enclosure rating per NEMA 250 to meet classifications
2 identified in the Contract Documents.
- 3 3. Panel(s) shall be completely assembled at the Contractor's factory.
- 4 a. No fabrication other than correction of minor defects or minor transit damage shall be
5 performed on panels at the jobsite.
- 6 4. Panel shall meet all requirements of UL 508A.
- 7 a. If more than one (1) disconnect switch is required to disconnect all power within a
8 panel or enclosure, provide a cautionary marking with the word "CAUTION" and the
9 following or equivalent, "Risk of Electric Shock-More than one (1) disconnect switch
10 required to de-energize the equipment before servicing."
- 11 5. Provide control panel in accordance with NEC Article 409 - Industrial Control Panels.
- 12 a. In the event of any conflict between NEC Article 409 and UL 508A, the more stringent
13 requirement shall apply.

14 B. Internal Panel Wiring:

- 15 1. Panel wire duct shall be installed between each row of components, and adjacent to each
16 terminal strip.
- 17 a. Route wiring within the panel in wire-duct neatly tied and bundled with tie wraps.
- 18 b. Follow wire-duct manufacturer's recommended fill limits.
- 19 c. Wire-duct shall have removable snap-on covers and perforated walls for easy wire
20 entrance.
- 21 d. Wire-duct shall be constructed of nonmetallic materials with rating in excess of the
22 maximum voltage carried therein.
- 23 2. Wiring shall be installed such that if wires are removed from one (1) device, source of
24 power will not be disrupted to other devices.
- 25 3. Splicing and tapping of wires permitted only at terminal blocks.
- 26 4. Wire bunches to doors shall be secured at each end so that bending or twisting will be
27 around longitudinal axis of wire.
- 28 a. Protect bend area with sleeve.
- 29 5. Arrange wiring neatly, cut to proper length, with surplus wire removed.
- 30 a. Arrange wiring with sufficient clearance.
- 31 b. Provide abrasion protection for wire bundles that pass through openings or across edges
32 of sheet metal.
- 33 6. AC circuits shall be routed separate from analog signal cables and digital signal cables.
- 34 a. Separate by at least 6 IN, except at unavoidable crossover points and at device
35 terminations.
- 36 7. Provide at least 6 IN of separation between intrinsically safe devices and circuits and non-
37 intrinsically safe devices and circuits.
- 38 8. Wiring to pilot devices or rotary switches shall be individually bundled and installed with a
39 "flexible loop" of sufficient length to permit the component to be removed from panel for
40 maintenance without removing terminations.
- 41 9. Conductors for AC and DC circuits shall be type MTW stranded copper listed for operation
42 with 600 V at 90 DegC.
- 43 a. Conductor size shall be as required for load and 16 AWG minimum.
- 44 b. Internal panel wiring color code:
 - 45 1) AC circuits:
 - 46 a) Power wiring: Black.
 - 47 b) Control interconnections: Yellow.
 - 48 c) Neutral: White.
 - 49 d) Ground: Green.
 - 50 2) Low voltage DC circuits:
 - 51 a) Power wiring: Blue.
 - 52 b) Control interconnections: Violet.
 - 53 3) Foreign voltage circuits: Pink.
- 54 10. Analog signal cables shall be of 600 V insulation, stranded copper, twisted-shielded pairs.
- 55 a. Conductor size: 18 AWG minimum.

- 1 b. Terminate shield drain conductors to ground only at one (1) end of the cable.
- 2 11. Wire and cable identification:
- 3 a. Wire and cables numbered and tagged at each termination.
- 4 b. Wire tags:
- 5 1) Slip-on, PVC wire sleeves with legible, machine-printed markings.
- 6 2) Adhesive, snap-on, or adhesive type labels are not acceptable.
- 7 c. Markings as identified in the Shop Drawings.
- 8 C. Grounding Requirements:
- 9 1. Equipment grounding conductors shall be separated from incoming power conductors at the
- 10 point of entry.
- 11 2. Minimize grounding conductor length within the enclosure by locating the ground reference
- 12 point as close as practical to the incoming power point of entry.
- 13 3. Bond electrical racks, chassis and machine elements to a central ground bus.
- 14 a. Nonconductive materials, such as paint, shall be removed from the area where the
- 15 equipment contacts the enclosure.
- 16 4. Bond the enclosure to the ground bus.
- 17 a. It is imperative that good electrical connections are made at the point of contact
- 18 between the ground bus and enclosure.
- 19 5. Panel-mounted devices shall be bonded to the panel enclosure or the panel grounding
- 20 system by means of locknuts or pressure mounting methods.
- 21 6. Sub-panels and doors shall be bonded to ground.
- 22 D. Termination Requirements:
- 23 1. Wiring to circuits external to the panel connected to interposing terminal blocks.
- 24 2. Terminal blocks rigidly mounted on DIN rail mounting channels.
- 25 3. Terminal strips located to provide adequate space for entrance and termination of the field
- 26 conductors.
- 27 4. One (1) side of each strip of terminal blocks reserved exclusively for the termination of field
- 28 conductors.
- 29 5. Terminal block markings:
- 30 a. Marking shall be the same as associated wire marking.
- 31 b. Legible, machine-printed markings.
- 32 c. Markings as identified in the shop drawings.
- 33 6. Terminal block mechanical characteristics, and electrical characteristics shall be in
- 34 accordance with NEMA ICS 4.
- 35 7. Terminal blocks with continuous marking strips.
- 36 a. Each terminal block shall be identified with machine printed labels.
- 37 8. Terminals shall facilitate wire sizes as follows:
- 38 a. 120 Vac applications: Conductor size 12 AWG minimum.
- 39 b. Other: Conductor size 14 AWG minimum..
- 40 9. Analog signal cable shield drain conductors shall be individually terminated.
- 41 10. Install minimum of 20 percent spare terminals.
- 42 11. Bladed, knife switch, isolating type terminal blocks where control voltages enter or leave
- 43 the panel.
- 44 12. Fused terminal blocks shall be used in the following circuits:
- 45 a. Control voltage is used to energize a solenoid valve.
- 46 b. DC power is connected to 2-wire, loop-powered instruments.
- 47 13. Fused terminal blocks shall be provided with blown fuse indicators.
- 48 14. When control circuits require more than one (1) field conductor connected to a single wiring
- 49 point, a sufficient number of terminal points shall be connected internally to allow
- 50 termination of only one (1) field conductor per terminal block.
- 51 15. DIN rail mounting channels shall be installed along full length of the terminal strip areas to
- 52 facilitate future expansion.
- 53 16. Connections to devices with screw type terminals shall be made using spade-tongue,
- 54 insulated, compression terminators.

- 1 E. Component Mounting and Placement:
- 2 1. Components shall be installed per manufacturer instructions.
- 3 2. Control relays and other control auxiliaries shall be mounted on DIN rail mounting channels
- 4 where practical.
- 5 3. Front panel devices shall be mounted within a range of 40 to 70 IN above the finished floor,
- 6 unless otherwise shown in the Contract Documents.
- 7 4. Locate power supplies with sufficient spacing for circulation of air.
- 8 5. Where components such as variable frequency drives and other electromagnetic devices are
- 9 installed within the same enclosure as the PLC system components, provide a barrier of at
- 10 least 6 IN of separation between the “power area containing the electromagnetic devices”
- 11 and the “control area”.
- 12 6. Components mounted in the panel interior shall be fastened to an interior sub-panel using
- 13 machine screws.
- 14 a. Fastening devices shall not project through the outer surface of the panel enclosure.
- 15 7. Excess mounting space of at least 20 percent for component types listed below to facilitate
- 16 future expansion:
- 17 a. Fuse holders.
- 18 b. Circuit breakers.
- 19 c. Control relays.
- 20 8. Components installed on sub-panels shall be provides with a minimum spacing between
- 21 component and wire duct of 1 IN.
- 22 a. Minimum of 2 IN separation between terminal strips and wire ducts.
- 23 F. Power Distribution:
- 24 1. Main incoming power circuits shall be protected with a thermal magnetic circuit breaker.
- 25 a. Limit load to maximum of 80 percent of circuit breaker rating.
- 26 2. Component types listed below shall be individually fused so that they may be individually
- 27 de-energized for maintenance:
- 28 a. PLC power supply modules.
- 29 3. Equip each panel with necessary power supplies with ratings required for installed
- 30 equipment and with minimum 25 percent spare capacity.
- 31 G. Internal Panel Lighting and Service Receptacles:
- 32 a. One (1) electrical GFCI duplex receptacle.
- 33 b. One (1) compact fluorescent light fixture with manual switch.
- 34 H. Environmental Controls:
- 35 1. Automatically controlled, closed-loop air conditioner required to maintain temperature
- 36 inside the enclosure below the maximum operating temperature rating of the components
- 37 inside the panel(s).
- 38 2. Environmental control components:
- 39 a. Air conditioner:
- 40 1) Dual-loop design to isolate panel interior air from exterior air.
- 41 2) Thermostat controlled.
- 42 3) Operate from 120 Vac and protected with a dedicated circuit breaker.

43 **PART 3 - EXECUTION**

44 **3.1 FACTORY TESTING**

- 45 A. Scope: Inspect and test entire panel assembly to verify readiness for shipment.
- 46 B. Location: Contractor’s factory.
- 47 C. Factory Tests:
- 48 1. Tests shall be fully documented and signed by the Contractor’s factory supervisor.
- 49 2. The panel shop shall fully test the control panel for correct wiring.
- 50 3. Burn-in test: Panel(s) shall be fully energized for a minimum period of 48 HRS.

1 4. Deficiencies shall be corrected prior to shipment from the Contractor's factory.

2 **3.2 INSTALLATION**

3 A. Anchor panels in a manner to prevent the enclosure from racking, which may cause the access
4 doors to become misaligned.

5 B. Obtain approved panel layouts prior to installation of conduits.

6 C. Install products in accordance with manufacturer's instructions.

7

8

END OF SECTION

9

THIS PAGE INTENTIONALLY LEFT BLANK

1
2

SECTION 16140
WIRING DEVICES (ADDED AD-02)

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Material and installation requirements for:
- 7 a. Wall switches.
- 8 b. Receptacles.
- 9 c. Device wallplates and coverplates.
- 10 B. Related Specification Sections include but are not necessarily limited to:
- 11 1. Division 00 - Procurement and Contracting Requirements.
- 12 2. Division 01 - General Requirements.
- 13 3. Section 16010 - Electrical: Basic Requirements.
- 14 4. Section 16130 - Raceways and Boxes.

15 **1.2 QUALITY ASSURANCE**

- 16 A. Referenced Standards:
- 17 1. National Electrical Manufacturers Association (NEMA):
- 18 a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
- 19 b. WD 1, General Color Requirements for Wiring Devices.
- 20 c. WD 6, Wiring Devices - Dimensional Requirements.
- 21 2. Underwriters Laboratories, Inc. (UL):
- 22 a. 20, General-Use Snap Switches.
- 23 b. 498, Standard for Attachment Plugs and Receptacles.
- 24 c. 514A, Metallic Outlet Boxes.
- 25 d. 894, Standard for Switches for Use in Hazardous (Classified) Locations.
- 26 e. 943, Ground-Fault Circuit-Interrupters.
- 27 f. 1010, Standard for Receptacle-Plug Combinations for Use in Hazardous (Classified)
- 28 Locations.
- 29 g. 1310, Standard for Class 2 Power Units.

30 **1.3 SUBMITTALS**

- 31 A. Shop Drawings:
- 32 1. See Specification Section 01340 for requirements for the mechanics and administration of
- 33 the submittal process.
- 34 2. Product technical data:
- 35 a. Provide submittal data for all products specified in PART 2 of this Specification
- 36 Section.
- 37 b. See Specification Section 16010 for additional requirements.

38 **PART 2 - PRODUCTS**

39 **2.1 ACCEPTABLE MANUFACTURERS**

- 40 A. Subject to compliance with the Contract Documents, the following manufacturers are
- 41 acceptable:
- 42 1. Wall switches and receptacles:
- 43 a. Bryant Electric.
- 44 b. Cooper Wiring Devices by Eaton.
- 45 c. Hubbell Incorporated Wiring Device-Kellems.
- 46 d. Leviton Manufacturing Company.

- 1 e. Legrand/Pass & Seymour.
- 2 f. Eaton Crouse-Hinds.
- 3 g. Appleton Electric Co.
- 4 h. Hubbell Killark.

5 **2.2 WALL SWITCHES**

- 6 A. Basic requirements unless modified in specific requirements paragraph of switches per
- 7 designated areas or types:
 - 8 1. Industrial Specification Grade.
 - 9 2. Quiet action, snap switch.
 - 10 3. Self grounding with grounding terminal.
 - 11 4. Back and side wired.
 - 12 5. Solid silver cadmium oxide contacts.
 - 13 6. Rugged thermoplastic and/or nylon housing and one-piece switch arm.
 - 14 7. Ratings: 20 A, 120/277 Vac.
 - 15 8. Switch handle type: Toggle.
 - 16 9. Types as indicated on the Drawings:
 - 17 a. Single-pole.
 - 18 b. Double-pole.
 - 19 c. 3-way.
 - 20 d. 4-way.
 - 21 e. Momentary contact.
 - 22 10. Standards: UL 20, UL 514A, NEMA WD 1, NEMA WD 6.
- 23 B. Wet or Damp Non-Architecturally Finished or Exterior Area Specific Requirements:
 - 24 1. Coverplate:
 - 25 a. Cast aluminum, gasketed, stainless steel hardware, natural, lacquer, or factory painted
 - 26 finish.
 - 27 b. Operator type:
 - 28 1) Side mounted rocker type handle to operate snap switch.
 - 29 2) Front mounted lever type handle to operate snap switch.
 - 30 3) Push/pull operator to operate snap switch.
 - 31 4) Spring type door to cover snap switch.
 - 32 c. Wet location rated.
 - 33 d. Single or multiple gang as required.

34 **2.3 RECEPTACLES**

- 35 A. Basic requirements unless modified in specific requirements paragraph of receptacles and per
- 36 designated areas:
 - 37 1. Industrial Specification Grade.
 - 38 2. Straight blade.
 - 39 3. Brass triple wipe line contacts.
 - 40 4. One-piece grounding system with double wipe brass grounding contacts and self grounding
 - 41 strap with grounding terminal.
 - 42 5. Back and side wired.
 - 43 6. Rating: 20 A, 125 Vac.
 - 44 7. High impact nylon body.
 - 45 8. Duplex or simplex as indicated on the Drawings.
 - 46 9. Configuration: NEMA 5-20R.
 - 47 10. Standards: UL 498, UL 514A, NEMA WD 1, NEMA WD 6.
- 48 B. Receptacle Type Specific Requirements:
 - 49 1. Basic receptacles:
 - 50 a. Weather-resistant when located in exterior locations or interior damp or wet areas as
 - 51 indicated on the Drawings.
 - 52 1) Identification: Letters “WR” on face of receptacle.

- 1 2. Ground Fault Circuit Interrupter (GFCI):
- 2 a. Specification Grade.
- 3 b. Class A protection.
- 4 c. Feed through type.
- 5 d. Test and reset buttons.
- 6 e. Self-testing.
- 7 f. Visual indicator light.
- 8 g. Weather-resistant when located in exterior locations or interior damp or wet areas as
- 9 indicated on the Drawings.
- 10 1) Identification: Letters "WR" on face of receptacle.
- 11 h. Additional standards: UL 943.
- 12 3. Plug load (PL) control receptacle.
- 13 a. Commercial Specification Grade.
- 14 b. Dual controlled (PLD) or half controlled (PLH) as indicated on the Drawings.
- 15 c. Identification: NEMA approved controlled receptacle marking on face of receptacle.
- 16 C. Exterior Locations Specific Requirements:
- 17 1. Coverplate:
- 18 a. Extra-duty rated, weatherproof (NEMA 3R) while in use, gasketed, stainless steel
- 19 hardware, copper-free aluminum, 3.2 IN minimum cover depth for #12 AWG cord.

20 **PART 3 - EXECUTION**

21 **3.1 INSTALLATION**

- 22 A. Install products in accordance with manufacturer's instructions.
- 23 B. Mount devices where indicated on the Drawings and as scheduled in Specification Section
- 24 16010.
- 25 C. See Specification Section 16130 for device outlet box requirements.
- 26 D. Where more than one (1) receptacle is installed in a room, they shall be symmetrically arranged.
- 27 E. Provide blank plates for empty outlets.

29 **END OF SECTION**

30

THIS PAGE INTENTIONALLY LEFT BLANK

1 **SECTION 16410**
2 **SAFETY SWITCHES (ADDED AD-02)**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Safety switches.
- 7 B. Related Specification Sections include but are not necessarily limited to:
8 1. Division 00 - Procurement and Contracting Requirements.
9 2. Division 01 - General Requirements.
10 3. Section 16010 - Electrical: Basic Requirements.
11 4. Section 16490 - Overcurrent and Short Circuit Protective Devices.

12 **1.2 QUALITY ASSURANCE**

- 13 A. Referenced Standards:
14 1. National Electrical Manufacturers Association (NEMA):
15 a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
16 b. KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts
17 Maximum).
18 2. Underwriters Laboratories, Inc. (UL):
19 a. 98, Enclosed and Dead-Front Switches.

20 **1.3 SUBMITTALS**

- 21 A. Shop Drawings:
22 1. See Specification Section 01340 for requirements for the mechanics and administration of
23 the submittal process.
24 2. Product technical data:
25 a. Provide submittal data for all products specified in PART 2 of this Specification
26 Section.
27 b. Provide a Summary Table or use Exhibit A that associates the safety switch features
28 with connected equipment tag number. Exhibit A indicates minimum data required.
29 c. See Specification Section 16010 for additional requirements.

30 **PART 2 - PRODUCTS**

31 **2.1 ACCEPTABLE MANUFACTURERS**

- 32 A. Subject to compliance with the Contract Documents, the following safety switch manufacturers
33 are acceptable:
34 1. Eaton
35 2. General Electric Company.
36 3. Square D Company.
37 4. Siemens.
38 5. Appleton Electric Company.
39 6. Crouse-Hinds.
40 7. Killark.

41 **2.2 SAFETY SWITCHES**

- 42 A. General:
43 1. Non-fusible or fusible as indicated on the Drawings.
44 2. Suitable for service entrance when required.
45 3. NEMA Type HD heavy-duty construction.

- 1 4. Switch blades will be fully visible in the OFF position with the enclosure door open.
- 2 5. Quick-make/quick-break operating mechanism.
- 3 6. Deionizing arc chutes.
- 4 7. Manufacture double-break rotary action shaft and switchblade as one (1) common
- 5 component.
- 6 8. Clear line shields to prevent accidental contact with line terminals.
- 7 9. Operating handle (except NEMA 7 and NEMA 9 rated enclosures):
- 8 a. Red and easily recognizable.
- 9 b. Padlockable in the OFF position
- 10 c. Interlocked to prevent door from opening when the switch is in the ON position with a
- 11 defeater mechanism.

- 12 B. Ratings:
- 13 1. Horsepower rated of connected motor.
- 14 2. Voltage and amperage: As indicated on the Drawings.
- 15 3. Short circuit withstand:
- 16 a. Non-fused: 10,000A.
- 17 b. Fused: 200,000A.

- 18 C. Accessories, when indicated in PART 3 of this Specification Section or on the Drawings:
- 19 1. Neutral kits.
- 20 2. Ground lug kits.
- 21 3. Auxiliary contact kits:
- 22 a. Opens before main switch.
- 23 b. Rated 10A at 125/250 Vac.
- 24 c. One (1) N.O. and one (1) N.C. contact.

- 25 D. Enclosures:
- 26 1. NEMA 3R rated:
- 27 a. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers
- 28 standard paint inside and out.
- 29 b. With or without knockouts, hinged and lockable door.

- 30 E. Overcurrent and short circuit protective devices:
- 31 1. Fuses.
- 32 2. See Specification Section 16490 for overcurrent and short circuit protective device
- 33 requirements.

- 34 F. Standards: NEMA KS 1, UL 98.

35 **PART 3 - EXECUTION**

36 **3.1 INSTALLATION**

- 37 A. Install as indicated and in accordance with manufacturer's instructions and recommendations.

39 **END OF SECTION**

40

1
2

EXHIBIT A

Safety Switch Summary Table					
Equipment Tag	Switch Model Number	Rated Amps	Fused / Non-fused	Enclosure Type	Accessories
Example	Per MFR	60A	NF	NEMA 4X non-metallic	Ground lug, Aux Contact

3

1 **SECTION 16500**

2 **INTERIOR AND EXTERIOR LIGHTING (ADDED AD-02)**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Material and installation requirements for:
7 a. Exterior and site luminaires.
8 b. Lamps and LEDs.
9 c. Ballasts and drivers.

10 B. Related Specification Sections include but are not necessarily limited to:

- 11 1. Division 00 - Procurement and Contracting Requirements.
12 2. Division 01 - General Requirements.
13 3. Division 03 - Concrete.
14 4. Section 16010 - Electrical: Basic Requirements.
15 5. Section 16120 - Wire and Cable - 600 Volt and Below.

16 **1.2 QUALITY ASSURANCE**

17 A. Referenced Standards:

- 18 1. American National Standards Institute (ANSI):
19 a. C78.377, Specification for the Chromaticity of Solid State Lighting Products.
20 2. Federal Communications Commission (FCC):
21 a. Code of Federal Regulations (CFR), 47 CFR 18, Industrial, Scientific and Medical
22 Equipment.
23 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
24 a. C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
25 4. Illuminating Engineering Society of North America (IESNA):
26 a. LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products.
27 b. LM-80, Measuring Lumen Maintenance of LED Light Sources.
28 5. National Electrical Manufacturers Association (NEMA):
29 a. 250, Enclosures for Electrical Equipment (1000Volts Maximum).
30 b. 410, Performance Testing for Lighting Controls and Switching Devices with Electronic
31 Fluorescent Ballasts.
32 c. LE 4, Recessed Luminaires, Ceiling Compatibility.
33 6. National Electrical Manufacturers Association/American National Standards Institute
34 (NEMA/ANSI):
35 a. C82.4, Ballasts for High-Intensity Discharge and Low-Pressure Sodium (LPS) Lamps
36 (Multiple-Supply Type).
37 b. C82.11, High-Frequency Fluorescent Lamp Ballasts - Supplements.
38 c. SSL 1, Electronic Drivers for LED Devices, Arrays and Systems.
39 7. National Fire Protection Association (NFPA):
40 a. 70, National Electrical Code (NEC).
41 b. 101, Life Safety Code.
42 8. Underwriters Laboratories, Inc. (UL):
43 a. 248-4, Low-Voltage Fuses - Part 4: Class CC Fuses.
44 b. 844, Standard for Luminaires for Use in Hazardous (Classified) Locations.
45 c. 924, Standard for Emergency Lighting and Power Equipment.
46 d. 935, Standard for Fluorescent-Lamp Ballasts.
47 e. 1012, Power Units Other Than Class 2.
48 f. 1029, Standard for High-Intensity-Discharge Lamp Ballasts.
49 g. 1310, Class 2 Power Units.
50 h. 1598, Luminaires.

- i. 8750, Light Emitting Diode (LED) Equipment for Use in Lighting Products.
- 9. United States Department of Energy (USDOE):
 - a. EAct, the National Energy Policy Act.

1.3 DEFINITIONS

- A. Average Rated Life for HID, fluorescent and induction luminaire light sources:
 - 1. The time after which 50 percent of a large group of light sources will have failed and 50 percent will have survived under normal operating conditions.
- B. Useful Life for LED luminaire light sources:
 - 1. The operating hours before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions.
 - 2. This is also known as 70 percent "Rated Lumen Maintenance Life" as defined in IESNA LM-80.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01340 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. Identify luminaire by Luminaire Schedule designation.
 - c. Luminaire data sheet:
 - 1) Name of manufacturer.
 - 2) Complete order information (catalog number).
 - 3) Description of construction and optics.
 - 4) Total input wattage.
 - 5) Luminous efficacy (lumens/Watt).
 - 6) Photometric performance data including candlepower distribution and coefficient of utilization (CU) table.
 - 7) Dimensional size.
 - 8) Weight.
 - 9) UL nameplate data for luminaires used in Class 1, Division 1 and 2 areas.
 - 10) Effective Projected Areas (EPA) for pole mounted luminaires.
 - d. See Specification Section 16010 for additional requirements.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01340 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
 - b. Submittal data for each component covered by warranty.
 - c. Warranty.

1.5 WARRANTY

- A. Minimum of a five (5) year Warranty from date of manufacture against failure for electronic fluorescent ballasts.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Luminaires: Per Luminaire Schedule {or equal}.
 - 2. Lamps:
 - a. General Electric.

- 1 b. Osram Sylvania.
- 2 c. Philips Lighting Company.
- 3 d. Venture.
- 4 3. Ballasts:
- 5 a. Fixture manufacturer's standard.

6 **2.2 GENERAL REQUIREMENTS**

- 7 A. All Luminaires and Electrical Components:
 - 8 1. UL labeled.
 - 9 2. Fixtures complete with lamps and ballasts.
 - 10 3. Rated for area classification as indicated on the Drawings.
 - 11 a. In Class I, Division 1 and 2 areas, the temperature rating of the luminaires and lamp or
 - 12 LED combination shall not exceed the auto-ignition temperature of the atmosphere in
 - 13 which the Luminaire is used.
- 14 B. Provide all recessed luminaires with gaskets of rubber, fiberglass, or equivalent material to
- 15 prevent light leaks around flush trim.
 - 16 1. Provide recessed luminaires with trim gaskets cemented in proper position.
- 17 C. Provide standard plaster frame for all recessed luminaires installed in plaster walls or ceilings.
 - 18 1. Design, finish and fabricate material to preclude possibility of rust stain in plaster.
- 19 D. Coordinate luminaire mounting where recessed into building canopies prior to Submitting Shop
- 20 Drawings. Confirm clearances and luminaire flange compatibility with construction.
- 21 E. Electrical components of recessed luminaires shall be accessible and removable through
- 22 luminaire without having to remove luminaire from ceiling.
- 23 F. No live parts normally exposed to contact.
- 24 G. When intended for use in wet areas: Mark luminaire "Suitable for wet locations."
- 25 H. When intended for use in damp areas: Mark luminaire "Suitable for damp locations" or
- 26 "Suitable for wet locations."

27 **2.3 LUMINAIRES**

- 28 A. Standards and Listings:
 - 29 1. UL 1598.
 - 30 2. UL 844 for hazardous locations.
 - 31 3. NEMA LE 4 for recessed locations.
- 32 B. Housings:
 - 33 1. As indicated in the following:
 - 34 a. Down Light luminaires:
 - 35 1) Minimum 22 gage sheet steel, or minimum 16 gage sheet aluminum, unless noted
 - 36 otherwise.
 - 37 2) Auxiliary junction box secured to mounting frame.
 - 38 b. Extruded aluminum housings, where scheduled, shall be at least 1/8 IN thick.
 - 39 c. Punch and form housings prior to finishing (post-paint).
- 40 C. Fasteners:
 - 41 1. As indicated in the Luminaire Schedule and the following:
 - 42 a. Aluminum or steel luminaires: Cadmium-plated or an equivalent.
 - 43 b. Stainless steel luminaires: Stainless steel.
 - 44 c. Bronze luminaires: Bronze or stainless steel.
 - 45 d. Non-metallic luminaires: Stainless steel.
- 46 D. Finishes:
 - 47 1. As indicated in the Luminaire Schedule and the following:
 - 48 a. Painted surfaces:

- 1) Manufacturer's standard metal pretreatment and baked or air-dried, light-stabilized enamel finish; acrylic, alkyd, epoxy, polyester or polyurethane.
 - 2) White finishes shall have minimum 85 percent reflectance.
 - b. Unpainted surfaces:
 - 1) Interior: Clear anodic coating, satin finish.
 - 2) Exterior: Clear anodic coating.
- E. Lens/Louver Frames:
1. As indicated in the Luminaire Schedule and the following:
 - a. Extruded aluminum with mitered corners.
 - b. Hinging or other normal motion shall not cause lens or louver to drop out.
 - c. No light leak between frame and housing.
- F. Lenses:
1. As Indicated in the Luminaire Schedule and the Following:
 - a. Linear fluorescent luminaires: Male conical prismatic, minimum thickness 0.150 IN, size as required.
 - b. Held securely in place but must also be removable for cleaning and relamping.
- G. Gaskets:
1. As Indicated in the Luminaire Schedule and the Following:
 - a. Moisture seal gaskets at exterior locations and in other designated wet areas.
 - b. Secure frames to luminaire bodies with screws or other means, to result in tight installation, without light leaks.
- H. Lamp Holders:
1. Position sockets so that lamps are in optically correct relation to luminaire components.
 2. Secure sockets by screws to luminaire enclosure or husk. Spring mounted sockets are not approved. Do not use plastic or sheet metal sockets unless specified otherwise.
 3. Sockets with open circuit voltage over 300 volts: Safety type, designed to open supply circuit upon lamp removal.
 4. Fluorescent: White urea plastic body; silver plated phosphor bronze or beryllium copper contacts.
- I. Wiring:
1. Long tube fluorescent luminaires shall comply with NEC requirements and be supplied with a quick disconnect accessible to qualified persons before servicing or maintaining the ballast.
- J. Mounting Accessories:
1. Provide appropriate mounting accessories for each luminaire, compatible with various structural conditions encountered.
 - a) Submit coordinated mounting accessories as part of Shop Drawing submission.
 - 2) Luminaires mounted on suspended ceiling grids should be provided with outlet box designed for grid mounting with direct cord entry and supported by outlet box.
 - 3) For high intensity discharge lamps:
 - a) Use stems suspended from swivel shock-absorbing fittings.

2.4 LAMPS

- A. Medium Screw Base Fluorescent and Solid State:
1. Type and initial lumens as indicated in the Luminaire Schedule.
 2. Size and shape coordinated with luminaire.
 3. Fluorescent:
 - a. Self-ballasted.
 - b. Types: Spiral, reflector.
 4. Solid state:
 - a. Integral driver.

- 1 b. Types: A and PAR.
- 2 B. Fluorescent:
- 3 1. T8 (265 mA) programmed start linear medium bi-pin lamps (G13):
- 4 a. Correlated color temperature of 3500 degrees Kelvin.
- 5 b. Minimum color rendering index (CRI) of 80.
- 6 c. Minimum initial lumen ratings for each lamp type shall be:
- 7 1) 2850 lumens for 48 IN, 32 watt F32T8 lamp.
- 8 d. Average rated life:
- 9 1) 30,000 HRS at 3 HRS per start.
- 10 2) 36,000 HRS at 12 HRS per start.
- 11 e. Low-mercury, green-tipped type manufactured to be in compliance with the EPA's
- 12 Toxicity Characteristic Leaching Procedure (TCLP).

13 **2.5 BALLASTS**

- 14 A. Fluorescent High-Frequency Electronic Ballasts:
- 15 1. General characteristics:
- 16 a. High frequency electronic type and operate lamp(s) at a frequency above 31 kHz to
- 17 avoid interference with infrared devices and eliminate visible flicker.
- 18 1) Avoid frequency ranges of 27-31 kHz, 34-41 kHz, and 55-61 kHz.
- 19 b. Lamp Current Crest Factor of 1.7 or less.
- 20 c. Power Factor greater than 0.98.
- 21 d. Input current shall have Total Harmonic Distortion (THD) of less than 20 percent when
- 22 operated at nominal line voltage with primary lamp.
- 23 e. Operate from 60 Hz input source of 120V through 277V with sustained variations of +/-
- 24 10 percent (voltage and frequency).
- 25 f. Contain auto restart circuitry in order to restart lamps without resetting power.
- 26 g. Class A sound rating or quieter.
- 27 h. Provided with integral leads or poke-in wire trap connectors color coded per ANSI
- 28 C82.11.
- 29 i. Tolerate sustained open circuit and short circuit output conditions.
- 30 j. UL listed, Class P.
- 31 k. Standards:
- 32 1) UL 935.
- 33 2) ANSI C62.41 Category A for Transient protection.
- 34 3) ANSI C82.11 where applicable.
- 35 4) Federal Communications Commission (FCC) rules and regulations, Title 47 CFR
- 36 part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
- 37 5) NEMA 410 for in-rush current limits.
- 38 6) Manufactured in a factory certified to ISO 9001 Quality System Standards.
- 39 2. Fluorescent high-frequency electronic ballasts for T8 linear and T5 long twin-tube lamps:
- 40 a. Type per Luminaire Schedule:
- 41 1) Programmed start.
- 42 b. Minimum Ballast Factor of:
- 43 1) 0.85 for Normal Output.
- 44 c. Minimum starting temperature of 0 DegF.
- 45 d. Five year warranty from date of manufacture for operation at a maximum case
- 46 temperature of 158 DegF.
- 47 3. Fluorescent high-frequency electronic ballasts T8, T5 and T5/HO linear lamps:
- 48 a. Programmed Start.
- 49 b. For T8 linear lamps: NEMA Premium.
- 50 c. Parallel operation providing independent lamp operation allowing remaining lamp(s) to
- 51 maintain full light output when one or more lamps fail.
- 52 d. One circuit-interrupting socket per lamp.
- 53 e. Minimum Ballast Factor, unless otherwise noted in the Luminaire Schedule:
- 54 1) T8 lamps: 0.85.

- 1 2) T5 lamps: 1.0.
- 2 3) T5HO lamps: 1.0.
- 3 f. Minimum starting temperature:
- 4 1) Standard T8 and T5 lamps: 0 DegF.
- 5 2) Energy-saving T8 lamps: 60 DegF.
- 6 3) T5HO lamps: -20 DegF.
- 7 g. Tolerate operation at 158 DegF case temperature without damage.
- 8 h. Suitable to operate in:
- 9 1) Indoor conditioned spaces: 50 – 104 DegF ambient temperature.
- 10 2) Outdoor and unconditioned indoor spaces: 0 – 104 DegF ambient temperature.
- 11 i. Utilize multi-lamp ballasts in luminaires with multiple lamps unless otherwise noted in
- 12 Luminaire Schedule.
- 13 j. Five year warranty from date of manufacture for operation at a maximum case
- 14 temperature of 158 DegF.

15 **2.6 MAINTENANCE MATERIALS**

- 16 A. Furnish a minimum of 2 or 10 percent of total of each type and wattage of lamps, whichever is
- 17 greater.
- 18 B. Furnish a minimum of 10 percent of total of each type and amperage of fuses for fixtures
- 19 indicated to be fused.
- 20 C. Spare parts are to be stored in a box clearly labeled as to its contents.

21 **PART 3 - EXECUTION**

22 **3.1 INSTALLATION**

- 23 A. Coordinate Luminaire Types with Ceiling Construction:
- 24 1. Provide mounting hardware for the ceiling system in which the luminaire is to be installed.
- 25 B. Fasten luminaires supported by suspended ceiling systems to ceiling framing system with hold
- 26 down clips.
- 27 C. Provide mounting brackets and/or structural mounting support for wall-mounted luminaires.
- 28 1. Do not support luminaire from conduit system.
- 29 2. When luminaire is supported from outlet boxes, install per NFPA 70.
- 30 3. Supports for luminaire mounted on exterior walls shall not be attached to exterior face of the
- 31 wall.
- 32 D. Support surface mounted luminaires from the building structure and not from the ceiling
- 33 suspension system.
- 34 1. Luminaires up to 4 FT wide and 4 FT long: A minimum of four supporting points, one at
- 35 each corner.
- 36 2. Luminaires 8 FT long: A minimum of five support points, one at center of luminaire and
- 37 one at each corner.
- 38 3. Luminaires smaller than 2 FT in length: A minimum of two supporting points.
- 39 E. Provide pendant luminaires with swivel hangers which will allow luminaire to swing in any
- 40 direction but will not permit stem to rotate.
- 41 1. Provide hangers with enclosure rating (NEMA 1, 4, or 7) equal to enclosure requirements of
- 42 area in which they are installed.
- 43 2. Swivel hangers for luminaires in mechanical equipment areas: Shock absorbing type.
- 44 3. Secure low and high bay luminaires with safety chain or safety aircraft cable to the building
- 45 structure.
- 46 a. Chain or cable to prevent luminaire from falling more than 3 IN before the luminaire is
- 47 caught by the chain or cable.
- 48 F. Pendant Mounted, Open, Industrial Fluorescent Luminaire:

- 1 1. Not in continuous rows:
 - 2 a. Supported by conduit or by approved chains or cable:
 - 3 b. Hardwired to ceiling mounted junction box.
- 4 2. In continuous rows:
 - 5 a. Supported rigidly with conduit and fasten luminaire to each other or mount on
 - 6 continuous metal channel per Specification Section 16010.
 - 7 b. Hardwired to ceiling mounted junction box.
 - 8 c. Provide reflector alignment clips.
- 9 G. Provide access panels for recessed luminaires that require access for maintenance when such
- 10 access is not provided for in design of luminaire.
 - 11 1. Locate luminaires in accordance with reflected ceiling plans.
- 12 H. Locate luminaire in exact center of ceiling tile unless otherwise indicated.
 - 13 1. Relocate misinstalled luminaire and replace damaged ceiling materials.
- 14 I. Mount luminaire at heights indicated in Specification Section 16010 or per Luminaire Schedule
- 15 or as indicted on the Drawings.
- 16 J. Install exterior luminaires so that water can not enter or accumulate in the wiring compartment.
- 17 K. Where indicated, provide two-level control of three (3) and/or four (4) lamp fluorescent
- 18 luminaires.
 - 19 1. Provide two (2) ballasts per luminaire and control inside lamp(s) in each luminaire by one
 - 20 (1) switch or set of switches and the outside two (2) lamps by a second switch or group of
 - 21 switches.
- 22 L. Emergency Battery Ballasts:
 - 23 1. Where emergency battery ballasts are shown controlled via switching device, wire ballast so
 - 24 lamps will not operate when normal power is available and switching device turns lights off.
 - 25 Lamps will operate in emergency mode regardless of switch position.
 - 26 2. Luminaire manufacturer to supply the emergency battery ballasts with luminaire.
- 27 M. Ground luminaire and ballasts.

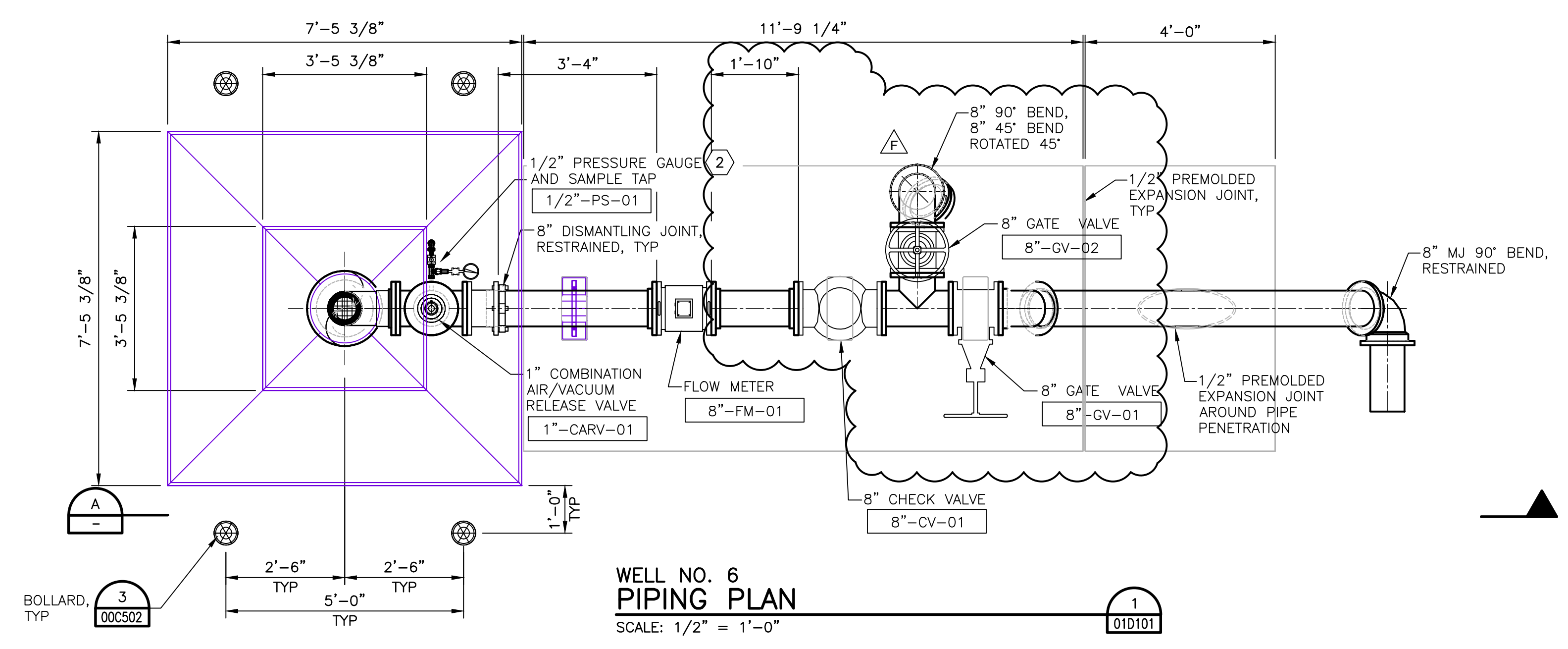
28 3.2 ADJUST AND CLEAN

- 29 A. See Specification Section 01710.
 - 30 B. Replace all inoperable lamps with new lamps prior to final acceptance.
 - 31 C. Aim all emergency lighting units, so that, the path of egress is illuminated.
-

33 **END OF SECTION**

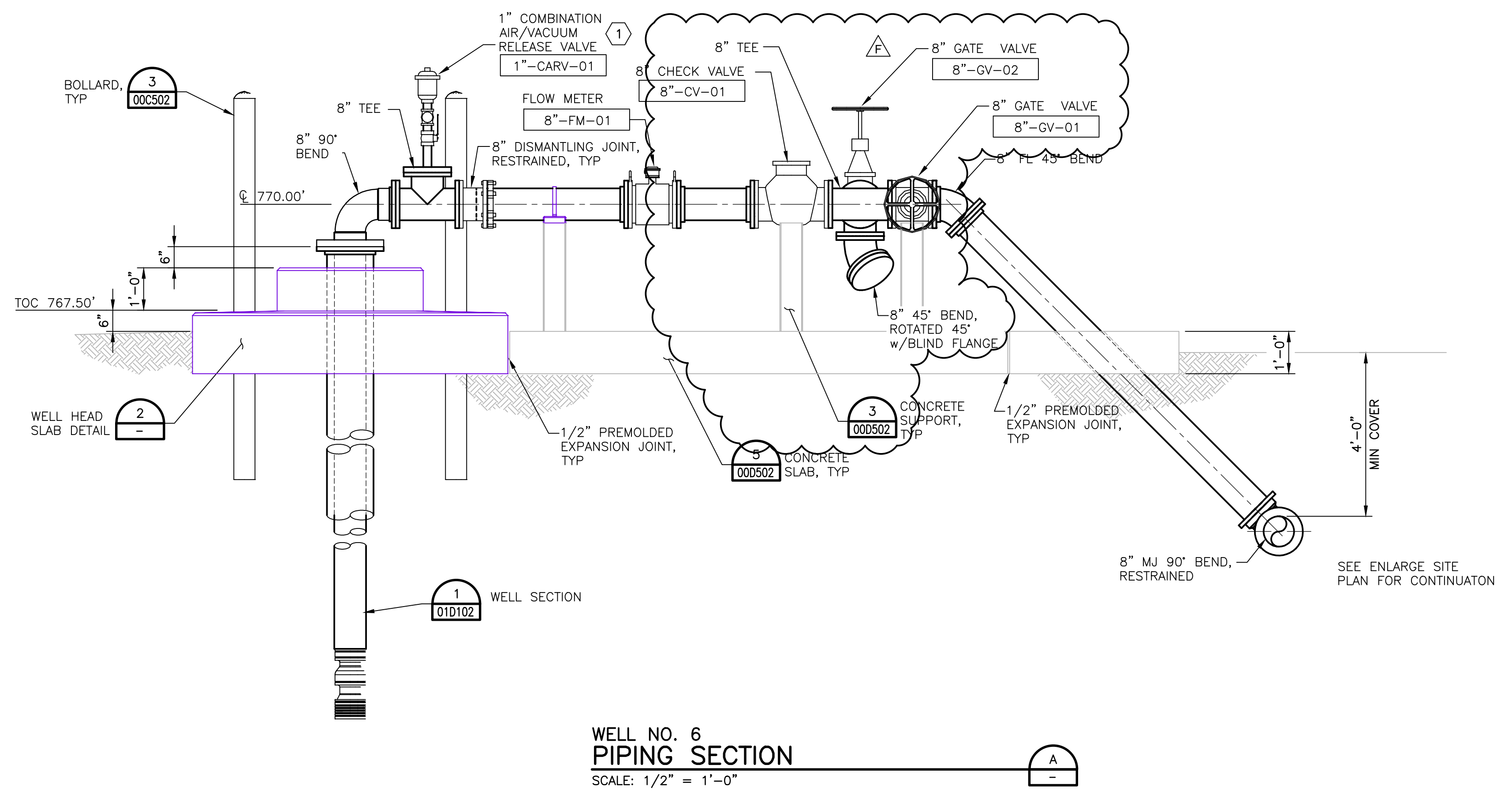
34

THIS PAGE INTENTIONALLY LEFT BLANK

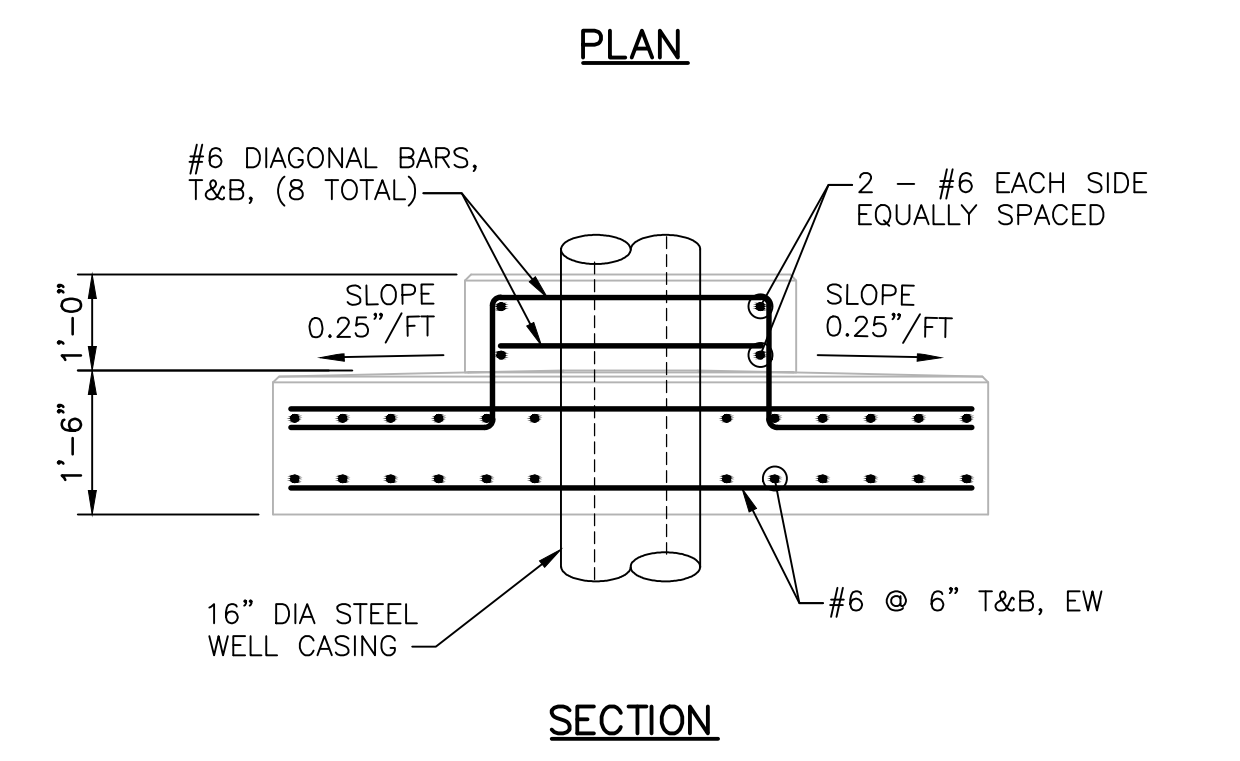
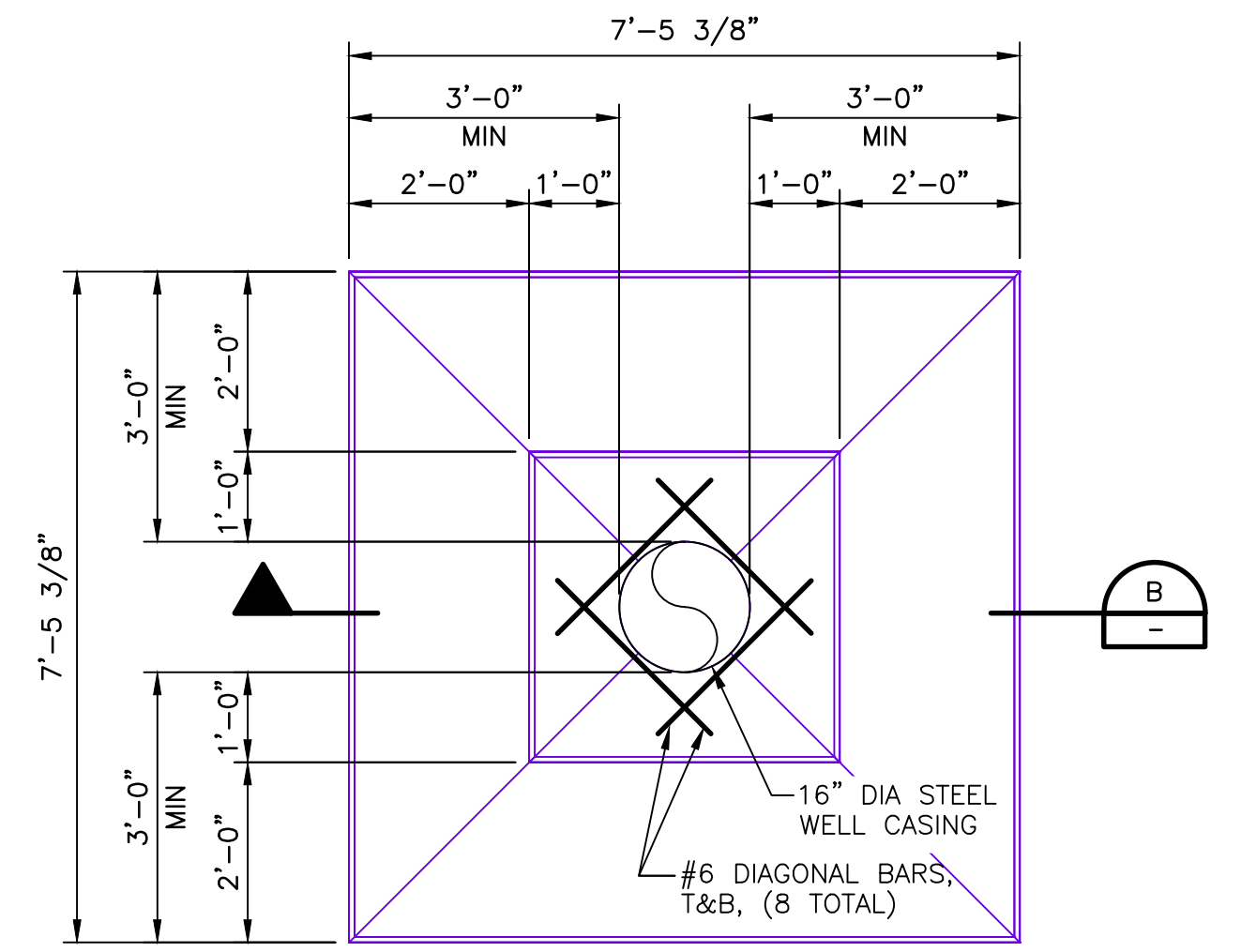


- KEY NOTES:**
- ① BLIND FLANGE, DRILL AND TAP FOR 1" AIR RELEASE VALVE.
 - ② 1/2" DRILLED AND TAPPED FOR PRESSURE GAUGE/TRANSMITTER.

WELL NO. 6 PIPING PLAN
SCALE: 1/2" = 1'-0"



WELL NO. 6 PIPING SECTION
SCALE: 1/2" = 1'-0"



WELL NO. 6 WELL HEAD SLAB DETAIL
SCALE: 1/2" = 1'-0"

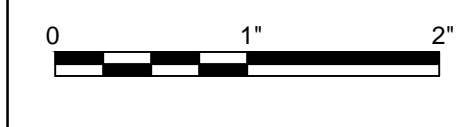


ISSUE	DATE	DESCRIPTION
F	01/16/2017	ADDENDUM NO. 2
E	10/25/2016	ISSUED FOR BID
D	08/12/2016	ISSUED FOR BID
C	07/07/2016	ISSUED FOR 100% REVIEW
B	03/25/2016	ISSUED FOR TCEQ REVIEW
A	02/11/2016	ISSUED FOR 90% REVIEW

PROJECT MANAGER	PETER NEWELL
DESIGNED BY	P. NEWELL
DESIGNED BY	J. FELAN
DRAWN BY	J. FELAN
DRAWN BY	
CHECKED BY	S. BEROSSET
DATE	AUGUST 2016
PROJECT NUMBER	000000010027525

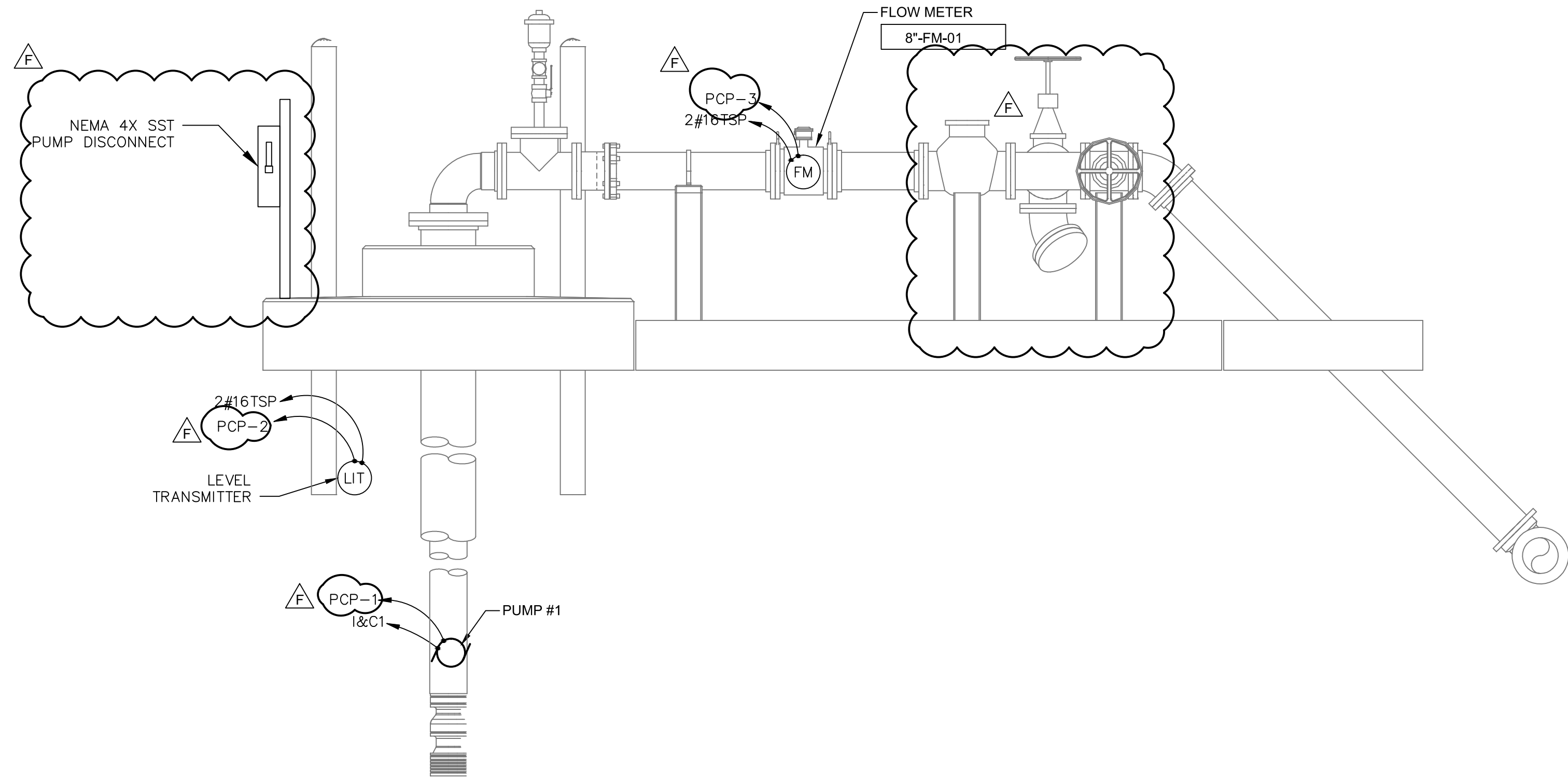


BRUSHY CREEK MUNICIPAL UTILITY DISTRICT
WELL NO. 6 AT SAM BASS FIELD



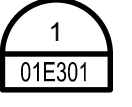
FILENAME | 01D101.dwg
SCALE | 1/2" = 1'-0"

SHEET
01D101



- GENERAL NOTES:**
1. REFER TO ONE-LINE, CONTROL SCHEMATICS, DETAILS, OTHER DISCIPLINE SHEETS AND SPECIFICATIONS FOR OTHER INFORMATION AND REQUIREMENTS.
 2. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL CONDUIT, CONDUCTORS, AND ANY OTHER APPURTENANCES TO PROVIDE POWER TO INSTRUMENTATION FURNISHED BY OTHERS. INSTRUMENTATION INCLUDES LEVEL TRANSMITTER, FLOW METER, AND PLC. COORDINATE WITH SYSTEMS INTEGRATOR AND OWNER.

ELECTRICAL PUMP SECTION
NOT TO SCALE



ISSUE	DATE	DESCRIPTION
F	01/16/2016	ADDENDUM NO. 2
E	10/25/2016	ISSUED FOR BID
D	08/12/2016	ISSUED FOR BID
C	07/07/2016	ISSUED FOR 100% REVIEW
B	03/25/2016	ISSUED FOR TCEQ REVIEW
A	02/11/2016	ISSUED FOR 90% REVIEW

PROJECT MANAGER	PETER NEWELL
DESIGNED BY	L. COLLINS
DESIGNED BY	L. COLLINS
DRAWN BY	L. COLLINS
DRAWN BY	
CHECKED BY	S. BEROSSET
DATE	AUGUST 2016
PROJECT NUMBER	000000010027525



**BRUSHY CREEK
MUNICIPAL UTILITY DISTRICT
WELL NO. 6 AT SAM BASS FIELD**



**ELECTRICAL
PUMP SECTION**

FILENAME | 01E301.dwg
SCALE | AS NOTED

SHEET
01E301

C:\pwworking\hdr\0789711\01E301.dwg, Plot: 1/17/2017 5:21:47 PM, lcollins

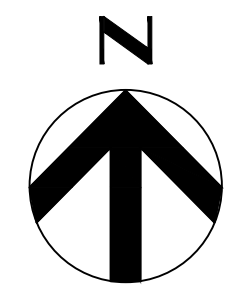
SERVICE LOAD ANALYSIS

PROJECT:	BCMUD #6
PROJECT NUMBER:	272124
SQ FOOTAGE:	

MAIN DISTRIBUTION:	BKR-1	480	VOLT
--------------------	-------	-----	------

TYPE	NEW CONNECTED		NEW DEMAND	
	AMPACITY	KVA	AMPACITY	KVA
EQUIPMENT:	3	2	3	2
RECEPTACLES:	1	1	1	1
LIGHTING:	1	1	1	1
AC/HEATING:	0	0	0	0
CONTINUOUS MOTORS:	77	64	96	80
OTHERS:	0	0	0	0
TOTAL	81	67	101	84

SERVICE VOLTAGE: 480 VOLTS
 REQUIRED SERVICE AMPACITY: 200 AMPS
 SCHEDULED SERVICE AMPACITY: 200 AMPS

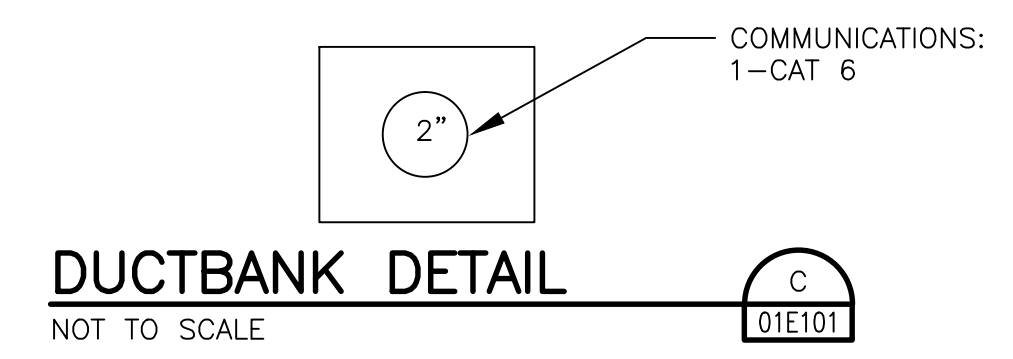
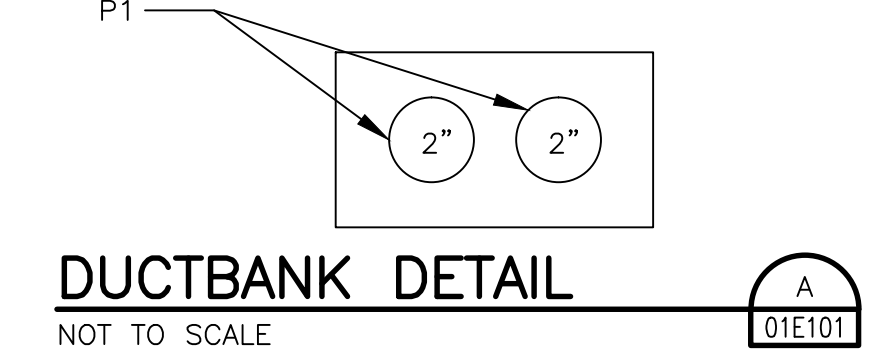
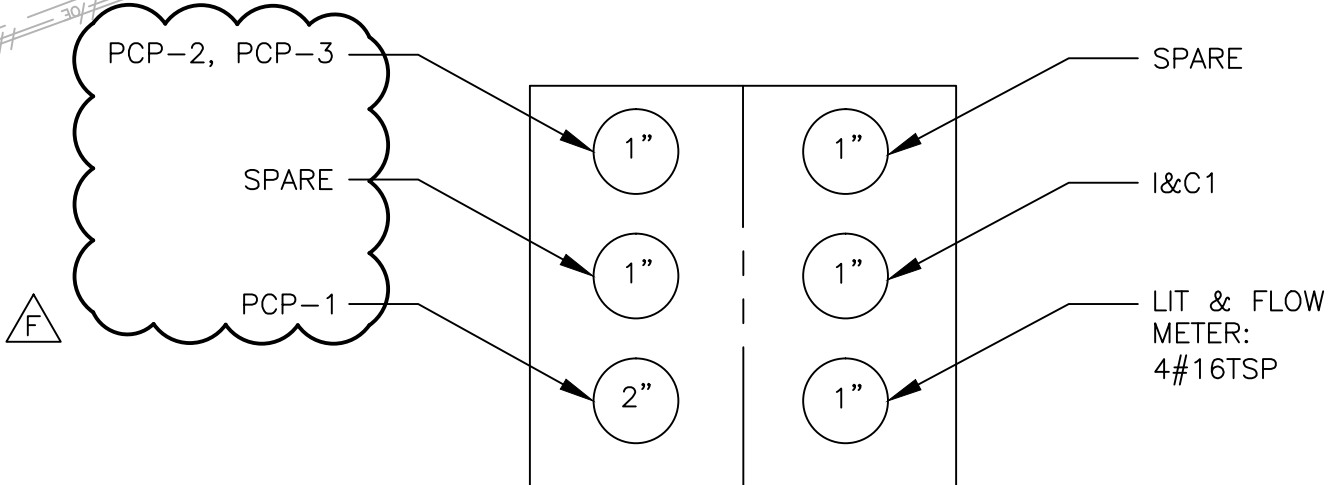
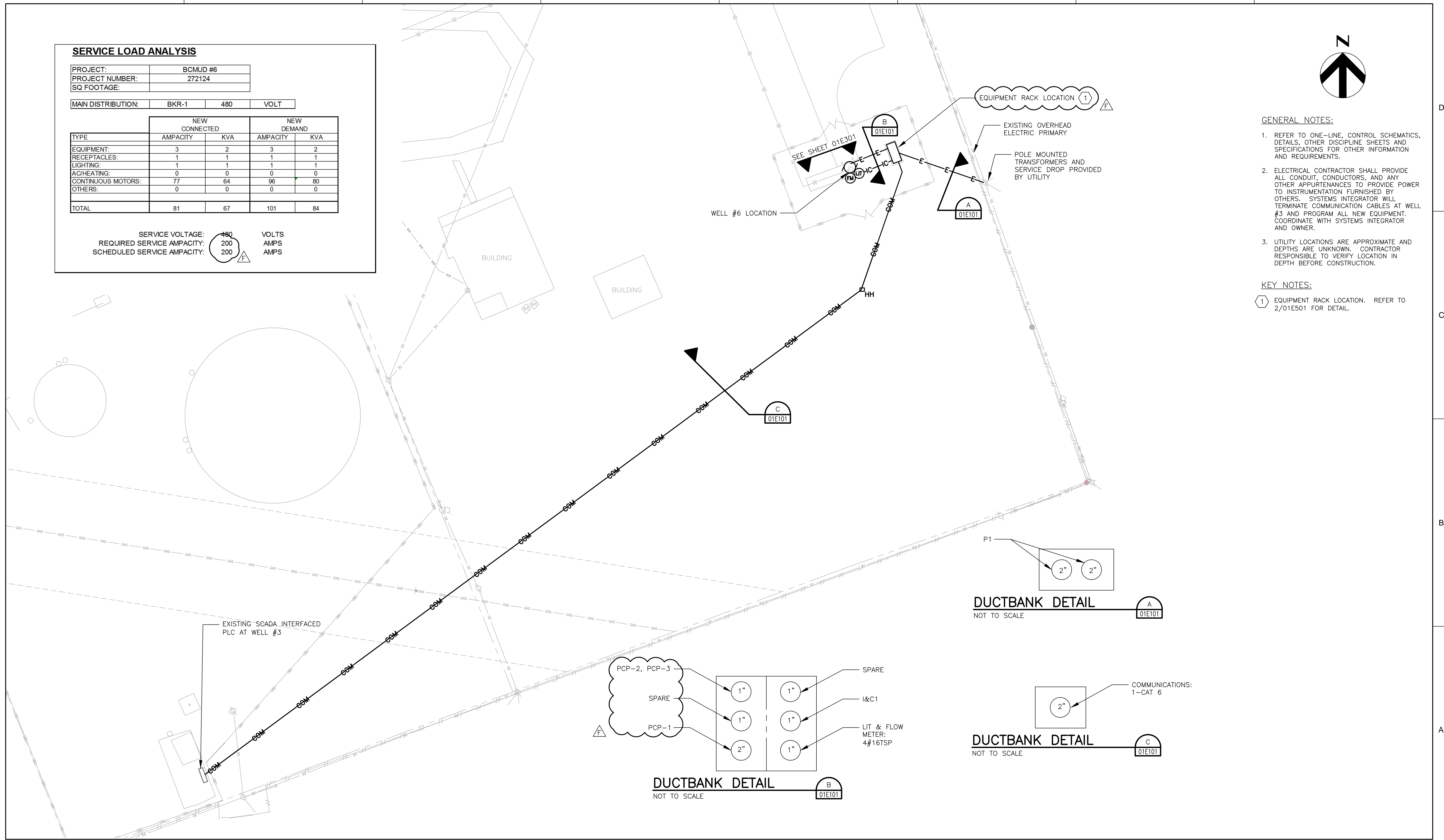


GENERAL NOTES:

- REFER TO ONE-LINE, CONTROL SCHEMATICS, DETAILS, OTHER DISCIPLINE SHEETS AND SPECIFICATIONS FOR OTHER INFORMATION AND REQUIREMENTS.
- ELECTRICAL CONTRACTOR SHALL PROVIDE ALL CONDUIT, CONDUCTORS, AND ANY OTHER APPURTENANCES TO PROVIDE POWER TO INSTRUMENTATION FURNISHED BY OTHERS. SYSTEMS INTEGRATOR WILL TERMINATE COMMUNICATION CABLES AT WELL #3 AND PROGRAM ALL NEW EQUIPMENT. COORDINATE WITH SYSTEMS INTEGRATOR AND OWNER.
- UTILITY LOCATIONS ARE APPROXIMATE AND DEPTHS ARE UNKNOWN. CONTRACTOR RESPONSIBLE TO VERIFY LOCATION IN DEPTH BEFORE CONSTRUCTION.

KEY NOTES:

- ① EQUIPMENT RACK LOCATION. REFER TO 2/01E501 FOR DETAIL.



ISSUE	DATE	DESCRIPTION
F	01/16/2017	ADDENDUM NO. 2
E	10/25/2016	ISSUED FOR BID
D	08/12/2016	ISSUED FOR BID
C	07/07/2016	ISSUED FOR 100% REVIEW
B	03/25/2016	ISSUED FOR TCEQ REVIEW
A	02/11/2016	ISSUED FOR 90% REVIEW

PROJECT MANAGER	PETER NEWELL
DESIGNED BY	L. COLLINS
DESIGNED BY	L. COLLINS
DRAWN BY	L. COLLINS
DRAWN BY	
CHECKED BY	S. BEROSSET
DATE	AUGUST 2016
PROJECT NUMBER	000000010027525



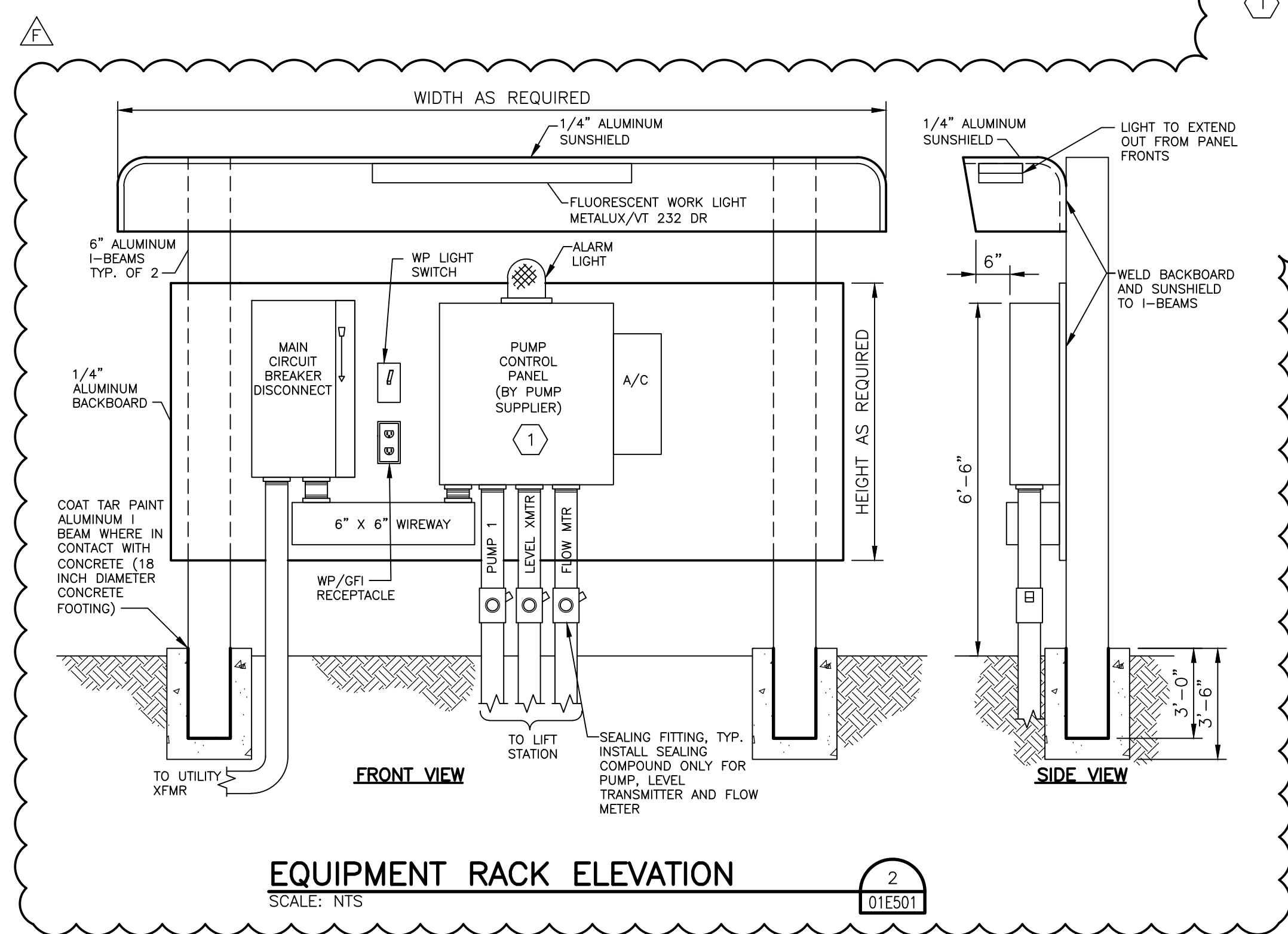
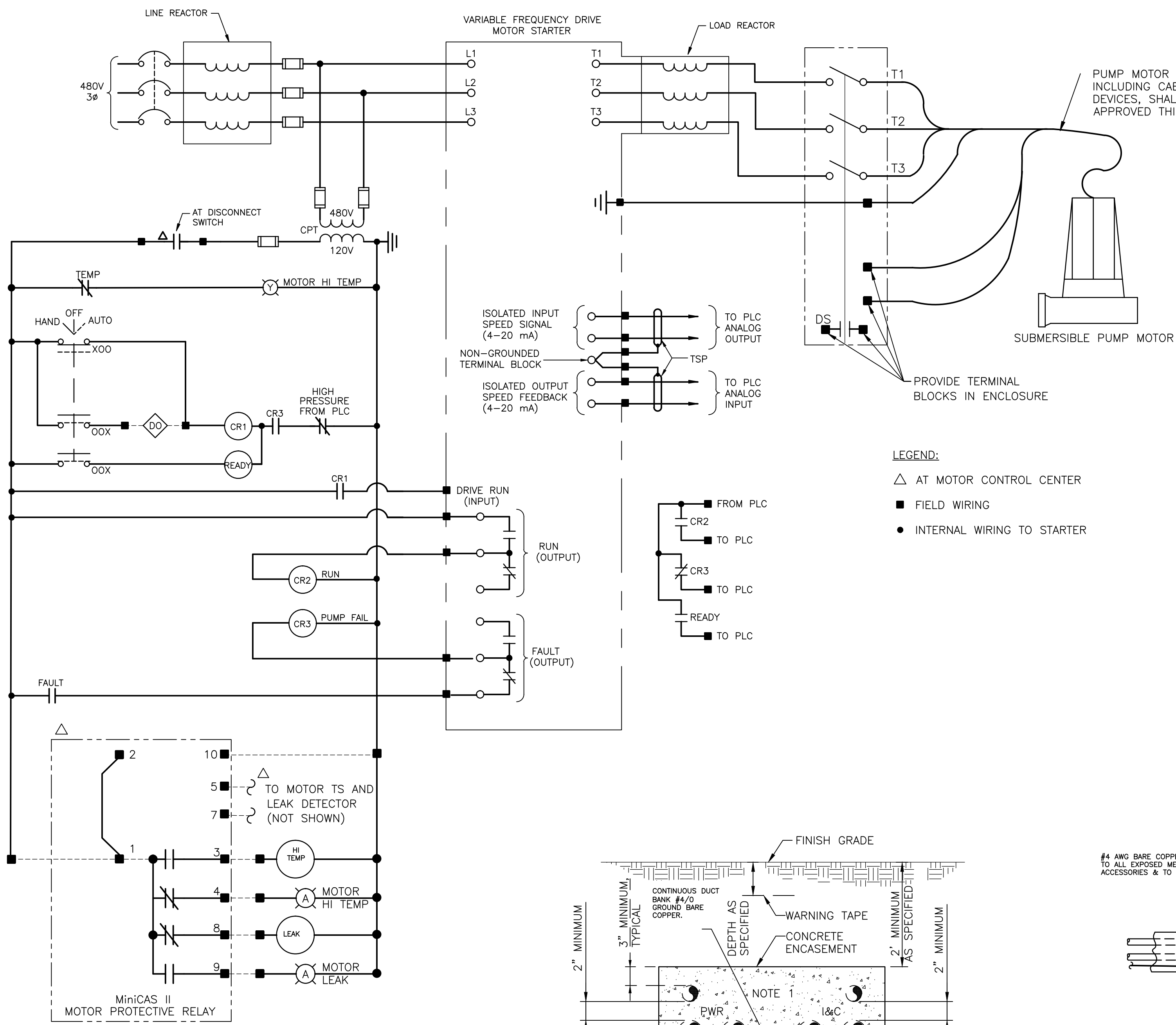
**BRUSHY CREEK MUNICIPAL UTILITY DISTRICT
 WELL NO. 6 AT SAM BASS FIELD**



ELECTRICAL SITE PLAN
 FILENAME | 01E101.dwg
 SCALE | 1" = 20'

SHEET
01E101

C:\pwworking\hds\0789711\01E101.dwg, Plot: 1/17/2017 5:15:31 PM, collins



GENERAL NOTES:

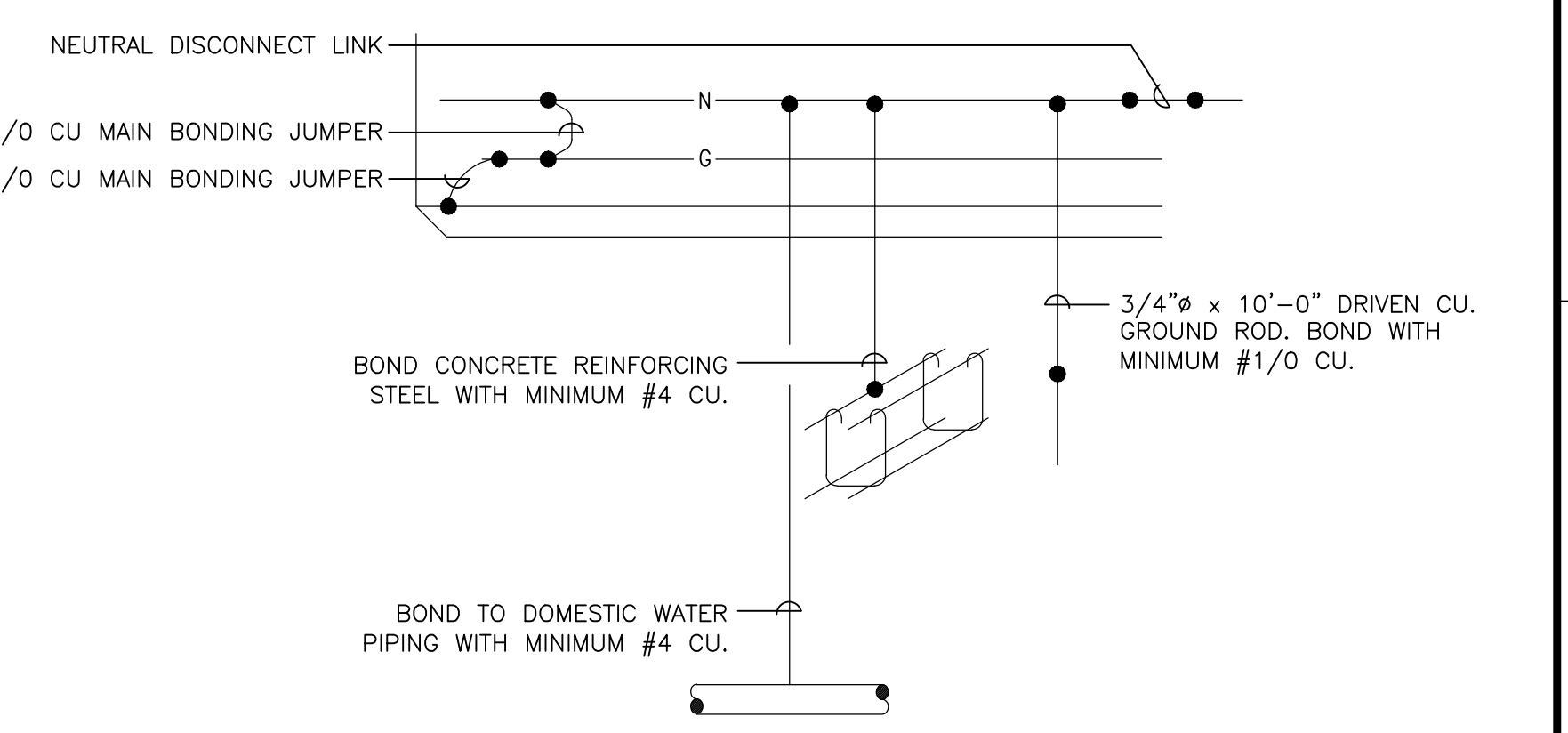
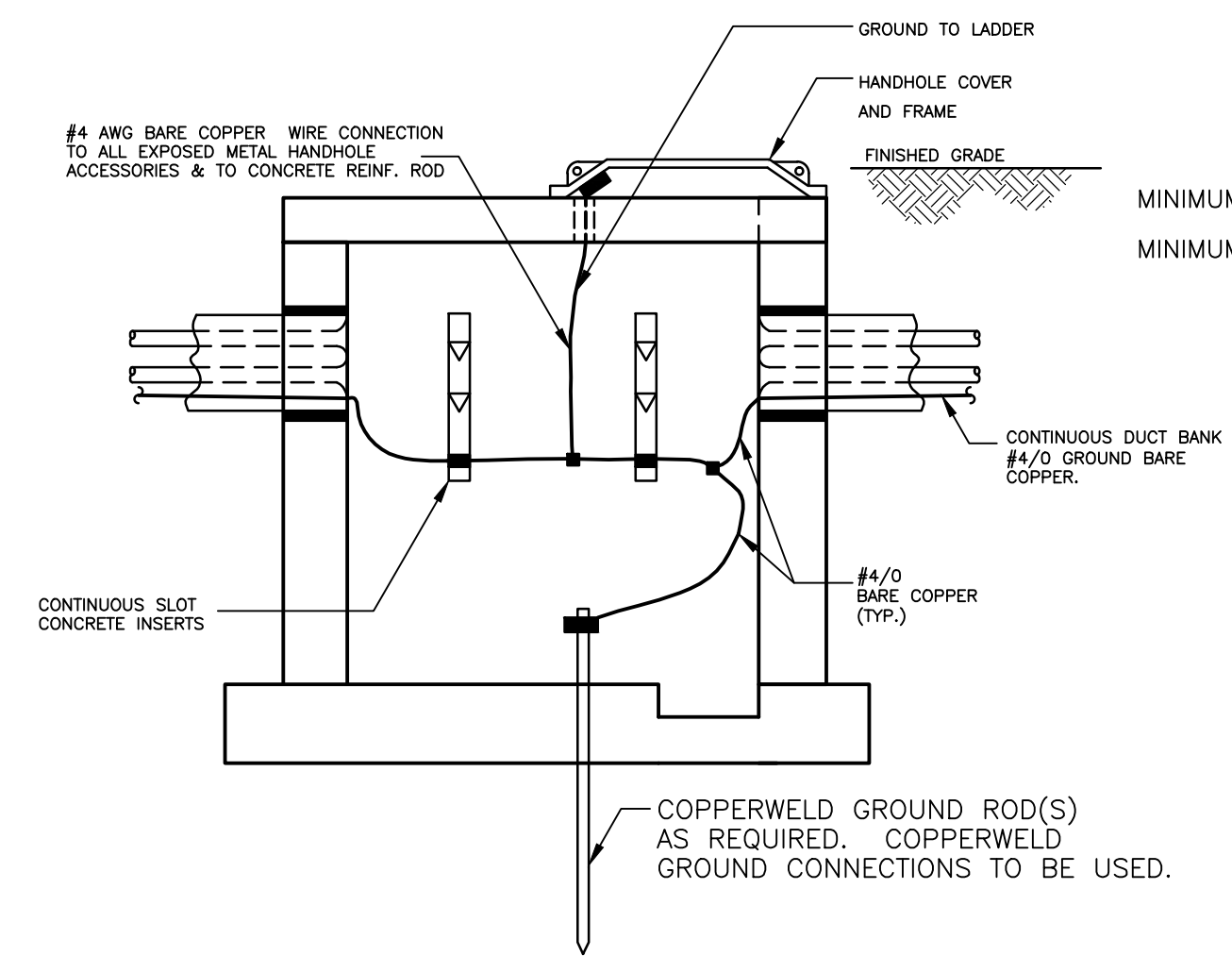
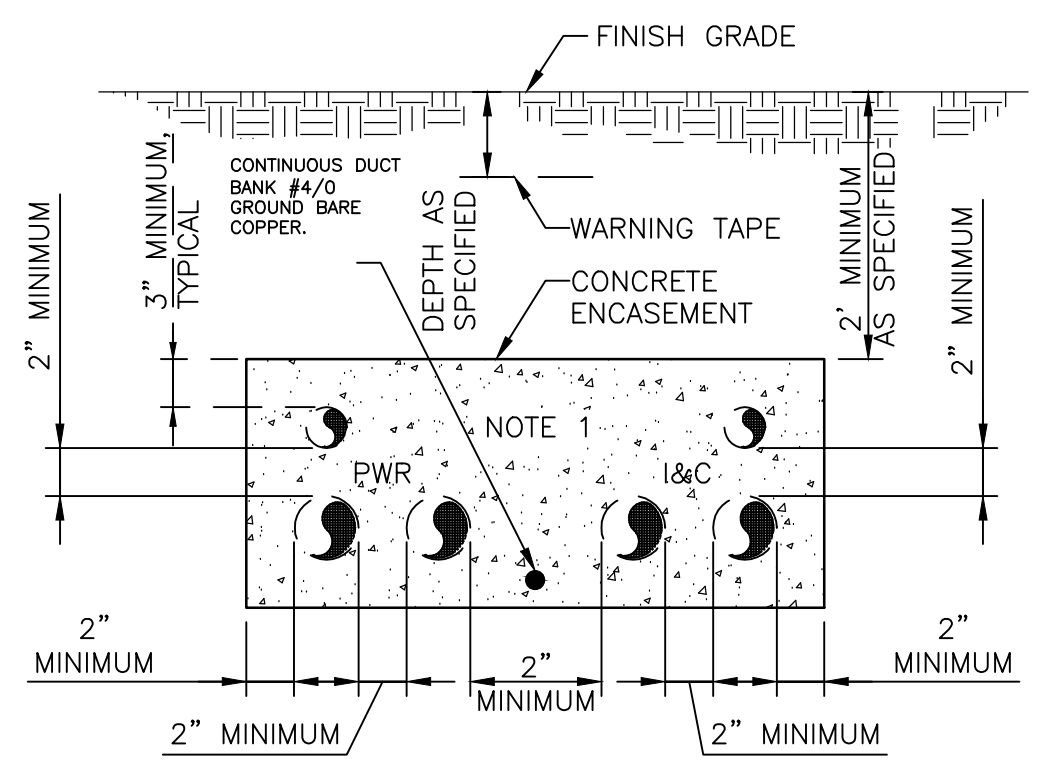
- REFER TO ONE-LINE, CONTROL SCHEMATICS, DETAILS, OTHER DISCIPLINE SHEETS AND SPECIFICATIONS FOR OTHER INFORMATION AND REQUIREMENTS.

KEY NOTES:

- PUMP CONTROL PANEL BY PUMP MANUFACTURER. PUMP CONTROL PANEL SHALL PROVIDE ALL POWER AND INSTRUMENTATION APPURTENANCES FOR, INCLUDING BUT NOT LIMITED TO, WORK LIGHT, 20A GFI RECEPTACLE, INSTRUMENTATION, SURGE PROTECTION, AIR CONDITIONING, PLC, AND VFD. PLC DONE BY OTHERS BUT WILL BE HOUSED WITHIN PUMP CONTROL PANEL. CONTRACTOR SHALL COORDINATE REQUIREMENTS WITH SYSTEMS INTEGRATOR.

LEGEND:

- △ AT MOTOR CONTROL CENTER
- FIELD WIRING
- INTERNAL WIRING TO STARTER



NOTES:

- NUMBER OF CONDUITS AS REQUIRED FOR THE APPLICATION.

CONCRETE ENCASED DUCTBANK
SCALE: NTS

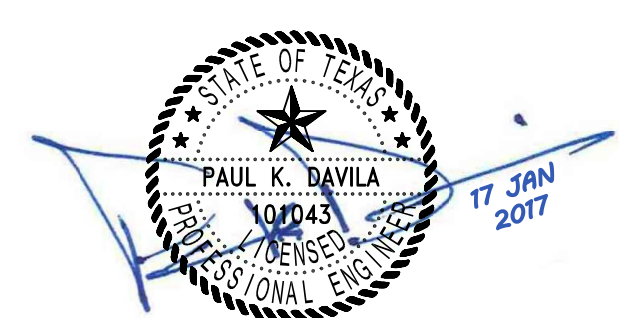
HANDHOLE GROUNDING DETAIL
SCALE: NTS

GROUNDING ELECTRODE SYSTEM DETAIL
SCALE: NTS



ISSUE	DATE	DESCRIPTION
F	01/16/2017	ADDENDUM NO. 2
E	10/25/2016	ISSUED FOR BID
D	08/12/2016	ISSUED FOR BID
C	07/07/2016	ISSUED FOR 100% REVIEW
B	03/25/2016	ISSUED FOR TCEQ REVIEW
A	02/11/2016	ISSUED FOR 90% REVIEW

PROJECT MANAGER	PETER NEWELL
DESIGNED BY	L. COLLINS
DESIGNED BY	
DRAWN BY	L. COLLINS
DRAWN BY	
CHECKED BY	S. BEROSSET
DATE	AUGUST 2016
PROJECT NUMBER	000000010027525



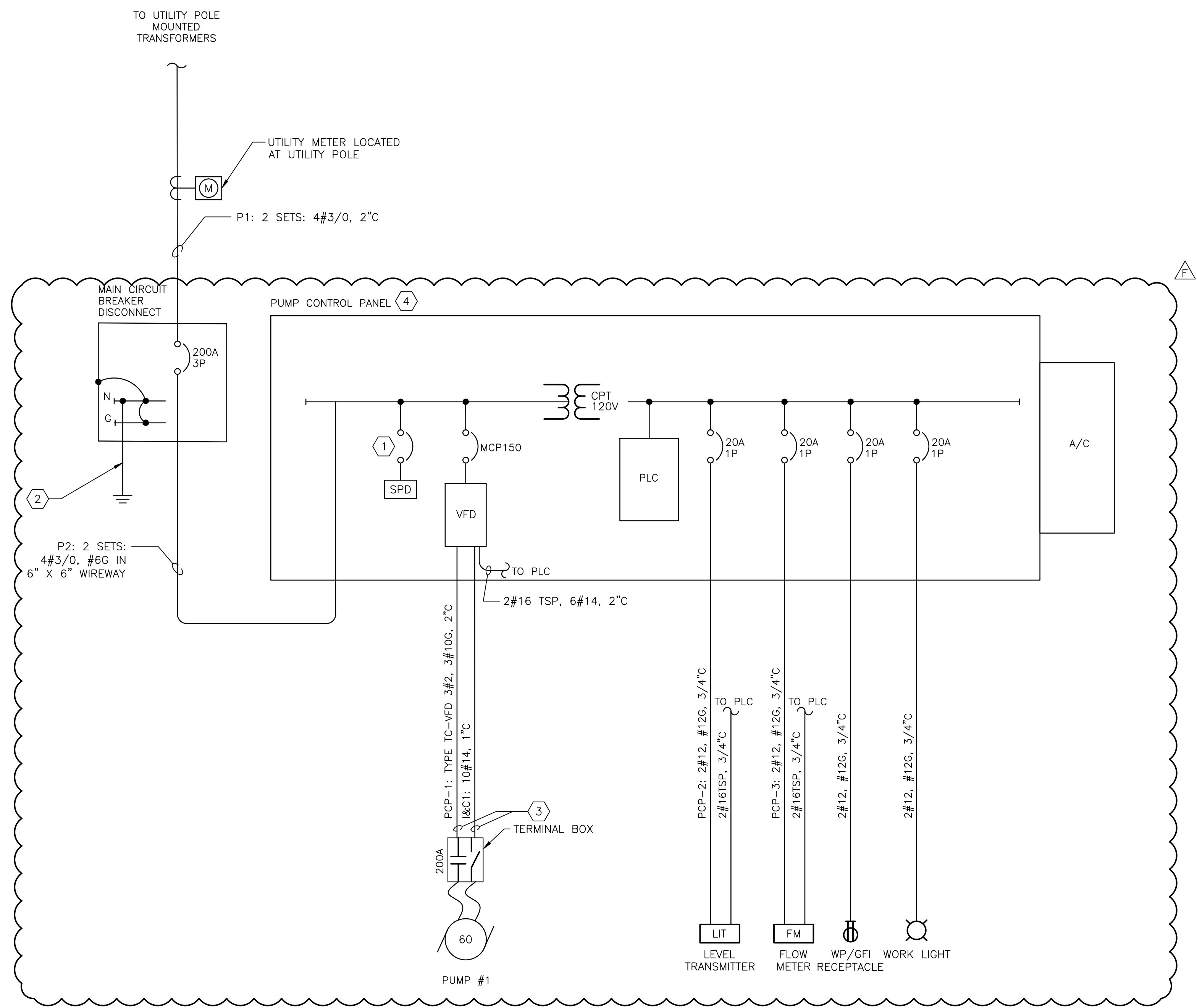
**BRUSHY CREEK
MUNICIPAL UTILITY DISTRICT
WELL NO. 6 AT SAM BASS FIELD**



FILENAME | 01E501.dwg
SCALE | NOT TO SCALE

SHEET
01E501

C:\www\engineering\01E501.dwg, Plot: 1/18/2017 1:44:28 PM, lcollins



GENERAL NOTES:

1. REFER TO ONE-LINE, CONTROL SCHEMATICS, DETAILS, OTHER DISCIPLINE SHEETS AND SPECIFICATIONS FOR OTHER INFORMATION AND REQUIREMENTS.
2. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL CONDUIT, CONDUCTORS, AND ANY OTHER APPURTENANCES TO PROVIDE POWER TO INSTRUMENTATION FURNISHED BY OTHERS. INSTRUMENTATION INCLUDES LEVEL TRANSMITTER, FLOW METER, AND PLC. COORDINATE WITH SYSTEMS INTEGRATOR AND OWNER.

KEY NOTES:

- 1 BREAKER SIZED BY MANUFACTURER.
- 2 REFER TO 6/01E501 FOR GROUNDING ELECTRODE SYSTEM DETAIL.
- 3 PUMP MOTOR AND CONTROL CABLES BY PUMP MANUFACTURER.
- 4 PUMP CONTROL PANEL BY PUMP MANUFACTURER. PUMP CONTROL PANEL SHALL PROVIDE ALL POWER AND INSTRUMENTATION APPURTENANCES FOR INCLUDING BUT NOT LIMITED TO, WORK LIGHT, 20A GFI RECEPTACLE, INSTRUMENTATION, SURGE PROTECTION, AIR CONDITIONING, PLC, AND VFD.

ONE LINE DIAGRAM

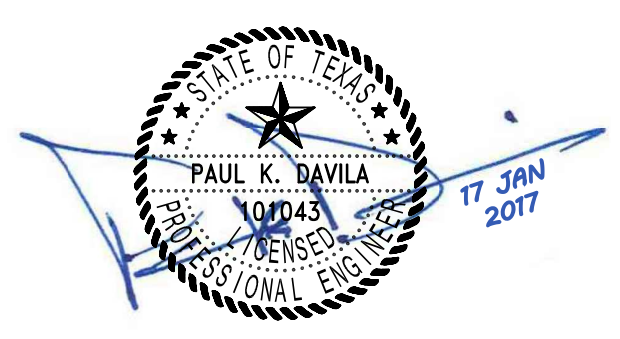
NOT TO SCALE

1
01E601



ISSUE	DATE	DESCRIPTION
F	01/16/2017	ADDENDUM NO. 2
E	10/25/2016	ISSUED FOR BID
D	08/12/2016	ISSUED FOR BID
C	07/07/2016	ISSUED FOR 100% REVIEW
B	03/25/2016	ISSUED FOR TCEQ REVIEW
A	02/11/2016	ISSUED FOR 90% REVIEW

PROJECT MANAGER	PETER NEWELL
DESIGNED BY	L. COLLINS
DESIGNED BY	
DRAWN BY	L. COLLINS
DRAWN BY	
CHECKED BY	S. BEROSSET
DATE	AUGUST 2016
PROJECT NUMBER	000000010027525



**BRUSHY CREEK
MUNICIPAL UTILITY DISTRICT
WELL NO. 6 AT SAM BASS FIELD**

**ELECTRICAL
ONE-LINE DIAGRAM**



FILENAME 01E601.dwg
SCALE AS NOTED

SHEET
01E601

C:\pwworking\hdr\78911\01E601.dwg, Plot: 1/17/2017 5:25:56 PM, collins