ADDENDUM #2

TMWRF ALARM UPGRADE
BID # 22/23-010 / PWP # WA-2023-078
BIDS DUE NO LATER THAN: 1:45 PM ON NOVEMBER 17, 2022 - *REVISED*
PUBLIC BID OPENING: 2:00 PM ON NOVEMBER 17, 2022 - *REVISED*

This addendum is to notify all potential proposers of clarifications made to the Bid documents as stated below.

DRAWINGS

Drawing No. E-19-101: Delete E-19-101 and replace with attached E-19-101.

Drawing No. E-21-101: Delete E-21-101and replace with attached E-21-101.

Drawing No. E-25-101: Delete E-25-101and replace with attached E-25-101.

Drawing No. E-00-601: Delete E-00-601 and replace with attached E-00-601.

SPECIFICATIONS

Specification No. 16000 Electrical General Provisions: Delete 16000 Electrical General Provisions and replace with attached 16000 Electrical General Provisions.

Please note and adjust your bid according to the revisions, additions, deletions, clarifications or modifications as presented on this Addendum #2, which are made a part of this bid. NOTE: To avoid disqualification, this Addendum 2 (and any other addenda) must be signed by an authorized representative of the bidding firm in the space provided and must be submitted with your firm's sealed proposal. Failure to return this addendum, duly signed, may be cause for rejection of the bid. ALL ADDENDA SHOULD BE SIGNED AND PLACED IN SEQUENTIAL ORDER AND ATTACHED TO THE FRONT OF THE BID PACKAGE, COMPLETE WITH ALL REQUIRED DOCUMENTS.

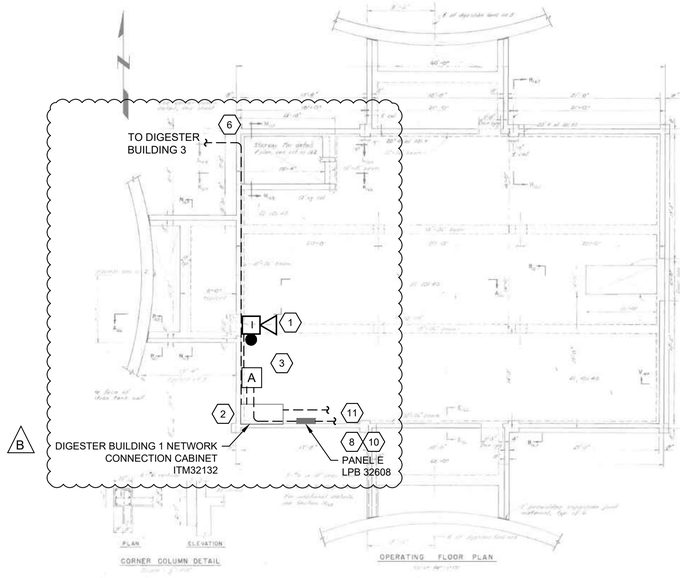
_____
CONTRACTOR BUSINESS NAME

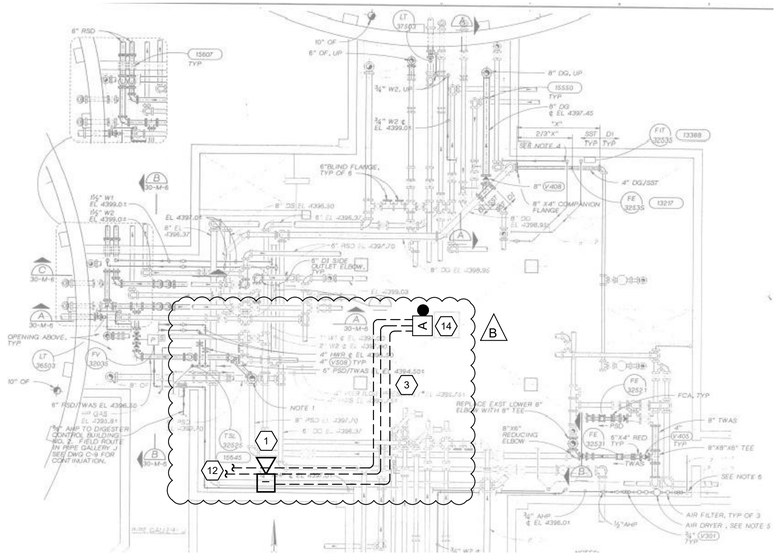
X_____
Authorized Signature

_____
Printed Name of Person Signing

_____
Dan Marran, C.P.M., CPPO
Contracts and Risk Manager

November 10, 2022





DIGESTER CONTROL BUILDING 1 (GROUND FLOOR)

SCALE = NOT TO SCALE

DIGESTER CONTROL BUILDING 1 (BASEMENT LEVEL)

SCALE = NOT TO SCALE

GENERAL SHEET NOTES

A. PROVIDE ALL WORK IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
B. THE LENGTH OF THE CONDUITS FROM AMPLIFIER TO SPEAKER AND/OR STROBE NEED TO BE 50 FT OR LESS.
C. SUPPLY AND INSTALL 18AWG, SINGLE TWISTED PAIR CABLE TO CONNECT THE SPEAKER(S) AND STROBE(S) FROM AMPLIFIER.
D. SUPPLY AND INSTALL 2#12, 1#12 GND CABLE FOR THE POWER OF AMPLIFIER.

SHEET KEYNOTES

1. AREA 19. REFER TO E-00-601 FOR RISER DIAGRAM.
2. SUPPLY AND INSTALL 1"C-(1) CAT 6 CABLE.
3. 3/4" CONDUIT.
4. SUPPLY AND INSTALL NEW ETHERNET SWITCH (ARUBA CX 6100) AT DIGESTER CONTROL BUILDING 2 - LOWER FLOOR.
5. RECEIVE POWER FROM DIGESTER CONTROL BUILDING 2 - GROUND FLOOR (LPB 34610).
6. SUPPLY AND INSTALL CONDUIT. UTILIZE EXISTING CONDUIT RACK IN EXTERIOR LOCATIONS. EXTERIOR CONDUIT SHALL BE PVC COATED.
7. SUPPLY AND INSTALL NEW ETHERNET SWITCH CABINET (ARUBA CX 6100) AT DIGESTER CONTROL BUILDING 3.
8. UTILIZE EXISTING PANEL LPB 32608 FOR POWER OF AMPLIFIER.
9. UTILIZE EXISTING PANELBOARD LPB 30601 (P-4-1) CIRCUIT 9 FOR THE POWER OF AMPLIFIER.
10. CONTRACTOR SHALL CONFIRM THE CIRCUIT NUMBER WITH OWNER.
11. SUPPLY AND INSTALL 1" POWER CONDUIT & 1" SIGNAL CONDUIT FROM HERE TO BASEMENT LEVEL ALARM.
12. USE EXISTING FLOOR PENETRATIONS FOR POWER AND CONTROL SIGNAL WIRING.
13. USE EXISTING FLOOR PENETRATION IN RACEWAY BELOW 120/208 PANEL FOR RUN TO BASEMENT.
14. HANG FROM GRADE BEAM AT 6' ABOVE FLOOR.

DIGESTER CONTROL BUILDING 2 (GROUND FLOOR)

SCALE = NOT TO SCALE

DIGESTER CONTROL BUILDING 2 (BASEMENT)

SCALE = NOT TO SCALE

DIGESTER CONTROL BUILDING 3

SCALE = NOT TO SCALE

DO NOT SCALE DRAWING

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B	ADDENDUM	BW	JB	22.11.08
A	ISSUE FOR BID	JAC	BW	22.07.01

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www.stantec.com

LONG V. HOANG
No. 019006
EXP. 6-30-23
ELECTRICAL

Client/Project
TRUCKEE MEADOWS WATER RECLAMATION FACILITY

ALARM UPGRADE

Washoe County, Nevada

Title ELECTRICAL
DIGESTER CONTROL BUILDINGS
ALARM PLAN

Project Number: 181307119
File Name: 18_E-19-101.dwg

HAM	LVH	BW	JUL 2022
Dwn.	Chkd.	Dsgn.	Date

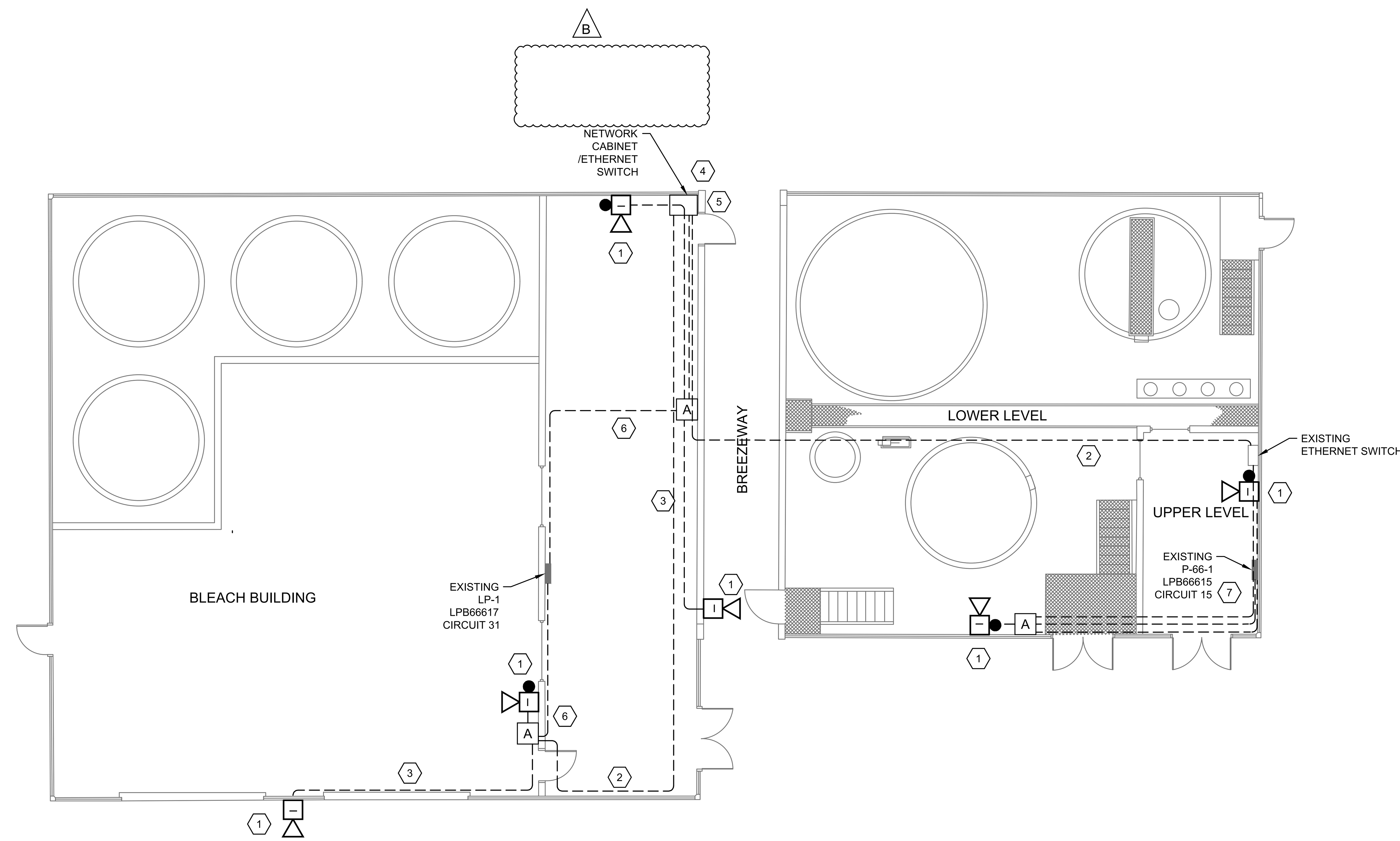
Drawing No. E-19-101
Revision
Sheet 18 of 34

GENERAL SHEET NOTES

A. PROVIDE ALL WORK IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
B. THE LENGTH OF THE CONDUITS FROM AMPLIFIER TO SPEAKER AND/OR STROBE NEED TO BE 50 FT OR LESS.
C. SUPPLY AND INSTALL 18AWG, SINGLE TWISTED PAIR CABLE TO CONNECT THE SPEAKER(S) AND STROBE(S) FROM AMPLIFIER.
D. SUPPLY AND INSTALL 2#12, 1#12 GND CABLE FOR THE POWER OF AMPLIFIER.

SHEET KEYNOTES

1. AREA 21. REFER TO E-00-601 FOR RISER DIAGRAM.
2. SUPPLY AND INSTALL 1"C-(1) CAT 6.
3. 3/4" CONDUIT.
4. SUPPLY AND INSTALL CONDUIT. UTILIZE EXISTING CONDUIT RACK IN EXTERIOR LOCATIONS. EXTERIOR CONDUIT SHALL BE PVC COATED. (B)
5. SUPPLY AND INSTALL ARUBA DS 6100 SWITCH.
6. UTILIZE EXISITNG LP-1 (LPB66617) CIRCUIT 31 FOR THE POWER OF AMPLIFIERS.
7. UTILIZE EXISTING P-66-1 (LPB66615) CIRCUIT 15 FOR THE POWER OF AMPLIFIER.



BLEACH AND CAUSTIC BUILDINGS

SCALE = NOT TO SCALE

0 4' 8' 16'

DO NOT SCALE DRAWING

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A	ISSUE FOR BID	JAC	BW	22.07.01

REGISTERED PROFESSIONAL ENGINEER LONG V. HOANG No. 019006 ELECTRICAL STATE OF NEVADA

Client/Project
TRUCKEE MEADOWS WATER RECLAMATION FACILITY

ALARM UPGRADE

Washoe County, Nevada

Title ELECTRICAL
BLEACH AND CAUSTIC BUILDINGS
ALARM PLAN

Project Number: 181307119
File Name: 21_E-21-101.dwg

HAM	LVH	BW	JUL 2022
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Drawing No. E-21-101

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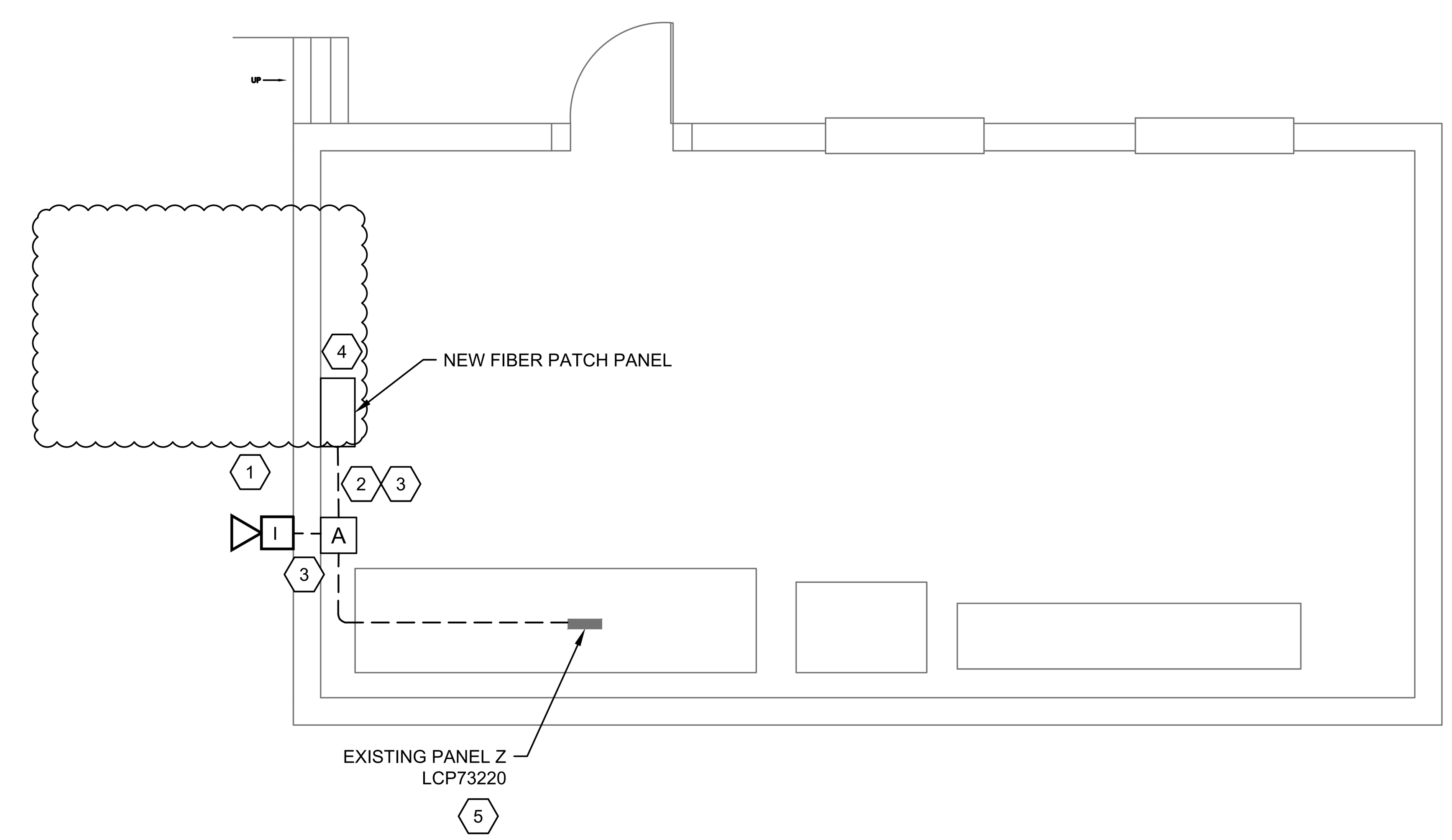
GENERAL SHEET NOTES

A. PROVIDE ALL WORK IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
B. THE LENGTH OF THE CONDUITS FROM AMPLIFIER TO SPEAKER AND/OR STROBE NEED TO BE 50 FT OR LESS.
C. SUPPLY AND INSTALL 18AWG, SINGLE TWISTED PAIR CABLE TO CONNECT THE SPEAKER(S) AND STROBE(S) FROM AMPLIFIER.
D. SUPPLY AND INSTALL 2#12, 1#12 GND CABLE FOR THE POWER OF AMPLIFIER.

SHEET KEYNOTES

1. AREA 25. REFER TO E-00-601 FOR RISER DIAGRAM.
2. SUPPLY AND INSTALL 1"C-(1) CAT 6 CABLE.
3. 3/4" CONDUIT.
4. SUPPLY AND INSTALL CONDUIT. UTILIZE EXISTING CONDUIT RACK IN EXTERIOR LOCATIONS. EXTERIOR CONDUIT SHALL BE PVC COATED. (B)
5. CONTRACTOR SHALL CONFIRM THE CIRCUIT NUMBER WITH OWNER.



RECIRCULATION SUMP CONTROL ROOM

SCALE = NOT TO SCALE

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0 2' 4' 8'

DO NOT SCALE DRAWING

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REGISTERED PROFESSIONAL ENGINEER LONG V. HOANG No. 019006 ELECTRICAL STATE OF NEVADA

Client/Project
TRUCKEE MEADOWS WATER RECLAMATION FACILITY

ALARM UPGRADE

Washoe County, Nevada

Title
ELECTRICAL
RECIRCULATION SUMP CONTROL ROOM
ALARM PLAN

Project Number: 181307119
File Name: 24_E-25-101.dwg

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Drawing No. E-25-101
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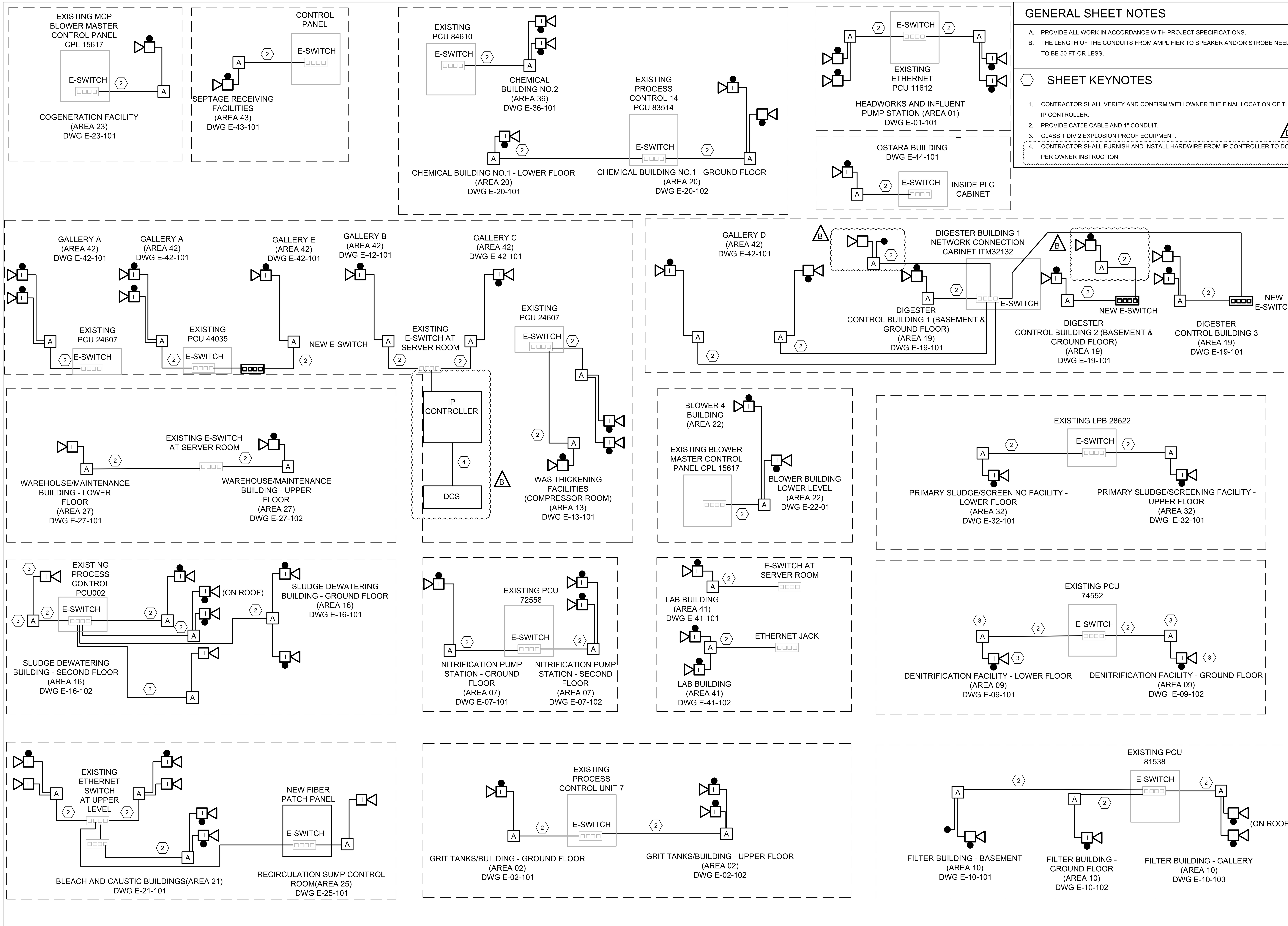

GENERAL SHEET NOTES

A. PROVIDE ALL WORK IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
B. THE LENGTH OF THE CONDUITS FROM AMPLIFIER TO SPEAKER AND/OR STROBE NEED TO BE 50 FT OR LESS.

SHEET KEYNOTES

1. CONTRACTOR SHALL VERIFY AND CONFIRM WITH OWNER THE FINAL LOCATION OF THE IP CONTROLLER.
2. PROVIDE CAT5E CABLE AND 1" CONDUIT.
3. CLASS 1 DIV 2 EXPLOSION PROOF EQUIPMENT.
4. CONTRACTOR SHALL FURNISH AND INSTALL HARDWIRE FROM IP CONTROLLER TO DCS PER OWNER INSTRUCTION. (B)

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REGISTERED PROFESSIONAL ENGINEER LONG V. HOANG No. 019006 ELECTRICAL STATE OF NEVADA

Client/Project
TRUCKEE MEADOWS WATER RECLAMATION FACILITY
ALARM UPGRADE
Washoe County, Nevada

Title
ELECTRICAL RISER DIAGRAM

Project Number:	181307119
File Name:	34_E-00-601.dwg

HAM	LVH	BW	JUL 2022
Dwn.	Chkd.	Dsgn.	Date

Drawing No. E-00-601
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SECTION 16000

ELECTRICAL - GENERAL PROVISIONS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, and equipment required and install complete and make operational, alarm system at the TMWRF as shown on the Drawings and as specified herein.

B. Contractor shall arrange and pay for the City of Sparks Building permit for the work required in the scope.

C. The work shall include furnishing, installing, and testing the equipment and materials detailed in the following Sections:

Section No		Title
13700	-	Alarms and Paging Equipment
16000	-	Electrical - General Provisions
16110	-	Raceways, Boxes, Fittings and Supports
16120	-	Wires and Cables (600 Volt Maximum)
16600	-	Underground Systems
16950	-	Electrical System Testing and Settings

D. The work shall include furnishing and installing the following:

1. Furnish and install Conduit and Cable for electrical equipment under Section 13700.

2. Furnish and install Conduit and Cable for all field-mounted instruments furnished and mounted under other Divisions. Install vendor furnished cables specified under other Divisions.

3. Furnish and install precast manholes, and handholes (if need).

4. Furnish and install manhole and handhole frames and covers (if need).

5. Furnish and install the fully programmed controller. Contractor shall contact the alarm equipment manufacturer for programming. Below is a table showing the alarm priorities, description, tone, and light color.

Alarm Priority	**Description**	**Horn Tone**	**Light Color**
Evacuate	Evacuate	TBD*	Red
1	Priority 1	TBD	Blue
2	Priority 2	TBD	Amber
3	computer alarm	TBD	Green
4	Future	TBD	White

*Coordinate horn tone/recorded message with TMWRF

6. Remove and demolish existing horns, associated equipment, and wiring. Wiring shall be disconnected at each terminus and fully removed. Existing conduit not in conflict with new

work shall remain in place. Work shall be staged to minimize interruptions in alarm function. Work shall be coordinated with Owner in advanced and notice of an alarm interruption provided a minimum of three working days prior to the interruption.

7. Perform testing of the electrical equipment.

E. Each bidder or their authorized representatives shall, before preparing their proposal, visit all areas of the existing buildings and structures in which work under this bid is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that their representative has visited the buildings and structures and noted the locations and conditions under which the work will be performed and that he/she takes full responsibility for a complete knowledge of all factors governing his/her work.

F. Sequencing and Scheduling

1. Coordinate electrical equipment installation with MOPO and/or facility operational constraints as approved by TMWRF staff.

2. Coordinate electrical equipment installation with other building components.

3. Arrange for chases, slots and openings in the building structures during the progress of construction to allow for the electrical installation.

4. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

5. Sequence, coordinate and integrate the installation of electrical materials and equipment for efficient flow of the work. Coordinate the installation of large equipment requiring position prior to closing in the building.

6. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

G. Excavation, bedding material, forms, concrete and backfill for underground raceways; forms and concrete for electrical equipment furnished under Division 16. The work shall be in accordance with Divisions 2 and 3.

1.2 RELATED WORK

A. Asset Identification and Labeling is included in Section 01672.

B. Acceptance testing and Facility Start-up is included in Section 01756.

C. Training and Demonstration Period is included in Section 01820.

D. Operations and Maintenance Data is included in Section 01830.

1.3 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings for equipment, materials and other items furnished under Division 16.

B. As a minimum all equipment specified in each Section of Division 16 shall be submitted at one time. As an example all lighting fixtures shall be submitted together, all motor control centers shall be submitted together, etc. Submittals that do not comply will be returned disapproved.

C. Shop drawings shall be submitted for the following equipment:

1. Raceways, Boxes, Fittings and Hangers

2. Wires and Cables

3. Precast Manholes and Handholes, Frames and Covers

4. Grounding Hardware and Connections

5. Intercom and Paging System

D. The manufacturers name and product designation or catalog numbers shall be submitted for the following material:

1. Raceways, Boxes, Fittings and Hangers

2. Wire and Cable

E. The following shall be submitted for record.

1. Ground System Test Results.

2. Electrical System Test Results

F. Mark submittals to clearly identify proposed equipment including accessories, options, and features and to exclude parts not applicable to the project.

G. Check shop drawings for accuracy prior to submittal. Shop drawings shall be stamped with the date checked and a statement indicating that the shop drawings conform to this Section and the Drawings. This statement shall also list all exceptions to this Section and the Drawings. Mark submittals to identify proposed equipment including accessories, options and features being proposed for approval and exclude parts not to be used. Shop drawings not so checked and noted shall be returned marked NOT APPROVED.

H. The Engineer's check shall be for conformance with the design concept of the project and compliance with this Section and the Drawings. Errors and omissions on approved shop drawings shall not relieve the Contractor from the responsibility of providing materials and workmanship required by this Section and the Drawings.

I. All dimensions shall be field verified at the job site and coordinated with the work of all other trades.

J. Material shall not be ordered or shipped until the shop drawings have been approved. No material shall be ordered or shop work started if shop drawings are marked “APPROVED AS NOTED - CONFIRM," "APPROVED AS NOTED - RESUBMIT" or "NOT APPROVED."

K. In addition to manufacturer's equipment shop drawings, submit electrical installation working drawings containing the following:

1. Concealed and buried conduit layouts, shown on floor plans drawn at not less than 1/4-in = 1-ft-0-in scale. The layouts shall include locations of process equipment, motor control centers, transformers, panelboards, control panels and equipment, motors, switches, motor starters, large junction or pull boxes, instruments and any other electrical devices connected to concealed or buried conduits.

2. Plans shall be drawn on high quality reproducible, double sided bond, size 34-in by 22-in and shall be presented in a neat, professional manner.

3. Review plans and change order related orders work shall be submitted in 11-in x 17-in format.

4. Concrete floors and/or walls containing concealed conduits shall not be poured until conduit layouts are approved.

L. Operation and Maintenance Data

1. Submit operations and maintenance data for equipment furnished under this Division, in accordance with Section 01830 – Operations and Maintenance Data. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists including replacement part numbers, to instruct operating and maintenance personnel unfamiliar with such equipment.

2. Manuals shall include the following as a minimum:

a. A comprehensive index.

b. A complete "As-Built" set of approved shop drawings.

c. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.

d. System schematic drawings "As-Built," illustrating all components, piping and electric connections of the systems supplied under this Section.

e. Detailed service, maintenance and operation instructions for each item supplied.

f. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.

g. The operating instructions shall also incorporate a functional description of the entire system, with reference to the systems schematic drawings and instructions.

h. Complete parts list with stock numbers, including spare parts.

1.4 REFERENCE STANDARDS

A. Electric equipment, materials and installation shall comply with the National Electrical Code (NEC) and with the latest edition of the following codes and standards:

1. National Electrical Safety Code (NESC)

2. Occupational Safety and Health Administration (OSHA)

3. National Fire Protection Association (NFPA)

4. National Electrical Manufacturers Association (NEMA)

5. American National Standards Institute (ANSI)

6. Insulated Cable Engineers Association (ICEA)

7. Instrument Society of America (ISA)

8. Underwriters Laboratories (UL)

9. Factory Mutual (FM)

10. National Electrical Testing Association (NETA)

11. State Building Code

12. The BOCA National Building Code (BOCA)

13. American Society for Testing and Materials (ASTM)

14. Institute of Electrical and Electronics Engineers (IEEE)

15. Joint Industrial Council (JIC)

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.5 PRIORITY OF THE CONTRACT DOCUMENTS

A. If, during the performance of the work, the Contractor finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and the Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or installation method which represents the most stringent option, the highest quality or the largest quantity.

B. In all cases, figured dimensions shall govern over scaled dimensions, but work not dimensioned shall be as directed by the Engineer and work not particularly shown, identified, sized, or located shall be the same as similar work that is shown or specified.

C. Detailed Drawings shall govern over general drawings, larger scale Drawings take precedence over smaller scale Drawings, Change Order Drawings shall govern over Contract Drawings and Contract Drawings shall govern over Shop Drawings.

D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Engineer.

E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times.

1.6 ENCLOSURE TYPES

A. Unless otherwise required, electrical enclosures shall be NEMA Types as follows:

1. NEMA 1 in dry, non-process indoor above grade locations (i.e. administration areas, laboratories, control rooms, storage rooms).

2. NEMA 12 in "DAMP" locations shown on the Drawings and maintenance shops.

3. NEMA 4 in outdoor locations, rooms below grade including basements and buried vaults and "WET" locations shown on the Drawings.

4. NEMA 4X in "CORROSIVE" "WET" locations shown on the Drawings.

1.7 HAZARDOUS AREAS

A. Equipment, materials and installation in areas designated as hazardous on the Drawings shall comply with NEC Articles 500, 501, 502 and 503.

B. Equipment and materials installed in hazardous areas shall be UL listed for the appropriate hazardous area classification.

1.8 CODES, INSPECTION AND FEES

A. Equipment, materials and installation shall comply with the requirements of the local authority having jurisdiction.

B. Obtain all necessary permits and pay all fees required for permits and inspections.

1.9 ELECTRICAL SYSTEM TESTING AND SETTINGS

A. Test systems and equipment furnished under Division 16 and repair or replace all defective work and equipment at no additional cost to TMWRF. Refer to the individual equipment sections for additional specific testing requirements.

B. Make adjustments to the systems furnished under Division 16 and instruct TMWRF's personnel in the proper operation of the systems.

C. In addition to the specific testing requirements listed in the individual Sections, the following minimum tests and settings shall be performed.

1. Mechanical inspection, testing and settings of equipment for proper operation.

2. Check control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by control schematic and wiring diagrams.

3. Inspect each piece of equipment in areas designated as HAZARDOUS to ensure that equipment of proper rating is installed. In the case where HAZARDOUS rated equipment is installed outdoors verify that gasketed enclosures were furnished.

4. Verify grounding of instrumentation equipment.

D. Testing shall be scheduled and coordinated with the Engineer at least 2 weeks in advance. Provide qualified test personnel, instruments and test equipment.

E. Provide a test report verifying compliance with the testing requirements included under Division 16. The report shall include a Table of Content and a data sheet for each component tested. The Table of Content shall identify each component by a unique number. The Number shall appear on the technical data sheet for identification. Submit cable test results, grounding test results, circuit

breaker, motor circuit protector, and protective device settings, fuse type and rating for each piece of equipment. Test report shall be submitted in a three ring binder. Three copies shall be furnished.

1.10 INTERPRETATION OF DRAWINGS

A. CONDUIT

1. Unless specifically stated to the contrary, the Drawings do not show exact locations of conduit runs. Coordinate the conduit installation with other trades and the actual supplied equipment.

2. Conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed. Unless otherwise indicated install branch circuit conduits exposed in process/ industrial type spaces and concealed in finished spaces.

3. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation. Where home-runs indicate conduit is to be installed concealed or exposed the entire branch circuit shall be installed in the same manner.

4. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

5. Except where dimensions are shown, the locations of equipment, fixtures, outlets and similar devices shown on the Drawings are approximate only. Exact locations shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

6. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials to install and place in satisfactory operation all power, lighting and other electrical systems shown.

7. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at his/her own expense. Redesign and detailed plans shall be submitted to the Engineer for approval. No additional compensation will be provided for changes in the work, either his/her own or others, caused by such redesign.

8. Submittal Data Requirements

a. Submittals

i. Catalog cuts or data sheets on restraints to be utilized detailing compliance with this Section. Reference "Type" in accordance with Paragraph F - Materials.

ii. Catalog cuts or data sheets on restraints to be utilized detailing compliance with this Section. Reference "Type" in accordance with Paragraph F - Materials.

iii. An itemized list of all isolated and non-isolated equipment. Detailed schedules showing isolator and seismic restraints proposed for each piece of equipment, referencing material and seismic calculation by drawing numbers.

b. Shop Drawings

i. When walls and slabs are used as seismic restraint locations, details of acceptable methods for conduits, busways, cable bus and cable trays must be included.

ii. Indicate isolation devices selected with complete dimensional and deflection data before condition is accepted for installation.

iii. Provide specific details of seismic restraints and anchors; include number, size and locations for each pipe of equipment.

iv. Coordinated or contract drawings shall be marked with the specific locations and types of restraints shown for conduits, busway and cable tray. Rod bracing and assigned load at each restraint location shall be clearly delineated. Tributary loads shall be considered for proper restraint sizing.

v. For ceiling suspended equipment provide minimum and maximum installation angle allowed for restraint system as well as braced and un-braced rod lengths at each allowable installation condition.

B. Related Work

1. Supplementary Support Steel

a. Contractor shall supply supplementary support steel and connections for all equipment and materials as required.

1.11 SIZE OF EQUIPMENT

A. Investigate each space in the structure through which electrical equipment furnished under Division 16 must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure that the tilting does not impair the functional integrity of the equipment.

1.12 RECORD DRAWINGS

A. As the work progresses, legibly record all field changes on a set of Project Contract Drawings, hereinafter called the "Record Drawings."

B. Record Drawings shall accurately show the installed condition of the following items:

1. Raceways and pull boxes.

2. Conductor sizes and conduit fills.

3. Panel Schedule(s).

4. Control Wiring Diagram(s).

5. Underground raceway and duct bank routing.

6. Page/party system components, wiring and routing of raceways.

7. Grounding system.

8. Point to point connection diagrams:

   a. Provide detailed point-to-point interconnection wiring diagrams for all equipment furnished under Divisions 13, and 16 requiring an electrical connection; either control, signal, or power, as indicated. All communication system wiring shall be included.

   b. Point-to-point connection diagrams shall be produced with AutoCad 2019 software. A separate drawing shall be provided for each diagram. One complete diagram shall be included on a drawing.

   c. Refer to the TMWRF Electrical CAD Standards for details related to Drawing Production.

   d. Submit samples of the point-to-point (PTP) interconnection diagrams to the Engineer for approval at the beginning of the construction phase. The sample drawings shall indicate the drawing format, equipment and device labeling and wire tagging methodology to be used for all diagrams. Five separate sample diagrams shall be submitted. The diagrams shall include the following information:

   e. Circuit origin, destination and wire numbers.

   f. Field wiring terminal strip names and numbers.

   g. Each point-to-point interconnection diagram shall be unique with diagram number, wire numbers, device numbers, equipment numbers and location designations.

   h. Submit detailed PTP connection diagrams for each system. The diagram shall show all components of the circuit both analog, digital, and discrete, including all relays, switches, and starters which are being provided for proper operation. Pneumonic designations used shall correspond to the loop numbers indicated in the contract documents and Sections 01672, 17102 and 17103. The format shall be the Instrument Society of America, Standard for Instrument Loop Diagrams, ISA-S5.4 plus the following requirements:

      i. Show all interconnecting wiring between equipment, panels, terminal junction boxes and field mounted components. The diagrams shall show all components and panel terminal board identification numbers and all wire numbers. This diagram shall include all intermediate terminations between field elements and panels (e.g. terminal junction boxes). The diagrams shall be coordinated with the work to be performed under Divisions 11, 16 and 17.

      ii. Show locations of all devices.

      iii. Show all power back to termination on terminal block or panel board, including circuit breaker size, as applicable.

      iv. Show all grounding points with cabinets and panels and identify the connection point of individual components.

      v. Each PTP connection diagram shall be submitted on a 24-in by 36-in sized sheet with all the information needed for installation, checkout, startup and maintenance. Each diagram shall contain the following information:

         1. All devices or items with clear labeling and identification. Refer to Section 01672 – Asset Identification and Labeling.

2. Each component of the circuit, including wire numbers and connections. The wires shall be tagged at every device, piece of equipment and in every junction box, pull box terminal cabinet, manhole and handhole. Tagging of the wires or cables shall agree with the P&ID, Loop Diagrams, Equipment Lists and Sections 01672 and 17103. The nomenclature system and system tagging requirements are included in Divisions 1 and

3. Word descriptions of circuit functions. The title should be adequate, but if not, a supplemental note shall be added. A description of special features or functions which are not obvious or implied in the title, especially safety and shutdown circuits, is required. The identification of safety and shutdown circuits is especially important.

4. All interconnections with identifying numbers for electrical cables and conductor pairs. This identification of connections includes junction boxes, computer input/output (I/O) connections, grounding system and grounding connections.

5. Locations of devices, such as, but not limited to: field, panels, auxiliary equipment, termination cabinets, local control panels, switchgear, motor control centers, and panel boards.

6. Electrical power supply requirements designation voltage and other applicable requirements.

7. Identifying numbers for equipment, including devices, panels, terminal boxes, junction boxes, motor control centers, switchgear and panel boards

8. The PTP connection diagrams shall be produced on reproducible vellum (24-in by 36-in) with 1/8-in letter size which can be reduced to (half size) for field use and still be legible.

9. Each PTP connection diagram shall contain only one circuit or loop. Care must be used to prevent overcrowding and space left for future additions and circuit data.

10. A consistent pattern (horizontal or vertical) shall be developed for presentation. The drawing shall be divided into section for relative location of devices.

11. The symbols used shall be consistent with the symbols shown on the contract drawings and symbol sheets. The symbols in ANSI Y32.20 (ISA S5.1) are suitable for instrumentation devices. However, these symbols shall be expanded to include connection points and power sources to clarify certain connection and operation details required on the diagrams. Refer to Section 17103 – Process Instrumentation and Controls Diagram for details.

i. Data Base

i. A data base that correlates the wire's identification number with the equipment and drawings shall be established with Microsoft Access Software.

ii. The data base shall employ the following fields:

1. Wire Identification Number

2. Wire size and type

3. Equipment tag number in which each end of wire terminates

4. Termination point ID at each end (i.e. terminal strip & position on strip)

5. Building identification code

6. Process system code

7. Shop drawing ID and page in which the respective field termination is indicated.

8. Interconnection Diagram number in which wire or equipment is indicated.

9. details.

iii. The data base shall be configured to allow the user to sort and query the information.

iv. The data base shall be provided to the CM in electronic and hard format

1. Five copies of the data base shall be provided on electronic USB Media Drive 3.0.

2. Seven hard copies shall be submitted for review and for insertion into the hard copy O&M manual sorted as follows:

j. Provide Wire, Equipment and System Schedules:

i. Wire Schedules shall be sorted in list format with the following priorities:

1. Wire ID Number

2. Equipment ID where wire is terminated

3. Termination point ID

ii. Equipment Schedule shall be sorted in page format. Each page shall include the Equipment tag number, the interconnection diagram on which it is indicated and wire ID numbers immediately below its respective Interconnection Diagram. Adjacent to the wire numbers shall be the termination equipment and terminals trip IDS and the respective shop drawing on which they are indicated. The sort shall have the following priorities, each page shall be arranged with:

1. Equipment tag number

2. Interconnection diagram number

3. Wire ID Number

iii. System Schedule shall be sorted with the following priorities:

1. System Code

2. Equipment tag number

3. Interconnection diagram

C. Submit the record drawings and the schedule of control wiring raceways and wire numbers (or the point-to-point connection diagram) to the Engineer.

1.13 EQUIPMENT INTERCONNECTIONS

A. Review shop drawings of equipment furnished under Divisions 13 and 16 and prepare coordinated wiring interconnection diagrams. Submit copies of wiring diagrams or tables with Record Drawings.

B. Furnish and install all equipment interconnections.

1.14 MATERIALS AND EQUIPMENT

A. Materials and equipment furnished under this contract shall be new.

B. Material and equipment of the same type shall be the product of one manufacturer and shall be UL listed.

C. Provide Quality Control.

D. Warrant all equipment furnished. Refer to individual equipment sections for additional warranty items.

1.15 EQUIPMENT IDENTIFICATION

A. Identify equipment, disconnect switches, separately mounted motor starters, control stations, etc. furnished under Division 16 with the name of the equipment it serves. Motor control centers, control panels, panelboards, switchboards, switchgear, junction or terminal boxes, transfer switches, etc, shall have nameplate designations as shown on the Drawings.

B. Nameplates shall be engraved, laminated plastic, not less than 1/16-in thick by 3/4-in by 2-1/2-in with 3/16-in high white letters on a black background.

C. Nameplates shall be screw mounted to NEMA 1 enclosures. Nameplates shall be bonded to all other enclosure types using an epoxy or similar permanent waterproof adhesive. Two sided foam adhesive tape is not acceptable. Where the equipment size does not have space for mounting a nameplate the nameplate shall be permanently fastened to the adjacent mounting surface.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SLEEVE AND FORMS FOR OPENINGS

A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all slots for electrical work and form before concrete is poured.

B. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the floor slab is poured.

C. Where setting drawings are not available in time to avoid delay in scheduled floor slab pours, the Engineer may allow the installations of such conduit to be exposed. Requests for this deviation must be submitted in writing. No additional compensation for such change will be allowed.

D. Seal all openings, sleeves, penetration and slots as specified in Section 16110.

3.2 CUTTING AND PATCHING

A. Cutting and patching shall be done in a thoroughly workmanlike manner and be in compliance with modifications and repair to concrete. Saw cut concrete and masonry prior to breaking out sections.

B. Core drill holes in concrete floors and walls as required.

C. Install work at such time as to require the minimum amount of cutting and patching.

D. Do not cut joists, beams, girders, columns or any other structural members.

E. Cut opening only large enough to allow easy installation of the conduit.

F. Patching to be of the same kind and quality of material as was removed.

G. The completed patching work shall restore the surface to its original appearance or better.

H. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed.

I. Remove rubble and excess patching materials from the premises.

J. When existing conduits are cut at the floor line of wall line, they shall be filled with grout of suitable patching material.

3.3 INSTALLATION

A. Work not installed according to the Drawings and Specification shall be subject to change as directed by the Engineer at Contractor's expense.

B. Electrical equipment shall be protected against mechanical and water damage. Store all electrical equipment in dry permanent shelters. Do not install electrical equipment in place until structures are weather-tight.

C. Damaged equipment shall be replaced or repaired by the equipment manufacturer, at the Engineer's discretion and at the Contractor's expense.

D. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted in accordance with the field painting requirements specified in Section 09902 at the Contractor's expense.

3.4 MANUFACTURERS SERVICE

A. Provide manufacturer's services for testing and start-up of the following equipment:

1. Intercom and Paging System (__1__ days __1__ trips minimum)

B. Testing and startup shall not be combined with training. Testing and start-up time shall not be used for manufacturer's warranty repairs.

3.5 TRAINING

A. Provide manufacturer's services for training of plant personnel in operation and maintenance of the equipment furnished under Division 16.

1. Intercom and Paging System (__1__ days __1__ trips minimum)

B. The cost of training programs to be conducted with TMWRF's personnel shall be included in the Contract Price. The training and instruction, insofar as practicable, shall be directly related to the system being supplied.

C. Provide detailed O&M manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project.

D. The training program shall represent a comprehensive program covering all aspects of the operation and maintenance of each system.

E. All training schedules shall be coordinated with and at the convenience of TMWRF. Shift training may be required to correspond to TMWRF's working schedule.

F. Within 7 days of contract award to the Contractor, submit an overview of the proposed training plan. This overview shall include, for each course proposed:

1. An overview of the training plan.

2. Course title and objectives.

3. Prerequisite training and experience of attendees.

4. Recommended types of attendees.

5. Course Content - A topical outline.

6. Course Duration.

7. Course Location - Training center or job site.

8. Course Format - Lecture, laboratory demonstration, etc.

9. Schedule of training courses including dates, duration and locations of each class.

10. Resumes of the instructors who will actually implement the plan.

G. The Engineer will review the training plan submittal with TMWRF staff.

END OF SECTION