

SET NO: _____



Municipal Water District

San Diego County, California

**FINAL CONTRACT DOCUMENTS
FOR THE CONSTRUCTION OF:**

**PROGRAMMABLE LOGIC CONTROLLER (PLC)
REPLACEMENT PROJECT**

AUGUST 2023

D120091

(Potable Water & Recycled Water Sites)

D700036

(Wastewater Sites)

OLIVENHAIN MUNICIPAL WATER DISTRICT

San Diego County California

FINAL CONTRACT DOCUMENTS

FOR THE CONSTRUCTION OF

PROGRAMMABLE LOGIC CONTROLLER (PLC) REPLACEMENT PROJECT

PROJECT NOs

D120091 District Wide PLC Replacements (PW/RW)
D700036 District Wide PLC Replacements (WW)

Prepared by:



Glen V. Rozak, P.E
Principal in Charge
Sr Control Systems
Engineer
Tetra Tech, Inc.

08/21/2023

Date:
Division 01
Division 17



Rodney Barnes, P.E
Sr Electrical Engineer
Tetra Tech, Inc.

08/21/2023

Date:
Division 16



Accepted by:



Lindsey Stephenson, P.E.
Engineering Manager
Olivenhain Municipal Water District

08/22/2023

Date:

DISTRICT BOARD OF DIRECTORS

Christy Guerin
President

Division 03

Matthew R. Hahn
Vice President

Division 04

Neal Meyers
Treasurer

Division 05

Lawrence A. Watt
Secretary

Division 02

Marco San Antonio
Director

Division 01

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BID FORM CHECKLIST

(To be placed in the Bidder's Contract Documents in front of the Table of Contents)

Bid Form Page	Requirement	Initial
1 of 3	BID NOTICE-Fill in date of the mandatory Pre-Bid Conference attended:	
1 of 17	BID FORM- Fill out the form and acknowledge <u>all</u> addenda in the spaces provided at the end of the first paragraph	
2 of 17	BIDDING INSTRUCTIONS- Examination of the site and review of the Contract Documents has been completed	
2 of 17	BIDDING INSTRUCTIONS- Bid Schedule and all Bid forms are to be submitted with this Bid Form Checklist	
4, 5, & 6 of 17	BID SCHEDULE- Fill out all items in the Bid Schedule, including dollar amounts in words and in numbers for each item	
7 of 17	DESIGNATION OF SUBCONTRACTORS- Fill in all information required on the form	
8 of 17	LISTING OF MANUFACTURERS- Fill in all information required on the form	
9 of 17	Fill in the type of Bid Bond enclosed in the first paragraph, and list all principals of the company in the third paragraph	
10 of 17	Fill in Bidder's license classification, license number, and all other information required in the fourth paragraph, including signature and date	
11 of 17	CERTIFICATE OF DRUG-FREE WORKPLACE- Fill in Bidder's name at the top and Certification section at the bottom of the page, including signature and date	
12 of 17	CERTIFICATE OF NONDISCRIMINATION- Fill in all information required on the form, including signature and date	
13 of 17	NONCOLLUSION AFFIDAVIT- Fill in all information required on the form including signature and date and provide notarization	
14 of 17	BIDDER'S EXPERIENCE- PROJECT EXPERIENCE FOR SYSTEM INTEGRATOR - Fill in all information required on the form and provide signature and date at the bottom	
15 of 17	BIDDER'S EXPERIENCE- SYSTEM INTEGRATOR QUALIFICATIONS - Fill in all information required on the form, attach requested qualifications, and provide signature and date at the bottom	
16 of 17	BIDDER'S EXPERIENCE- PROJECT EXPERIENCE FOR ELECTRICAL WORK - Fill in all information required on the form and provide signature and date at the bottom	
17 of 17	INSURANCE ACKNOWLEDGEMENT- Fill in all information required on the form and provide signature and date where indicated	
1 of 2	BID BOND- Fill in all required information including dollar amount	
2 of 2	BID BOND- Fill in all required information, provide signatures of the bidder and surety where indicated, provide notarization for principal of bidder and surety, and attach a certified Power of Attorney for surety	
00810 2 of 15	1.04 MARKING AND ADDRESSING BID ENVELOPE- Contract Documents are sealed in an envelope marked and addressed as required in this section	

Dated _____ Signature of Bidder _____

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TABLE OF CONTENTS

PART I BIDDING AND CONTRACT REQUIREMENTS

DIVISION 0 BIDDING AND CONTRACT REQUIREMENTS

NOTICE INVITING SEALED BIDS-----	1 to 3 White
BID FORM-----	1 to 17 Yellow
BID BOND-----	1 to 2 Yellow
AGREEMENT-----	1 to 3 Blue
PERFORMANCE BOND-----	1 to 2 Blue
PAYMENT BOND-----	1 to 2 Blue
CONTRACTOR'S CERTIFICATE REGARDING	
WORKERS' COMPENSATION -----	1 to 2 Blue
CERTIFICATE OF INSURANCE (WORKERS' COMPENSATION)-----	1 to 3 Blue
INSURANCE ENDORSEMENT (WORKERS' COMPENSATION) -----	1 to 2 Blue
CERTIFICATE OF INSURANCE (LIABILITY)-----	1 to 5 Blue
INSURANCE ENDORSEMENT (LIABILITY)-----	1 to 2 Blue
CERTIFICATE OF INSURANCE (BUILDERS' RISK "ALL RISK")-----	1 to 4 Blue
INSURANCE ENDORSEMENT (BUILDERS' RISK "ALL RISK")-----	1 to 2 Blue
GENERAL PROVISIONS	
TABLE OF CONTENTS -----	1 to 3 Goldenrod
MAIN BODY-----	1 to 47 Goldenrod
SHOP DRAWING SUBMITTAL FORM -----	1 to 1 Goldenrod
PROGRESS ESTIMATE AND PAYMENT FORM -----	1 to 1 Goldenrod
CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT-----	1 to 1 Goldenrod
CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT -----	1 to 1 Goldenrod
PROPOSED CHANGE ORDER -----	1 to 1 Goldenrod
PUBLIC CONTRACT CODE SECTION 20104, ET SEQ -----	1 to 4 Goldenrod
SECTION 00810 SPECIAL PROVISIONS -----	1 to 15 Gray

PART II TECHNICAL SPECIFICATIONS

DIVISION 1 GENERAL REQUIREMENTS

SECTION 01010	SUMMARY OF WORK _____	1 TO 4
SECTION 01039	COORDINATION MEETINGS _____	1 TO 3
SECTION 01043	COORDINATION WITH DISTRICT'S OPERATIONS _____	1 TO 2
SECTION 01090	REFERENCE STANDARDS _____	1 TO 2
SECTION 01115	CONSTRUCTION SEQUENCE _____	1 TO 25
SECTION 01150	MEASUREMENT AND PAYMENT _____	1 TO 1
SECTION 01170	SPECIAL TECHNICAL PROVISIONS _____	1 TO 2
SECTION 01300	RECORD DRAWINGS AND SUBMITTALS _____	1 TO 5
SECTION 01310	CONSTRUCTION PROGRESS SCHEDULES _____	1 TO 3
SECTION 01342	PROGRESS SAMPLES _____	1 TO 1
SECTION 01370	SCHEDULE OF VALUES _____	1 TO 2
SECTION 01400	QUALITY CONTROL _____	1 TO 5
SECTION 01545	PROTECTION OF THE WORK AND PROPERTY _____	1 TO 4
SECTION 01600	MATERIALS AND EQUIPMENT _____	1 TO 5
SECTION 01660	SYSTEMS START-UP AND TESTING _____	1 TO 2
SECTION 01700	PROJECT CLOSEOUT _____	1 TO 2
SECTION 01730	OPERATION AND MAINTENANCE DATA _____	1 TO 3

DIVISION 2 SITE WORK (REFERENCE OMWD STANDARD SPECS & GREENBOOK)

DIVISION 3 CONCRETE (REFERENCE OMWD STANDARD SPECS & GREENBOOK)

DIVISION 4 MASONRY (NOT USED)

DIVISION 5 METALS (NOT USED)

DIVISION 6 WOOD AND PLASTICS (NOT USED)

DIVISION 7 THERMAL AND MOISTURE PROTECTION (NOT USED)

DIVISION 8 DOORS AND WINDOWS (NOT USED)

DIVISION 9 FINISHES (NOT USED)

DIVISION 10 SPECIALTIES (NOT USED)

CONTENTS OF VOLUME I

CONTRACT DOCUMENTS

PAGE

DIVISION 11 EQUIPMENT (NOT USED)

DIVISION 12 FURNISHINGS (NOT USED)

DIVISION 13 SPECIAL CONSTRUCTION (NOT USED)

DIVISION 14 CONVEYING SYSTEMS (NOT USED)

DIVISION 15 MECHANICAL (REFERENCE OMWD STANDARD SPECS.)

DIVISION 16 ELECTRICAL

SECTION 16010	ELECTRICAL BASIC REQUIREMENTS _____	1 TO 8
SECTION 16060	GROUNDING _____	1 TO 6
SECTION 16120	WIRE AND CABLE _____	1 TO 11
SECTION 16130	RACEWAY AND BOXES _____	1 TO 14
SECTION 16140	WIRING DEVICES _____	1 TO 7
SECTION 16195	ELECTRICAL IDENTIFICATION _____	1 TO 3

DIVISION 17 INSTRUMENTATION AND CONTROLS

SECTION 17000	INSTRUMENTATION AND CONTROLS _____	1 TO 40
APPENDIX A	SITE DEFINITION AND IDENTIFIERS _____	1 TO 3
APPENDIX B.1	CONTRACT DRAWINGS _____	1 TO 43
APPENDIX B.2	PROVISIONAL BILL OF MATERIALS _____	1 TO 145
APPENDIX C	OPERATOR INTERFACE UPGRADES _____	1 TO 2
APPENDIX D	1746 SLC TO 5069 COMPACTLOGIX I/O CONVERSION _____	1 TO 1
APPENDIX E	1746 SLC TO 1756 CONTROLLOGIX I/O CONVERSION _____	1 TO 1
APPENDIX F	1766 MICROLOGIX TO 5069 COMPACTLOGIX _____	1 TO 1
APPENDIX G.1	5069 IO CONVERSION SPECIAL CONDITIONS _____	1 TO 1
APPENDIX G.2	1756 IO CONVERSION SPECIAL CONDITIONS _____	1 TO 1
APPENDIX H.1	1746 to 5069 LOCAL AND REMOTE IO UPGRADES _____	1 TO 1
APPENDIX H.2	1746 to 1756 LOCAL AND REMOTE IO UPGRADES _____	1 TO 1
APPENDIX I.1	5069 PLC POWER SYSTEM UPGRADES _____	1 TO 2
APPENDIX I.2	1756 PLC POWER SYSTEM UPGRADES _____	1 TO 2
APPENDIX J	ETHERNET REMOTE IO UPGRADES _____	1 TO 1
APPENDIX K	FIELD SURVEY DATA REPORT AND IO LIST _____ (SEE SEPARATE ATTACHMENT)	1 TO 923
APPENDIX L	PLC PROGRAM MIGRATION _____	1 TO 30
SECTION 17300	CONTROLS PANELS AND APPURTENATCES _____	1 TO 4
SECTION 17490	FACTORY AND FIELD TESTING _____	1 TO 12

REFERENCE STANDARDS

Olivenhain Municipal Water District, Standard Specifications and Drawings for the Construction of Water, Recycled Water, and Sewer Facilities, February, 2017.

Standard Specifications for Public Works Construction, "Greenbook", 2012.

San Diego Regional Standard Drawings (Latest Edition).

END TABLE OF CONTENTS

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PART I

BIDDING AND CONTRACT REQUIREMENTS

NOTICE INVITING SEALED BIDS
FOR THE CONSTRUCTION OF
PROGRAMMABLE LOGIC CONTROLLER (PLC)
REPLACEMENT PROJECT
FOR THE
OLIVENHAIN MUNICIPAL WATER DISTRICT

NOTICE IS HEREBY GIVEN that the Board of Directors of said District invites and will receive sealed bids up to the hour of **10:00 a.m. on September 26, 2023** for the furnishing to said District of all transportation, labor, materials, tools, equipment, services, permits, utilities, and other items necessary to construct said work. At said time, said bids will be publicly opened and read aloud at the office of the Olivenhain Municipal Water District, 1966 Olivenhain Road, Encinitas, CA 92024, (760) 753-6466.

The District will conduct a **MANDATORY** Pre-Bid Conference at the 4S Water Reclamation Facility (4S WRF) located at 16595 Dove Canyon Road, San Diego, CA 92127, at **10:00 a.m. on Thursday, September 7, 2023**

All questions relative to this project prior to the opening of bids shall be directed to the District (see enclosed Pre-Bid Question Form). It shall be understood that no specification interpretations will be made by telephone nor will any "or equal" products be considered for approval prior to award of the contract. Bidders are encouraged to submit their pre-bid questions as early as possible, in writing via email, so they can be answered in writing through an addendum if necessary. Pre-bid questions will be received in writing up to **2:00 p.m. on Thursday, September 14, 2023**, after which they will not be answered.

Bids shall conform to and be responsive to the Contract Documents for the work. Contract Documents can be downloaded from the "Upcoming Projects and Planning Resources" link under "Construction Projects" on the home page of the District's website at www.olivenhain.com. Contract documents are not available at the District. It will be the Bidder's responsibility to download and acknowledge receipt of all addenda. If you wish to be placed on the plan holders list, please send your company name, contact person, contact phone number and email to prebid@olivenhain.com.

Each bid shall be submitted on the bid form furnished as part of the Contract Documents and must state the Contractor's applicable license classification, license number, license expiration date, name of license holder, and relationship to Bidder. The license classification required for this project is Class C10 Electrical Contractor. Each bid must be accompanied by cash, a cashier's check, a certified check, or a bidder's bond executed by an admitted surety insurer. This bid guarantee shall be in an amount of not less than 10 percent of the amount of the bid and made payable to the order of or for the benefit of the District.

Said cash, check, or bond shall be given as guarantee that the Bidder will enter into a contract with the District and furnish the required payment and performance bonds and insurance certificates and endorsements if awarded the work, and will be declared forfeited if the Bidder refuses to timely enter into said contract or furnish the required bonds or insurance certificates and endorsements if his bid is accepted.

Each bid shall be sealed and delivered to District personnel at **1966 Olivenhain Road, Encinitas, CA 92024** on or before the day and hour set for the opening of bids. Bids shall be sealed in an envelope marked and addressed in accordance with Section 00810. Whether the bidder submits by mail or in-person, it is the sole responsibility of the bidder to see that his/her bid is received as specified by personnel of the Owner on or before the day and hour of bid opening. Bids not marked as being received by personnel of the Owner on or before the day and hour of bid opening will be rejected.

Bidders shall demonstrate minimum qualifications with their Bid, as described on the Bidder's Experience Form, performing the type of work required by this contract. Bidders failing to demonstrate this experience may be rejected as nonresponsive at the option of the District.

Under the provisions of the California Public Works Apprenticeship Standards, Sections 1777.5, 1777.6, and 1777.7 of the Labor Code, a copy of the "Extract of Public Works Contract Award" has been included. This document will be filed with the California Department of Industrial Relations at the time of the award of the Contract.

The Board of Directors has obtained from the Director of the California Department of Industrial Relations a determination of the general prevailing rate of per diem, wages, and the general prevailing rate for legal holiday and overtime work in the locality in which said work is to be performed for each craft, classification, or type of worker needed. Not less than the determined rates shall be paid to all workers employed in the performance of the contract. Such rates of wages are on the file with the Department of Industrial Relations and in the office of the District and are available to any interested party upon request.

Pursuant to Public Contract Code Section 22300, the Contractor may substitute equivalent securities for retention amounts which this Contract requires. However, the District reserves the right to solely determine the adequacy of the securities being proposed by the Contractor and the value of those securities. The District shall also be entitled to charge an administrative fee, as determined by the District in its sole discretion, for substituting equivalent securities for retention amounts.

The Contractor agrees that the District's decision with respect to the administration of the provisions of Public Contract Code Section 22300 shall be final and binding and not subject to subsequent litigation or arbitration of any kind as to acceptance of any securities being proposed, the value of these securities, the costs of administration and the determination of whether or not the administration should be accomplished by an independent agency or by the District. The District shall be entitled, at any time, to request the deposit of additional securities of a value designated by the District, in the District's sole discretion, to satisfy this requirement. If the District does not receive satisfactory securities within 12 calendar days of the date of the written request, the District shall be entitled to withhold amounts due Contractor until securities of satisfactory value to the District have been received.

Pursuant to Section 995.710 of the Code of Civil Procedures, the Contractor may substitute any of the instruments specified in Code of Civil Procedure Section 995.710 for the performance and payment bonds required by the Contract Documents. All such substitutions shall be subject to review and approval by the District. Contractor agrees to pay all attorney's fees and all other fees, costs, and expenses incurred by the District in reviewing substitutes proposed by the Contractor and in preparing and implementing any agreements determined appropriate by the District to adequately protect District.

All bidders shall agree to obtain and maintain in full effect all required insurance with limits not less than the amounts indicated. Bidders who fail to comply with the insurance requirements of this contract may have their bids rejected as nonresponsive at the election of the District.

Pursuant to California Labor Code Section 6705, the cost of sheeting, shoring, and bracing of trenches, or equivalent method, where part of the job, shall constitute a separate bid item under these contract documents.

District shall award the contract for the Project to the lowest responsive, responsible Bidder as determined by the District based on the **total Base Bid price for Schedule A**. District reserves the right to award any or all Bid Schedules, reject any and all bids, to waive any irregularity in the bids received and to award the Contract on the basis of the responsive bids.

The Board of Directors of the District reserves the right to select the schedule(s) under which the bids are to be compared and contract(s) awarded, to reject any and all bids, and to waive any and all irregularities or defects in any bid.

OLIVENHAIN MUNICIPAL WATER DISTRICT

Dated: 08/22/2023



LINDSEY STEPHENSON, P.E.
ENGINEERING MANAGER

BID FORMS
BID TO
OLIVENHAIN MUNICIPAL WATER DISTRICT
SAN DIEGO COUNTY, CALIFORNIA
FOR THE CONSTRUCTION OF
PLC REPLACEMENT PROJECT

Name of Bidder: _____

Business Address: _____

_____ Phone No.: _____

TO THE GOVERNING BODY OF THE OLIVENHAIN MUNICIPAL WATER DISTRICT

Pursuant to and in compliance with your Notice Inviting Sealed Bids and the other documents relating thereto, the undersigned Bidder, being fully familiar with the terms of the Contract Documents, local conditions affecting the performance of the Contract, the character, quality, quantities, and scope of the work, and the cost of the work at the place where the work is to be done, hereby proposes and agrees to perform within the time stipulated in the Special Provisions Section 00810 of the Contract, including all of its component parts and everything required to be performed, and to furnish any and all of the labor, material, tools, equipment, transportation, services, permits, utilities, and all other items necessary to perform the Contract and complete in a workmanlike manner, all of the work required in connection with the construction of said work all in strict conformity with the Plans and Specifications and other Contract Documents, including Addenda Nos. __, __ and __ for the prices hereinafter set forth.

The undersigned as Bidder, declares that the only persons or parties interested in this bid as principals are those named herein; that this bid is made without collusion with any person, firm, or corporation; and he proposes and agrees, if the bid is accepted, that he will execute a Contract with the Owner in the form set forth in the Contract Documents and that he will accept in full payment thereof the following prices, to wit:

BIDDING INSTRUCTIONS
FOR THE CONSTRUCTION OF
PLC REPLACEMENT PROJECT

Prior to the opening of bids, all questions relative to this project **shall be directed to Olivenhain Municipal Water District, Attn: Pre-bid. Bidders** are encouraged to submit their pre bid questions as early as possible, in writing to prebid@olivenhain.com, so they can be answered in writing through addendum, if necessary. **Pre bid questions will be received up to 2:00 p.m., on Thursday, September 14, 2023 after which no questions will be taken or answered.**

Bidders shall submit information demonstrating relevant project experience on the Bid Forms included within these Contract Documents. Bidders failing to demonstrate this experience may be rejected as nonresponsive at the option of the Owner.

Bidders agree to obtain and maintain in full effect all required insurance with limits not less than the amounts indicated. Insurers must be authorized to do business and have an agent for service of process in California, have an "A" policyholder's rating and a financial rating of at least Class VI in accordance with the most current rating by A.M. Best Company. Bidders who fail to comply with the insurance requirements of this Contract may have their bids rejected as nonresponsive at the election of the Owner.

The Bidder's attention is directed to General Provisions Article 3-1 "Award of Contract or Rejection of Bids" in the General Provisions concerning the above conditions.

Bidders must satisfy themselves of the character of the work to be performed by examination of the site and review of the Contract Documents. After bids have been submitted, the Bidder expressly waives the right to assert that there was a misunderstanding concerning the nature of the work to be done. Any bid protests must be submitted within three (3) calendar days of the bid due date.

The Contract Documents contain the provisions required for the construction of the Project. Information obtained from an officer, agent, or employee of the Owner or any other personnel shall not affect the risks or obligations assumed by the Contractor, or relieve him from fulfilling any of the conditions of the Contract.

Bids shall be made on the Bid Form and Bid Bond included within these Contract Documents. Bidders shall designate the subcontractors and list the manufacturers of materials to be used in the Project on the Designation of Subcontractors form included with these Contract Documents. All subcontractors listed to perform any of the work must be licensed in the State of California. No single subcontractor may perform more than 25% of the work listed in the Bid Schedule unless specifically approved in advance by the District prior to the submission of bids. The Owner reserves the right to find a bid non-responsive in the sole discretion Owner if a Bidder lists any unlicensed subcontractors to perform any of the work. Submit with the bid the completed Bid Forms included within these Contract Documents. Completely fill out the one page Bid Form Checklist included in front of the Table of Contents and include it with the bid.

The Owner reserves the right to find a bid non-responsive in its sole discretion of a Bidder fails to complete or include any of the aforementioned certificates or acknowledgements.

The pay items listed in the Bid Schedules are described in Specification Section 01150 – Measurement and Payment.

In order for the Owner to consider a Bidder's bid and for a bid to be considered responsive, all bid schedules must be completed. If any bid schedule is not filled in, the bid will be determined to be non-

responsive and will be rejected. The Owner reserves the right to reject any and all bids, to waive any irregularity in the bids received, and to award the Contract on the basis of the responsive bids.

Basis for the award shall be based on the total Base Bid price for Schedule A. The District reserves the right to award any or all Bid Schedules.

BID SCHEDULE A
PLC REPLACEMENT PROJECT

Item	Site ID / Facility	Project #	Amount \$	Phase
000	Mobilization/De-Mobilization (No To Exceed 5% of Contract Value)	D700036 / D120091	\$	--
001	4S-101_WRF Headworks Odor Control	D700036	\$	2a
002	4S-102_WRF Solids Building Odor Control	D700036	\$	2a
003	4S-103_Avenida Apice Sewer Pump Station	D700036	\$	1a
004	4S-104_WRF Blower Control	D700036	\$	2a
005	4S-105_Cerro Del Sol SPS #1	D700036	\$	1a
006	4S-106_Cerro Del Sol SPS #2	D700036	\$	1a
007	4S-107_Camino Sin Puente SPS #1	D700036	\$	1a
008	4S-108_Camino Sin Puente SPS #2	D700036	\$	1a
009	4S-109_Camino Sin Puente SPS #3	D700036	\$	1a
010	4S-110_Camino Sin Puente SPS #4	D700036	\$	1a
011	4S-111_Del Dios Sewer Pump Station	D700036	\$	1a
012	4S-112_4S Ranch WRF Filters	D700036	\$	2a
013	4S-113_Fire Station Sewer Pump Station	D700036	\$	1a
014	4S-114_Midpoint Sewer Lift Station	D700036	\$	1a
015	4S-115_Neighborhood 3 Sewer Pump Station	D700036	\$	1a

Item	Site ID / Facility	Project #	Amount \$	Phase
016	4S-116_4S Ranch WRF Main Control Panel 2A	D700036	\$	2a
017	4S-117_4S Ranch WRF Main Control Panel 2B	D700036	\$	2a
018	4S-118_4S Ranch WRF Reclaimed Water Pump Station (PLC-3)	D700036	\$	2a
019	4S-119_4S Ranch WRF Pond Pump Station and Reservoir (PLC-4)	D700036	\$	2a
020	4S-120_Santaluz Sewer Pump Station	D700036	\$	1a
021	4S-121_Avenida Orilla Sewer Pump Station	D700036	\$	1a
022	D-01_520 PRS/Flow Control	D120091	\$	1b
023	D-02_4S I Reservoir	D120091	\$	1b
024	D-03_Cannimara Pump Station	D120091	\$	1b
025	D-04_Cielo Pump Station	D120091	\$	1b
026	D-05_Crosby 3 & 4 PRS	D120091	\$	1b
027	D-07_Gano Reservoir	D120091	\$	1b
028	D-08_Gaty Reservoir	D120091	\$	1b
029	D-09_Oaks South #1 PRS	D120091	\$	1b
030	D-10_Miller Reservoir and Hydro Plant	D120091	\$	1b
031	D-11_Oaks South # 3 PRS	D120091	\$	1b
032	D-12_Peay Reservoir & Flow Control	D120091	\$	1b
033	D-13_Santa Fe Valley Pump Station & Reservoir	D120091	\$	1b

Item	Site ID / Facility	Project #	Amount \$	Phase
034	D-14_Unit M Flow Control	D120091	\$	1b
035	D-15_Unit Z Pump Station	D120091	\$	1b
036	D-16_Via De Las Flores PRS	D120091	\$	1b
037	D-17_Village Park Recycled Pump Station	D120091	\$	1b
038	D-18_Zorro Reservoir	D120091	\$	1b
039	M-201,202,203_McCollom ERT-1, ERT-2, ERT Control	D120091	\$	2b
040	M-204_McCollom WTP ICP-2	D120091	\$	2b
041	M-205_McCollom WTP ICP-3	D120091	\$	2b
042	M-206_Ammonia Feed Facility	D120091	\$	1b

TOTAL AMOUNT OF BID SCHEDULE A:

\$ _____

TOTAL AMOUNT OF BID SCHEDULE A ITEMS (IN WORDS):

All bid items are Lump Sump.

Amounts shall be shown in both words and figures, where indicated. In case of discrepancy, the amount shown in words will govern.

The above prices shall include all labor, materials, removal, overhead, profit, insurance, and incidentals required to complete the work.

¹Mobilization is limited to 5% of the total bid price for Base Bid - Bid Schedule

Note: By submission of this Bid, the Contractor acknowledges the one year guarantee as outlined in Section 5-14 of the General Provisions and has included said expenses as a part of this Bid.

DESIGNATION OF SUBCONTRACTORS

In compliance with the provisions of Section 4100 4114 of the Public Contract Code of the State of California, and any amendments thereof, each Bidder shall set forth below, the name, license number, and location of the mill, shop or office of each subcontractor who will perform work or labor, or render service to the Contractor in an amount in excess of one half (1/2) of one percent (1%) of the total bid, and the portion of the work which will be done by each subcontractor. All subcontractors listed must be licensed to perform the subcontract work in the State of California. No single subcontractor may perform work in excess of 25% of the total work listed in the Bid Schedule unless specifically approved by the District in advance of submission of the Bid. Bidders who list any unlicensed subcontractors on this form may have their bid rejected as non-responsive in the sole discretion of Owner.

If the Bidder fails to specify a subcontractor for any portion of the work in excess of one half (1/2) of one percent (1%) of the total bid to be performed under the Contract, he shall be deemed to have agreed to perform such portion himself, and he shall not be permitted to subcontract that portion of the work except under conditions permitted by law.

Subletting or subcontracting any portion of the work as to which no subcontractor was designated in the original bid shall only be permitted in case of public emergency or necessity, or otherwise permitted by law, and then only after a finding reduced to writing as a public record of the Owner.

Trade	% of Work To Be Done	Name of Subcontractor	License Number	Address

LISTING OF MANUFACTURERS

The Contractor shall submit this sheet with his bid, completed, to list the manufacturers of materials he intends to use. It shall be understood that where the Contractor elects to not use the material manufacturers called for in the Specifications, he will substitute only items of equal quality, durability, functional character, and efficiency as determined by the Owner. The Contractor should ascertain prior to bidding the acceptability of substitutes. Only one manufacturer shall be listed for each item.

[illegible]

The OWNER may request, and the Bidder shall supply, complete information on proposed alternates prior to Notice of Award. Any deviation from the following approved Manufacturers List shall be detailed in the Contractors Bid Submission.

Substitutions shall be allowed only if requested in accordance with Article 5-10 of the General Provisions within 35 calendar days of the date the Contract is awarded. Should a substitution be allowed, there will be no increase in the amount of the bid originally submitted.

ACCOMPANYING THIS BID IS

(insert the words "cash", "a cashier's check", "a certified check", or "a Bidder's bond" as the case may be) in an amount equal to at least 10 percent of the total amount of the Bid, payable to the

OLIVENHAIN MUNICIPAL WATER DISTRICT

The undersigned deposits the above named security as a bid guarantee and agrees that it shall be forfeited to the Owner as liquidated damages in case this bid is accepted by the Owner and the undersigned fails to execute a contract with the Owner as specified in the Contract Documents or fails to furnish the required payment and performance bonds, and insurance certificates and endorsements. Should the Owner be required to engage the services of an attorney in connection with the enforcement of this bid, Bidder promises to pay Owner's reasonable attorneys' fees, incurred with or without suit.

The names of all persons interested in the foregoing bids as principals are as follows: (NOTICE If Bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer, and manager thereof; if a general partnership, state true name of firm, also names of all individual partners composing firm; if a limited partnership, the names of all general partners and limited partners; if Bidder or other interested person is an individual, state first and last names in full; if the Bidder is a joint venture, state the complete name of each venturer).

The Owner has determined the license classification necessary to bid and perform the subject contract. In no case shall this Contract be awarded to a specialty contractor whose classification constitutes less than a majority of the project. When a specialty contractor is authorized to bid a portion of the work of this contract, all work to be performed outside of the contractor's license specialty, except work specifically authorized by the Owner, shall be performed by a licensed subcontractor in compliance with the Subletting and Subcontracting Fair Practices Act commencing with Section 4100 et seq., of the Public Contract Code. See Business and Professions Code Section 7059.

The Contractor's license classification(s) required for this project are as follows:

CLASS C10 - ELECTRICAL CONTRACTOR

It is the Owner's intent that "plans," as used in Public Contract Code Section 3300, is defined as the construction Contract Documents, which include both the Plans and the Specifications.

Bidder warrants and represents that it has the required experience performing the type of work required by this Contract.

Bidder warrants and represents, under penalty of perjury, that license(s) required by California State Contractor's License Law for the performance of the subject project are in full effect and proper order. Bidders must state, under penalty of perjury, the Contractor's applicable license classification, license number, license expiration date, name of license holder, and relationship to Bidder. Any bid not containing this information may be considered nonresponsive and may be rejected by the Owner.

Bidders relying upon licenses of Responsible Managing Employees (RME) or Responsible Managing Officers (RMO) agree to provide the Owner with all information it determines necessary to verify that the Bidder complies with California State Contractor's License Law.

DIR Registration Number: _____

License Classification: _____

License Number: _____

Expiration Date: _____

Name of License Holder: _____

Relationship to Bidder: _____

Name of Bidder: _____

Signatures: _____

Dated: _____, 20 _____

NOTE: If Bidder is a corporation, the legal name of the corporation shall be set forth above, together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation and the corporate seal; if Bidder is a partnership, the true name of the firm shall be set forth above, together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership; if the Bidder is an individual, his signature shall be placed above; if the Bidder is a joint venture, the name of the joint venture shall be set forth above with the signature of an authorized representative of each venturer.

CERTIFICATE OF DRUG-FREE WORKPLACE

BIDDER: _____

The Bidder named above hereby certifies compliance with Government Code Section 8355 in matters relating to providing a drug-free workplace. The above named Bidder will:

1. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations, as required by Government Code Section 8355(a).
2. Establish a Drug-Free Awareness Program as required by Government Code Section 8355(b), to inform employees about all of the following:
 - (a) The dangers of drug abuse in the workplace,
 - (b) The person's or organization's policy of maintaining a drug-free workplace,
 - (c) Any available counseling, rehabilitation and employee assistance programs, and
 - (d) Penalties that may be imposed upon employees for drug abuse violations.
3. Provide as required by Government Code Section 8355(c), that every employee who works on the proposed contract or loan:
 - (a) Will receive a copy of the company's drug-free policy statement, and
 - (b) Will agree to abide by the terms of the company's statement as a condition of employment on the contract or loan.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized legally to bind the Bidder to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME: _____

DATE EXECUTED: _____ EXECUTED IN COUNTY OF: _____

OFFICIAL'S SIGNATURE: _____

TITLE: _____

CERTIFICATE OF NONDISCRIMINATION

1. During the performance of this contract, Bidder and its subcontractors shall not unlawfully discriminate against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, medical condition, marital status, age (over 40) or sex. Bidders and subcontractors shall insure that the evaluation and treatment of their employees and applicants for employment are free of such discrimination. Bidder and subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12900 et seq.) and the applicable regulations promulgated thereunder (California Administrative Code, Title 2, Section 7285.0 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code, Section 12900, set forth in Chapter 5 of Division 4 of Title 2 or the California Administrative Code are incorporated into this contract by reference and made a part hereof as if set forth in full. Bidder and its subcontractor shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.
2. This Bidder shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

THE UNDERSIGNED CERTIFIES THAT THE BIDDER WILL COMPLY WITH THE ABOVE REQUIREMENTS.

BIDDER NAME: _____

CERTIFIED BY:

NAME: _____ TITLE: _____

SIGNATURE: _____ DATE: _____

NONCOLLUSION AFFIDAVIT

State of _____)
) ss.
County of _____)

I, _____, being duly sworn, deposes
and says that he or she is _____ of

_____, the party making the foregoing
bid, that the bid is not made in the interest of, or on behalf of, any undisclosed person,
partnership, company, association, organization, or corporation; that the bid is genuine and not
collusive or sham; that the bidder has not directly or indirectly colluded, conspired, connived, or
agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from
bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement,
communication, or conference, with anyone to fix the bid price of the bidder or any other bidder,
or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to
secure any advantage against the public body awarding the contract of anyone interested in the
proposed contract; that all statements contained in the bid are true; and, further, that the bidder
has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the
contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any
fee to any corporation, partnership, company association, organization, bid depository, or to any
member or agent thereof to effectuate a collusive or sham bid.

Signature of Bidder: _____

Subscribed and sworn to before me on this _____ day of _____
_____, 20__.

PROJECT EXPERIENCE FOR SYSTEM INTEGRATOR

BIDDER'S EXPERIENCE(CONTINUED)
SYSTEM INTEGRATOR QUALIFICATIONS

Name of Bidder: _____

In addition to relevant project experience, the bidder shall also provide the following documentation with the bid to demonstrate key qualifications to serve as the System Integrator. Attach the documentation with the bid. Bidders are encouraged to read contract documentation as additional qualifications may also be required.

- ✓ Allen Bradley Systems Integrator Partner Program Certification (minimum Silver or Gold Status) per Specification 17000 – Instrumentation and Controls, Section 1.8, A 3e
- ✓ Inductive Automation Certification (minimum Core Certified) per Specification 17000 – Instrumentation and Controls, Section 1.8, A 3e
- ✓ Key personnel qualifications Specification 17000 – Instrumentation and Controls, Section 1.8, A
 - Resume for Project Manager
 - Resume for Project Engineer

I declare, under penalty of perjury, that the foregoing and attached is true and correct.

Dated: _____, 20__

(Signature of Bidder)

BIDDER'S EXPERIENCE (CONTINUED)

PROJECT EXPERIENCE FOR ELECTRICAL WORK

Name
Contractor/Subcontractor
performing Electrical
Work

License Number:

DIR Registration
Number:

In addition to System Integrator experience, Bidder shall also demonstrate ability to perform electrical elements as required by Specification 17000 – Instrumentation and Controls, Section 1.8, B. The work may be completed by a subcontractor or self-performed.

List a minimum of three (3) similar projects successfully completed by the Bidder during the last five (5) years performing the type of work required by this contract. Additional sheets may be provided. Projects not similar in scope, fee, and complexity will not be considered as representative of this project.

Project Name and Location	Prime or Subcontractor to the Project	Project Owner's Name, Address, & Phone No.	Cost of Bidder's Work	Date Completed

I declare, under penalty of perjury, that the foregoing is true and correct.

Dated: _____, 20__

(Signature of Bidder)

INSURANCE ACKNOWLEDGMENT

On behalf of the Bidder making this bid, the undersigned warrants and represents that the Bidder has carefully read and understood all of the insurance requirements of the Contract Documents and has included the full cost of providing insurance meeting all requirements of the Contract Documents in the bid. The minimum insurance coverage shall be set forth in the Special Provisions Section 00810.

Upon request by Owner prior to the time of Award, the Bidder agrees to promptly provide Owner with letters from insurance companies meeting the requirements of the Contract Documents verifying that they are prepared to issue insurance to Bidder meeting all requirements of the Contract Documents. The failure of Bidder to provide Owner with this proof of insurance prior to the time of Award shall entitle Owner to reject the Bidder's bid as nonresponsive and to Award the bid to the next lowest Bidder at the sole discretion of Owner.

The failure of Bidder to provide Owner with insurance meeting all requirements of the Contract Documents within 15 calendar days after the Award, shall constitute a material breach of the Contract, entitling Owner to terminate the Contract and call the bid bond.

By dating and executing this Insurance Acknowledgment, Bidder hereby accepts all terms and conditions of this Insurance Acknowledgment and agrees to be bound by all of its terms.

Dated: _____, 20____

(Name of Bidder)

(Signature)

(Typed Name and Title)

(BLANK)

BID BOND

We, _____ as Principal, and
_____ as Surety, jointly and severally, bind
ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the

OLIVENHAIN MUNICIPAL WATER DISTRICT

(herein called Owner) for payment of the penal sum of _____ Dollars
(\$ _____), lawful money of the United States. Principal has submitted the accompanying
bid for the construction of

PLC REPLACEMENT PROJECT

If the Principal is awarded the Contract and enters into a written contract, in the form prescribed by the Owner, at the price designated by his bid, and files two bonds with the Owner, one to guarantee payment for labor and materials and the other to guarantee faithful performance, in the time and manner specified by the Owner, and carries all insurance in type and amount which conforms to the Contract Documents and furnishes required certificates and endorsements thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Forfeiture of this bond, or any deposit made in lieu thereof, shall not preclude the Owner from seeking all other remedies provided by law to cover losses sustained as a result of the Principal's failure to do any of the foregoing.

Principal and Surety agree that if the Owner is required to engage the services of an attorney in connection with the enforcement of this bond, each shall pay Owner's reasonable attorney's fees incurred with or without suit.

Executed on _____, 20__

PRINCIPAL

By: _____

(Seal if Corporation)

Title: _____

(Attach Acknowledgment of Authorized Representative of Principal)

Any claims under this bond may be addressed to:

_____ (name and address of Surety)

_____ (name and address of Surety's
agent for service of process in
California, if different from above)

_____ (telephone number of Surety's
agent in California)

(Attach Acknowledgment)

SURETY

By: _____
(Attorney-in-Fact)

NOTICE:

No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California. A certified copy of the Power of Attorney must be attached.

AGREEMENT

THIS AGREEMENT, made and entered into by and between the

OLIVENHAIN MUNICIPAL WATER DISTRICT

hereinafter referred to as "OWNER" and

_____ ;

a corporation under the laws of the state of _____

;

a partnership composed of _____

_____ ;

a joint venture composed of _____

_____ ;

an individual doing business as _____ ;

hereinafter referred to as "CONTRACTOR."

OWNER and CONTRACTOR agree as follows:

- (1) **SCOPE OF WORK:** CONTRACTOR will furnish all materials and will perform all of the work for the construction of the

PLC REPLACEMENT PROJECT

in accordance with the plans and specifications and other contract documents therefor.

- (2) **TIME OF COMPLETION:** The work shall be completed within the times set forth in the Special Provisions Section 00810. Time is of the essence.
- (3) **CONTRACT SUM:** OWNER will pay CONTRACTOR in accordance with the prices shown in the Bid Form.
- (4) **PAYMENTS:** Monthly progress payments and the final payment will be made in accordance with the General Provisions as modified by the Special Provisions. The filing of the notice of completion by OWNER shall be preceded by acceptance of the work made only by an action of the Governing Body of OWNER in session.
- (5) **COMPLIANCE WITH PUBLIC CONTRACTS LAW:** OWNER is a public agency in the State of California and is subject to the provisions of law relating to public contracts. It is agreed that all provisions of law applicable to public contracts are a part of this Contract

to the same extent as though set forth herein and will be complied with by CONTRACTOR.

- (6) **CONTRACT DOCUMENTS:** The complete contract includes all the contract documents set forth herein, to wit: Notice Inviting Sealed Bids, Bid Form, Bid Bond, Agreement, Performance Bond, Payment Bond, Contractor's Certificate Regarding Workers' Compensation, Certificate of Insurance (Workers' Compensation and Employer's Liability), Insurance Endorsement (Workers' Compensation and Employer's Liability), Certificate of Insurance (Liability), Insurance Endorsement (Liability), Certificate of Insurance (Builders' Risk "All Risk"), Insurance Endorsement (Builders' Risk "All Risk"), General Provisions, Special Provisions, Standard Specifications, Standard Drawings, Referenced Permits, Drawings, Plans, and also Addenda thereto and supplemental agreements.

This Agreement is executed by the OWNER pursuant to an action of its Governing Body in session on _____, 20____, authorizing the same, and CONTRACTOR has caused this Agreement to be duly executed.

Dated: _____, 20____ By: _____
(Authorized Representative of Owner)

Title: _____ GENERAL MANAGER

Dated: _____, 20____ _____
(Contractor)

By: _____
(Authorized Representative of Contractor)

Title: _____

(Seal if Corporation)

(Attach Acknowledgment for Authorized Representative of Contractor)

APPROVED:

(Attorney for OWNER)

Date

CERTIFICATE OF CONTRACTOR

I, _____, certify that I am a/the

[designate sole proprietor, partner in partnership, or specify corporate office, e.g., secretary] in the entity named as CONTRACTOR in the foregoing contract.

I hereby expressly certify that the name of the entity to which I am associated is _____

_____;

that this entity is in good standing and has complied with all applicable laws and regulations, and that I have been expressly authorized by the proper parties in this entity to execute this contract on behalf of the above-named entity.

(Signature)

ATTEST:

Name: _____
(Please Print)

Title: _____

(BLANK)

PERFORMANCE BOND

We, _____ as Principal,
and _____ as Surety, jointly and
severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein,
to the

OLIVENHAIN MUNICIPAL WATER DISTRICT

(herein called Owner) for payment of the penal sum of _____

_____ Dollars (\$ _____
)

lawful money of the United States. Owner has awarded Principal a contract for the construction
of

PLC REPLACEMENT PROJECT

THE CONDITION OF THIS OBLIGATION IS SUCH that if the Principal shall in all things abide
by and well and truly keep and perform the covenants, and agreements in the said contract, and
any alteration thereof made as therein provided, on his part to be kept and performed at the time
and in the manner therein specified, including all guarantees of workmanship and/or materials
for a two (2) year period, and shall indemnify and save harmless the Owner, District, the
Engineer/Architect, the Owner's Representative, and their consultants, and each of their
directors, officers, employees, and agents, as therein stipulated, this obligation shall become
null and void, otherwise, it shall be and remain in full force and effect.

Surety agrees that no change, extension of time, alteration, or addition to the terms of the
contract, or the work to be performed thereunder, or the plans and specifications shall in any
wise affect its obligation on this bond, and it does hereby waive notice thereof.

Principal and Surety agree that if the Owner is required to engage the services of an attorney in
connection with the enforcement of this bond, each shall pay Owner's reasonable attorney's fees
incurred, with or without suit, in addition to the above sum.

Executed in three original
counterparts on

_____, 20__

PRINCIPAL

By: _____

(Seal if Corporation)

Title: _____

(Attach Acknowledgment of Authorized Representative of Principal)

Any claims under this bond may be addressed to:

_____ (name and address of Surety)

_____ (name and address of Surety's
agent for service of process in
California, if different from above)

_____ (telephone number of Surety's
agent in California)

(Attach Acknowledgment)

SURETY

By: _____
(Attorney-in-Fact)

APPROVED:

(Attorney for OWNER) _____
Date

NOTICE:

No substitution or revision to this bond form will be accepted. Sureties must meet all requirements of Code of Civil Procedure Section 995.660(a). A certified copy of the Power of Attorney must be attached.

PAYMENT BOND

We, _____ as Principal,
and _____ as Surety, jointly and
severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the

OLIVENHAIN MUNICIPAL WATER DISTRICT

(herein called Owner) for payment of the penal sum of _____

_____ Dollars (\$ _____),

lawful money of the United States. Owner has awarded Principal a contract for the construction of

PLC REPLACEMENT PROJECT

If Principal or any of his subcontractors fails to pay any of the persons named in Section 3181 of the California Civil Code, or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract or during the one-year guarantee period, or for any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from the wages of employees of the contractor and his subcontractors pursuant to Section 13020 of the Unemployment Insurance Code, with respect to such work and labor, then Surety will pay the same in an amount not exceeding the sum specified above, and also will pay, in case suit is brought upon this bond, such reasonable attorney's fees as shall be fixed by the court.

This bond shall inure to the benefit of any of the persons named in Section 3181 of the California Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Surety agrees that no change, extension of time, alteration, or addition to the terms of the contract, or the work to be performed thereunder, or the plans and specifications shall in any wise affect its obligation on this bond, and it does hereby waive notice thereof.

Principal and Surety agree that should Owner become a party to any action on this bond that, each will also pay Owner's reasonable attorney's fees incurred therein in addition to the sum above set forth.

Executed in three original
counterparts on

_____, 20____

PRINCIPAL

By: _____

(Seal if Corporation)

Title: _____

(Attach Acknowledgment of Authorized Representative of Principal)

Any claims under this bond may be addressed to:

_____ (name and address of Surety)

_____ (name and address of Surety's
agent for service of process in
California, if different from above)

_____ (telephone number of Surety's
agent in California)

(Attach Acknowledgment)

SURETY

By: _____
(Attorney-in-Fact)

APPROVED:

(Attorney for OWNER)

Date

NOTICE:

No substitution or revision to this bond form will be accepted. Sureties must meet all requirements of Code of Civil Procedure Section 995.660(a). A certified copy of the Power of Attorney must be attached.

**CONTRACTOR'S CERTIFICATE
REGARDING WORKERS' COMPENSATION**

Name of Contract: **PLC REPLACEMENT PROJECT**

Name of Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**

Labor Code Section 3700:

"Every employer except the State shall secure the payment of compensation in one or more of the following ways:

- (a) By being insured against liability to pay compensation in one or more insurers duly authorized to write compensation insurance in this State.
- (b) By securing from the Director of Industrial Relations a certificate of consent to self-insure, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his employees.
- (c) For all political subdivisions of the state, including each member of a pooling arrangement under a joint exercise of powers agreement (but not the state itself), by securing from the Director of Industrial Relations a certificate of consent to self-insure against workers' compensation claims, which certificate may be given upon furnishing proof satisfactory to the director of ability to administer workers' compensation claims that may become due to its employees. On or before March 31, 1979, a political subdivision of the state which, on December 31, 1978, was uninsured for its liability to pay compensation, shall file a properly completed and executed application for a certificate of consent to self-insure against workers' compensation claims. The certificate shall be issued and be subject to the provisions of Section 3702."

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract.

Dated: _____, 20____

(Contractor)

By: _____
(Authorized Representative of Contractor)

(Seal if Corporation)

Title: _____

(Labor Code Section 1861 provides that the above certificate must be signed and filed by the Contractor with the Owner prior to performing any work under this Contract.)

CERTIFICATE OF INSURANCE

Name of Contract: **PLC REPLACEMENT PROJECT**

Name of Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**

Type of Insurance: **WORKERS' COMPENSATION INSURANCE AND
EMPLOYER'S LIABILITY INSURANCE**

THIS IS TO CERTIFY that the following policy has been issued by the below-stated company in conformance with the requirements of Articles 8-1 and 8-2 of the General Provisions and is in force at this time.

The Company will give at least 30 days' written notice by certified mail to the Owner and Engineer/Architect prior to any material change or cancellation of said policy.

<u>POLICY NUMBER</u>	<u>EXPIRATION DATE</u>	<u>TYPE OF INSURANCE</u>	<u>LIMITS OF LIABILITY</u>	
_____		A. WORKERS' COMPENSATION	Statutory Limits Under the Laws of the State of California	
_____		B. EMPLOYER'S LIABILITY	Each Employee	Each Accident
		Bodily Injury By Accident	\$	\$
		Bodily Injury By Disease	\$	\$

_____ Named Insured (Contractor)	_____ Insurance Company
_____ Street Number	_____ Street Number
_____ City and State	_____ City and State

By: _____
(Company Representative)
(SEE NOTICE ON PAGE 3 OF 3)

State of _____)
County of _____) ss.

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document

On _____ before me, _____
Date Here Insert Name and Title of the Officer

Personally appeared _____
Name(s) of Signer(s)

Who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the withing instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal

NOTARY PUBLIC

Insurance Company Agent for Service
of Process in California:

Name

Agency

Street Number

Street Number

City and State

City and State

Telephone Number

Telephone Number

This certificate or verification of insurance is not an insurance policy and does not amend, extend, or alter the coverage afforded by the policies listed herein. Notwithstanding any requirement, term, or condition of any contract or other document with respect to which this certificate or verification of insurance may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions, and conditions of such policies.

NOTICE:

No substitution or revision to the above certificate form will be accepted. If the insurance called for is provided by more than one insurance company, a separate certificate in the exact above form shall be provided for each insurance company.

Insurers must be authorized to do business and have an agent for service of process in California, have an "A" policyholder's rating and a financial rating of at least Class VI in accordance with the most current rating by A.M. Best Company.

(BLANK)

INSURANCE ENDORSEMENT

Name of Contract: **PLC REPLACEMENT PROJECT**

Name of Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**

Type of Insurance: **WORKERS' COMPENSATION INSURANCE AND
EMPLOYER'S LIABILITY INSURANCE**

This endorsement forms a part of Policy No. _____.

ENDORSEMENT:

It is agreed that with respect to such insurance as is afforded by the policy, the Company waives any right of subrogation it may acquire against the Owner, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents by reason of any payment made on account of injury, including death resulting therefrom, sustained by any employee of the insured, arising out of the performance of the above-referenced contract.

This endorsement does not increase the Company's total limits of liability.

Named Insured (Contractor)

Insurance Company

Street Number

Street Number

City and State

City and State

By: _____
(Company Representative)

(SEE NOTICE ON PAGE 2 OF 2)

State of _____)
County of _____) ss.

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document

On _____ before me, _____
Date Here Insert Name and Title of the Officer

Personally appeared _____
Name(s) of Signer(s)

Who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the withing instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal

NOTARY PUBLIC

NOTICE:

No substitution or revision to the above endorsement form will be accepted. If the insurance called for is provided by more than one policy, a separate endorsement in the exact above form shall be provided for each policy.

Insurers must be authorized to do business and have an agent for service of process in California, have an "A" policyholder's rating and a financial rating of at least Class VI in accordance with the most current rating by A.M. Best Company.

CERTIFICATE OF INSURANCE

Name of Contract: **PLC REPLACEMENT PROJECT**

Name of Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**

Type of Insurance: **LIABILITY INSURANCE**

THIS IS TO CERTIFY that the following policies have been issued by the below-stated company in conformance with the requirements of Articles 8-1 and 8-3 of the General Provisions and are in force at this time. The policy shall be an occurrence policy with a deductible not to exceed \$5,000.

<u>POLICY NUMBER</u> <u>EXPIRATION DATE</u>	<u>TYPE OF INSURANCE</u>	LIMITS OF LIABILITY In Thousands (000)	
		Occurrence	Aggregate
_____	A. GENERAL LIABILITY		
	Bodily Injury, Personal Injury, and Property Damage Combined	\$	\$
_____	B. EXCESS GENERAL LIABILITY	\$	\$
_____	C. AUTOMOBILE LIABILITY		
	Bodily Injury and Property Damage Combined	\$	\$
_____	D. EXCESS AUTOMOBILE LIABILITY	\$	\$

The following types of coverage are included in said policies (indicate by "X" in space):

A. GENERAL LIABILITY

Comprehensive Form-----YES___ NO___

Premises-Operations -----YES___ NO___

Explosion and Collapse Hazard ----- YES___ NO___

Underground Hazard-----YES___ NO___

Products/Completed Operations Hazard-----YES___ NO___

Contractual Insurance -----YES___ NO___

Broad Form Property Damage Including Completed Operations -----YES___ NO___

Independent Contractors-----YES___ NO___

Personal Injury -----YES___ NO___

B. EXCESS GENERAL LIABILITY

Umbrella Form-----YES___ NO___

Other Than Umbrella Form-----YES___ NO___

If other than Umbrella Form, please explain below:

C. AUTOMOBILE LIABILITY

Comprehensive Form Including Loading and Unloading-----YES___ NO___

Owned-----YES___ NO___

Hired -----YES___ NO___

Non-Owned -----YES___ NO___

D. EXCESS AUTOMOBILE LIABILITY

Umbrella Form-----YES___ NO___

Other Than Umbrella Form-----YES___ NO___

If other than Umbrella Form, please explain below:

This certificate or verification of insurance is not an insurance policy and does not amend, extend, or alter the coverage afforded by the policies listed herein. However, the insurance provided shall meet the requirements of the Contract Documents and include coverage as specified in this certificate.

The Company will give at least 30 days' written notice by certified mail to the Owner and the Engineer/Architect prior to any material change or cancellation of said policies.

Named Insured (Contractor)

Insurance Company

Street Number

Street Number

City and State

City and State

By:

(Company Representative)

(SEE NOTICE ON PAGE 5 OF 5)

State of _____)
County of _____) ss.

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document

On _____ before me, _____
Date Here Insert Name and Title of the Officer

Personally appeared _____
Name(s) of Signer(s)

Who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the withing instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal

NOTARY PUBLIC

Insurance Company Agent for Service
of Process in California:

Name

Agency

Street Number

Street Number

City and State

City and State

Telephone Number

Telephone Number

NOTICE:

No substitution or revision to the above certificate form will be accepted. if the insurance called for is provided by more than one insurance company, a separate certificate in the exact above form shall be provided for each insurance company.

Insurers must be authorized to do business and have an agent for service of process in California, have an "A" policyholder's rating and a financial rating of at least Class VI in accordance with the most current rating by A.M. Best Company.

INSURANCE ENDORSEMENT

Name of Contract: **PLC REPLACEMENT PROJECT**

Name of Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**

Type of Insurance: **LIABILITY INSURANCE**

This endorsement forms a part of Policy No. _____.

ENDORSEMENT:

The Owner, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents are included as additional insureds under said policies but only while acting in their capacity as such and only as respects operations of the named insured, his contractors, any subcontractor, any supplier, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable in the performance of the above-referenced contract. This insurance shall not apply if the loss or damage is ultimately determined to be the result of the sole and exclusive negligence (including any connected with the preparation or approval of maps, drawings, opinions, reports, surveys, designs, or specifications) of one or more of the aforesaid additional insureds. The insurance afforded to these additional insureds is primary insurance. If the additional insureds have other insurance which might be applicable to any loss, the amount of this insurance shall not be reduced or prorated by the existence of such other insurance.

The Contractual Liability Insurance afforded is sufficiently broad to insure all of the matters set forth in the article entitled "Indemnity" in the General Provisions of the above-referenced contract except those matters set forth in the third paragraph thereof.

This endorsement does not increase the Company's total limits of liability.

Named Insured (Contractor)

Insurance Company

Street Number

Street Number

City and State

City and State

By: _____
(Company Representative)

(SEE NOTICE ON PAGE 2 OF 2)

State of _____)
County of _____) ss.

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document

On _____ before me, _____
Date Here Insert Name and Title of the Officer

Personally appeared _____
Name(s) of Signer(s)

Who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the withing instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

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WITNESS my hand and official seal

NOTARY PUBLIC

NOTICE:

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Insurers must be authorized to do business and have an agent for service of process in California, have an "A" policyholder's rating and a financial rating of at least Class VI in accordance with the most current rating by A.M. Best Company.

CERTIFICATE OF INSURANCE

Name of Contract: **PLC REPLACEMENT PROJECT]**

Name of Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**

Type of Insurance: **BUILDERS' RISK "ALL RISK" INSURANCE**

THIS IS TO CERTIFY that the following policy has been issued by the below-stated company in conformance with the requirements of Articles 8-1 and 8-4 of the General Provisions and is in force at this time:

POLICY NUMBER	EXPIRATION DATE	LIMITS OF LIABILITY
		\$
		(Not Less Than Contract Amount)
		Deductible:
		\$
	(Not Sooner Than Contract Completion Date)	(Not More Than \$100,000)

This certificate or verification of insurance is not an insurance policy and does not amend, extend, or alter the coverage afforded by the policies listed herein. Notwithstanding any requirement, term, or condition of any contract or other document with respect to which this certificate or verification of insurance may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions, and conditions of such policies.

The Company will give at least 30 days' written notice by certified mail to the Owner and the Engineer/Architect prior to any material change or cancellation of said policy.

Named Insured (Contractor)

Insurance Company

Street Number

Street Number

City and State

City and State

By:

(Company Representative)

(SEE NOTICE ON PAGE 3 OF 3)

State of _____)
County of _____) ss.

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document

On _____ before me, _____
Date Here Insert Name and Title of the Officer

Personally appeared _____
Name(s) of Signer(s)

Who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the withing instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal

NOTARY PUBLIC

Insurance Company Agent for Service
of Process in California:

Name

Agency

Street Number

Street Number

City and State

City and State

Telephone Number

Telephone Number

NOTICE:

No substitution or revision to the above certificate form will be accepted. If the insurance called for is provided by more than one insurance company, a separate certificate in the exact above form shall be provided for each insurance company.

Insurers must be authorized to do business and have an agent for service of process in California, have an "A" policyholder's rating and a financial rating of at least Class VI in accordance with the most current rating by A.M. Best Company.

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INSURANCE ENDORSEMENT

Name of Contract: **PLC REPLACEMENT PROJECT**
Name of Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**
Type of Insurance: **BUILDERS' RISK "ALL RISK" INSURANCE**

This endorsement forms a part of Policy No. _____.

ENDORSEMENT:

The Owner, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents are included as additional insureds under said policy but only while acting in their capacity as such with respect to the above-referenced contract.

The insurance afforded to these additional insureds is primary insurance. If the additional insureds have other insurance which might be applicable to any loss, the amount of this insurance shall not be reduced or prorated by the existence of such other insurance.

This endorsement does not increase the Company's total limits of liability.

Named Insured (Contractor)

Insurance Company

Street Number

Street Number

City and State

City and State

By: _____
(Company Representative)

(SEE NOTICE ON PAGE 2 OF 2)

State of _____)
County of _____) ss.

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I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal

NOTARY PUBLIC

NOTICE:

No substitution or revision to the above endorsement form will be accepted. If the insurance called for is provided by more than one policy, a separate endorsement in the exact above form shall be provided for each policy.

Insurers must be authorized to do business and have an agent for service of process in California, have an "A" policyholder's rating and a financial rating of at least Class VI in accordance with the most current rating by A.M. Best Company.

TABLE OF CONTENTS **GENERAL PROVISIONS**

SECTION	ARTICLE	PAGE
1	DEFINITIONS, TERMS, AND ABBREVIATIONS-----	1
	1-1 DEFINITIONS-----	1
	1-2 TERMS-----	2
	1-3 ABBREVIATIONS-----	2
2	BID REQUIREMENTS AND CONDITIONS-----	2
	2-1 CONTRACT DOCUMENTS -----	2
	2-2 LICENSE AND BIDDER'S EXPERIENCE -----	3
	2-3 BIDS-----	3
	2-4 WITHDRAWAL OF BID-----	3
	2-5 BIDDERS INTERESTED IN MORE THAN ONE BID -----	4
	2-6 INTERPRETATION OF PLANS AND OTHER CONTRACT DOCUMENTS -----	4
	2-7 ADDENDA -----	4
	2-8 EXISTING CONDITIONS AND EXAMINATION OF CONTRACT DOCUMENTS -----	4
3	AWARD AND EXECUTION OF CONTRACT -----	5
	3-1 AWARD OF CONTRACT OR REJECTION OF BIDS-----	5
	3-2 EXECUTION OF CONTRACT -----	6
	3-3 BONDS-----	6
	3-4 INSURANCE REQUIREMENTS -----	7
	3-5 FAILURE TO EXECUTE CONTRACT -----	7
4	SCOPE OF WORK -----	7
	4-1 WORK TO BE DONE -----	7
	4-2 CHANGES IN THE WORK -----	7
	4-3 OBSTRUCTIONS-----	8
	4-4 UTILITIES-----	8
	4-5 PLANS AND SPECIFICATIONS FURNISHED BY THE OWNER-----	9
	4-6 FINAL CLEANUP -----	9
5	QUALITY OF THE WORK -----	9
	5-1 AUTHORITY OF THE OWNER'S REPRESENTATIVE-----	9
	5-2 SUPPLEMENTAL DRAWINGS-----	10
	5-3 CONFORMITY WITH CONTRACT DOCUMENTS AND ALLOWABLE DEVIATIONS-----	10
	5-4 MANUFACTURER'S INSTRUCTIONS -----	10
	5-5 COORDINATION OF PLANS AND SPECIFICATIONS -----	10
	5-6 INTERPRETATION OF PLANS AND SPECIFICATIONS-----	10

SECTION	ARTICLE	PAGE
	5-7 ERRORS OR DISCREPANCIES NOTED BY CONTRACTOR-----	11
	5-8 SUPERVISION AND SUPERINTENDENCE -----	11
	5-9 SHOP DRAWINGS-----	12
	5-10 QUALITY AND SAFETY OF MATERIALS AND EQUIPMENT-----	13
	5-11 STANDARDS, CODES, SAMPLES, AND TESTS -----	14
	5-12 OBSERVATION OF WORK BY OWNER'S REPRESENTATIVE -----	14
	5-13 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK -----	15
	5-14 ONE-YEAR GUARANTEE-----	15
6	PROSECUTION AND PROGRESS -----	16
	6-1 CONTRACTOR'S LIABILITY-----	16
	6-2 ASSIGNMENT -----	16
	6-3 CONTRACTOR'S CONSTRUCTION SCHEDULE AND COST BREAKDOWN -----	17
	6-4 TIME FOR COMPLETION AND FORFEITURE DUE TO DELAY-----	17
	6-5 EXTENSION OF TIME-----	18
	6-6 USE OF COMPLETED PORTIONS-----	19
7	LEGAL RELATIONS AND RESPONSIBILITIES -----	19
	7-1 OBSERVING LAWS AND ORDINANCES -----	19
	7-2 PERMITS AND LICENSES-----	19
	7-3 INVENTIONS, PATENTS AND COPYRIGHTS-----	20
	7-4 PUBLIC CONVENIENCE AND SAFETY -----	20
	7-5 RESPONSIBILITY FOR LOSS, DAMAGE, OR INJURIES-----	21
	7-6 CONTRACTOR'S RESPONSIBILITY FOR THE WORK -----	22
	7-7 PRESERVATION OF PROPERTY -----	22
	7-8 REGIONAL NOTIFICATION CENTER CONTACT -----	23
	7-9 EXCAVATION PLANS FOR WORKER PROTECTION REQUIRED BY LABOR CODE SECTION 6705-----	24
	7-10 SAFETY -----	24
	7-11 PERSONAL LIABILITY -----	25
	7-12 DEFENSE AND INDEMNITY -----	25
	7-13 HOURS OF LABOR-----	26
	7-14 PREVAILING WAGE-----	26
	7-15 TRAVEL AND SUBSISTENCE PAYMENTS -----	27
	7-16 APPRENTICES-----	27
	7-17 WARRANTY OF TITLE-----	27
	7-18 PROPERTY RIGHTS IN MATERIALS-----	28
	7-19 MUTUAL RESPONSIBILITY OF CONTRACTORS-----	28
	7-20 TERMINATION FOR BREACH-----	29
	7-21 NOTICE AND SERVICE THEREOF -----	30
	7-22 PARTIAL INVALIDITY -----	30

SECTION	ARTICLE	PAGE
	7-23 ATTORNEYS' FEES -----	30
	7-24 LANDS AND RIGHTS-OF-WAY-----	31
	7-25 NO WAIVER OF RIGHTS OR REMEDIES-----	31
	7-26 TAXES-----	31
	7-27 ASSIGNMENT OF ANTI-TRUST ACTIONS-----	32
	7-28 PAYROLL RECORDS -----	32
	7-29 MODIFICATION-----	33
	7-30 JURISDICTION AND VENUE-----	33
	7-31 HAZARDOUS WASTE-----	33
	7-32 EXCAVATIONS BELOW FOUR (4) FEET-----	33
	7-33 ARBITRATION-----	34
8	CONTRACTOR'S INSURANCE-----	34
	8-1 GENERAL -----	34
	8-2 WORKERS' COMPENSATION INSURANCE AND EMPLOYER'S LIABILITY INSURANCE -----	35
	8-3 LIABILITY INSURANCE-----	35
	8-4 BUILDERS' RISK "ALL RISK" INSURANCE -----	36
	8-5 CONTRACTOR'S LIABILITY NOT LIMITED BY INSURANCE -----	36
9	ESTIMATES AND PAYMENTS -----	36
	9-1 PAYMENT FOR CHANGES IN THE WORK -----	36
	9-2 PROGRESS PAYMENTS-----	38
	9-3 FINAL ESTIMATE AND PAYMENT -----	39
	9-4 OWNER'S RIGHT TO WITHHOLD CERTAIN AMOUNTS AND MAKE APPLICATION THEREOF-----	39
	9-5 WITHHELD CONTRACT FUNDS-----	40
	9-6 REQUIRED RELEASES -----	41
	9-7 AB 626-----	41
10	AUTHORITY AND STATUS OF OWNERS REPRESENTATIVES-----	41
	10-1 STATUS OF OWNERS REPRESENTATIVES-----	41
	10-2 AUTHORITY OF OWNERS REPRESENTATIVES-----	41
11	FORMS -----	42
	11-1 SHOP DRAWING SUBMITTAL FORM-----	42
	11-2 PROGRESS ESTIMATE AND PAYMENT FORM -----	42
	11-3 RELEASE FORM -----	42

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GENERAL PROVISIONS

SECTION 1 DEFINITIONS, TERMS, AND ABBREVIATIONS

1-1 DEFINITIONS

Whenever the following terms occur in the Contract Documents, the meaning shall be interpreted as follows:

ACCEPTANCE, FINAL ACCEPTANCE - The formal action by the Owner accepting the work as being complete.

ACCEPTED BID - The bid (proposal) accepted by the Owner.

ATTORNEY FOR OWNER – Alfred E. Smith, Nossaman, LLP, 777 S. Figueroa Street, 34th Floor, Los Angeles, CA. 90017, (213) 612-7831

BIDDER - Any individual, partnership, corporation, joint venture, or other combination thereof submitting a proposal for the work contemplated, acting directly or through an authorized representative.

CALENDAR DAY - Means all days of the week including Saturdays, Sundays and Holidays with the first day counted being the first day following the date specified.

CONTRACT - The written agreement executed between the Owner and the Contractor covering the performance of the work.

CONTRACTOR - The individual, partnership, corporation, joint venture, or other combination thereof who has entered into the contract with the Owner for the performance of the work. The term "Contractor" means the Contractor or his authorized representative.

CONTRACT DOCUMENTS - The Contract Documents set forth in the Agreement; also any and all supplemental agreements amending or extending the work contemplated. Supplemental agreements are written agreements covering alterations, amendments, or extensions to the contract and include contract change orders.

DAYS - Unless otherwise specified, days shall mean calendar days.

ENGINEER/ARCHITECT – The term "Engineer/Architect" means the Engineer/Architect or his authorized representative.

OWNER - The public entity identified as such in the Agreement. The term "Owner" means the Owner or his authorized representative.

OWNER'S REPRESENTATIVE - The person or firm authorized by the Owner to represent it during the performance of the work by the Contractor. The term "Owner's Representative" means the Owner's Representative or his assistants.

PLANS, DRAWINGS - The Plans (drawings), or reproductions thereof, which show the location, character, dimensions, and details of the work to be done.

SPECIAL PROVISIONS - Additions, deletions, and changes to the General Provisions and Standard Specifications.

SPECIFICATIONS - The directions, provisions, and requirements contained in the General Provisions and Standard Specifications as supplemented by the Special Provisions.

STANDARD SPECIFICATIONS - The Contract Documents identified or referenced as such.

SUBCONTRACTOR - An individual, partnership, corporation, joint venture, or other combination thereof who has a contract with the Contractor to perform any of the work at the site. Subcontractor also means an individual, partnership, corporation, joint venture, or other combination thereof who has a contract with another subcontractor to perform any of the work at the site.

STANDARD DRAWINGS, STANDARD PLANS - That portion of the Plans identified or referenced as such.

UTILITY - Public or private fixed works for the transportation of fluids, gases, power, signals, or communications.

WORK - Any and all obligations, duties, and responsibilities necessary to complete the construction assigned to, or undertaken by, the Contractor pursuant to the Contract Documents including all materials, equipment, and supplies incorporated or to be incorporated in the construction. Also, the completed construction or parts thereof required to be provided under the Contract Documents.

1-2 TERMS

Wherever the terms "required," "permitted," "ordered," "designated," "directed," "prescribed," or terms of like import are used, it shall be understood that the requirements, permission, order, designation, direction, or prescription of the Owner's Representative is intended. Similarly, the terms "acceptable," "satisfactory," "or equal," or terms of like import shall mean acceptable to or satisfactory to the Owner's Representative, unless otherwise expressly stated. The word "provide" shall be understood to mean furnish and install.

1-3 ABBREVIATIONS

Wherever abbreviations are used, they shall have the meanings as set forth in the Special Provisions.

SECTION 2 BID REQUIREMENTS AND CONDITIONS

2-1 CONTRACT DOCUMENTS

The Contract Documents are set forth in the Agreement form and the definition of "Contract Documents" is in Article 1-1 DEFINITIONS.

2-2 LICENSE AND BIDDER'S EXPERIENCE

No bid will be accepted from a bidder who is not licensed to conduct business in the state of California and licensed to perform the class of work defined by the Contract Documents. Bidder's personnel shall also meet required qualifications as listed in Technical Specification 17000. All bidders shall complete the Bidder's Experience forms as part of their bid. Bidders failing to complete and submit the Bidder's Experience forms with their bid may be treated as nonresponsive at the option of the Owner. Bidders unable to demonstrate experience and qualifications required by this contract may also be rejected as nonresponsive.

2-3 BIDS

Bids shall be made upon the Bid Form furnished by the Owner and a part of the Contract Documents. The Bid Form Checklist, Bid Form and Bid Bond must be submitted with the bid. All bids shall be properly executed and with all items filled in; the signatures of all persons signing shall be in longhand. Erasures, interlineations, or other corrections shall be authenticated by affixing in the margin immediately opposite the correction the initials of a person signing the bid. Written amounts shall govern in case of discrepancy between the amounts stated in writing and the amounts stated in figures. If the unit price and the total amount named by a bidder for any item are not in agreement, the unit price alone shall be considered as representing the bidder's intention, and the totals shall be corrected to conform thereto.

Bids shall not contain any recapitulation of the work to be done. Alternative bids will not be considered, except as called for. No oral, telegraphic, or telephonic bids or modifications will be considered.

Bids shall be accompanied by a "Bid Guarantee" in the form of cash, a cashier's check, a certified check, or bidder's bond executed by an admitted surety insurer, in an amount not less than 10% of the amount of bid, and made payable to or for the benefit of the Owner. Said cash, check, or bond shall be given as a guarantee that the bidder will enter into a contract and furnish the required bonds or substitutes and insurance certificates and endorsements if awarded the contract, and in case of refusal or failure to enter into said contract and furnish the required bonds or substitutes and insurance certificates and endorsements within 15 calendar days after notice of award by the Owner in writing, the cash or the check and the money represented by said check shall be forfeited to the Owner, or in the event that a bond is deposited, said security shall be forfeited. Forfeiture does not preclude the Owner from seeking all other remedies provided by law to recover losses sustained as a result of the Contractor's failure to enter into the contract or to furnish the required bonds or insurance certificates and endorsements.

Bids shall be sealed in an envelope marked and addressed as set forth in the Special Provisions 00810. Bids shall be delivered to personnel of the Owner at the location designated in the Notice Inviting Sealed Bids on or before the day and hour set for the opening of bids.

IN-PERSON bids must be sealed and received as specified above by the district front office before the day and hour set for the opening of the bids.

MAILED BIDS shall be in sealed envelopes, shall be sent at bidder's risk via certified mail (or equivalent trackable delivery) with postage prepaid, shall be marked and addressed as indicated above, and received before the day and hour set for the opening of the bids. Any bidder electing to submit a bid by mail must notify the district prior to the bid opening at prebid@olivenhain.com of a mailed bid and provide the tracking number so district can validate receipt.

ELECTRONICALLY transmitted bids are not considered sealed bids and will not be accepted.

Whether the bidder submits by mail or in-person, it is the sole responsibility of the bidder to see that his/her bid is received as specified by personnel of the Owner on or before the day and hour of bid opening. Bids not marked as being received by personnel of the Owner on or before the day and hour of bid opening will be rejected.

2-4 WITHDRAWAL OF BID

A bidder may withdraw his bid by a signed written request any time prior to the day and hour for receiving bids designated in the Notice Inviting Sealed Bids. Thereafter the Bid may be withdrawn only as permitted in accordance with Public Contract Code Section 5100, et seq., regarding relief of Bidders.

The withdrawal of a bid does not prejudice the right of a bidder to file a new bid so long as the new bid is delivered as set forth in Article 2-3 BIDS prior to the closing time specified for all bids.

2-5 BIDDERS INTERESTED IN MORE THAN ONE BID

No person, partnership, or corporation shall be allowed to make or file, or be interested in more than one bid for the work, unless alternative bids are called for. A person, partnership, or corporation submitting a subproposal to a bidder, or who has quoted prices on material to a bidder, is not thereby disqualified from submitting a subproposal or quoting prices to other bidders.

2-6 INTERPRETATION OF PLANS AND OTHER CONTRACT DOCUMENTS

If any person or entity contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the Plans, Specifications, or other Contract Documents, or finds discrepancies in, or omissions from the Plans and Specifications or other Contract Documents, he may submit to the Owner a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery. An interpretation or correction of the Contract Documents will be made only by Addendum duly issued by the Owner and made available on the District website at www.olivenhain.com. The Owner and the

Engineer/Architect will not be responsible for any other explanation or interpretation of the documents.

2-7 ADDENDA

Addenda issued before the time in which to submit bids expires shall be included in the bid and shall be made a part of the contract.

2-8 EXISTING CONDITIONS AND EXAMINATION OF CONTRACT DOCUMENTS

The bidder represents that he has carefully examined the Contract Documents and the site where the work is to be performed and that he has familiarized himself with all local conditions and federal, state and local laws, ordinances, rules, and regulations that may affect in any manner the performance of the work. The bidder further represents that he has studied all surveys and investigation reports about subsurface and latent physical conditions pertaining to the jobsite, that he has performed such additional surveys and investigations as he deems necessary to complete the work at his bid price, and that he has correlated the results of all such data with the requirements of the Contract Documents. The submittal of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, including locality, uncertainty of weather and all other contingencies, and as to the character, quality, quantities, and scope of the work.

The Plans and Specifications for the work show subsurface conditions or otherwise hidden conditions as they are supposed or believed by the Engineer/Architect to exist; but it is not intended or to be inferred that the conditions as shown thereon constitute a representation that such conditions are actually existent. Except as otherwise specifically provided in the Contract Documents, the Owner, the Engineer/Architect, and their consultants shall not be liable for any loss sustained by the Contractor as a result of any variance of such conditions as shown on the Plans and the actual conditions revealed during the progress of the work or otherwise.

Where the Owner or the Engineer/Architect or their consultants have made investigations of subsurface conditions in areas where the work is to be performed, such investigations were made only for the purpose of study and design. The conditions indicated by such investigations apply only at the specific location of each boring or excavation at the time the borings or excavations were made. Where such investigations have been made, bidders or Contractors may inspect the records as to such investigations subject to and upon the conditions hereinafter set forth. The inspection of the records shall be made at the office of the Engineer/Architect.

The records of such investigations are not a part of the contract and are shown solely for the convenience of the bidder or Contractor. It is expressly understood and agreed that the Owner, the Engineer/Architect, and their consultants assume no responsibility whatsoever in respect to the sufficiency or accuracy of the investigations; the records thereof; or of the interpretations set forth therein or made by the Owner's consultants, the Engineer/Architect or his consultants in the use thereof by the Engineer/Architect, and there is no warranty or guarantee, either express or implied, that the conditions indicated by such investigations or records thereof are representative of those existing throughout such areas, or any part thereof, or that unlooked-for

developments may not occur, or that materials other than, or in proportions, densities, or other characteristics different from, those indicated may not be encountered.

When a log of test borings showing a record of the data obtained by the investigation of subsurface conditions by the Owner, the Engineer/Architect, or their consultants is included with the Plans or other documents, it is expressly understood and agreed that said log of test borings does not constitute a part of the contract, represents only the opinion of the Owner or the Engineer/Architect or their consultants as to the character of the materials encountered by them in the test borings, is included in the Plans or other documents only for the convenience of bidders, and its use is subject to all of the conditions and limitations set forth in this article.

The availability or use of information described in this article is not to be construed in any way as a waiver of the provisions of the first paragraph in this article and a bidder or Contractor is cautioned to make such independent investigations and examination as he deems necessary to satisfy himself as to conditions to be encountered in the performance of the work.

No information derived from such inspection of records of investigations or compilation thereof made by the Owner, the Engineer/Architect, or their consultants will in any way relieve the bidder or Contractor from any risk or from properly fulfilling the terms of the contract nor entitle the Contractor to any additional compensation.

SECTION 3 AWARD AND EXECUTION OF CONTRACT

3-1 AWARD OF CONTRACT OR REJECTION OF BIDS

The award of the contract, if it be awarded, will be to the lowest responsible responsive bidder complying with the instructions contained in the Contract Documents. The Owner, however, reserves the right to select the schedules under which the bids are to be compared; to delete certain bid items from the Bid Schedule, to reject any and all bids, and to waive any irregularity in bids received. If, in the judgment of the Owner, a bid is unbalanced or if the bidder is not responsible, it shall be considered sufficient grounds for rejection of the entire bid.

The Owner shall have the period of time set forth in the Special Provisions after the opening of bids within which to accept or reject the bids. No bidder may withdraw his bid during said period. The Owner will return the bid guarantees, except any guarantees which have been forfeited, and except bidders' bonds, to the respective bidders whose bids they accompanied after the execution of the contract by the successful bidder or rejection of all bids or upon receipt of a written request therefor received after said period of time set forth in the Special Provisions.

Before award of the contract, any bidder shall furnish upon request proof of required insurance, a recent statement of his financial condition, and previous construction experience or such other evidence of his qualifications as may be requested by the Owner. If a bidder fails to furnish in a timely manner the information requested, it shall be considered sufficient grounds for rejection of such bidder's entire bid.

3-2 EXECUTION OF CONTRACT

The form of agreement, bonds, and other documents which the successful bidder, as Contractor, will be required to execute are included as a part of the Contract Documents.

The contract shall be signed by the successful bidder and returned to the Owner, together with the bonds or substitutes and insurance certificates and endorsements, within 15 calendar days or such additional time as may be allowed by the Owner from the date of the mailing of notice from the Owner to the bidder or from the date of personal delivery of notice from the Owner to the bidder that the agreement is ready for signature. The agreement, bonds or substitutes, insurance certificates and endorsements, and other documents to be executed by the Contractor shall be executed in original-quadruplicate, one each of which shall be filed with the Owner and one each with the Attorney for the Owner and the Engineer/Architect for the Owner.

3-3 BONDS

The successful bidder, simultaneously with execution of the Contract Documents, shall either furnish a Payment Bond and Performance Bond each in an amount equal to 100% of the contract amount, or equivalent cash or securities in lieu of these bonds in accordance with Code of Civil Procedure Section 995.710. The failure of Contractor to make a written request to Owner to use alternative securities meeting the requirements of Code of Civil Procedure Section 995.710 at the time the Contract Documents are signed shall be deemed a waiver of the right of Contractor to subsequently substitute these alternative securities. Alternative securities proposed by the Contractor shall be subject to review and approval by Owner. Contractor agrees to provide Owner with a deposit in a sum determined adequate by the Owner to cover all attorney's fees and all other fees, costs, and expenses incurred by the Owner in reviewing Contractor's request to use alternative securities in lieu of the required bonds and to prepare all agreements determined necessary by Owner to adequately protect Owner's interest. Performance and Payment Bonds shall be furnished by surety companies meeting the requirements of Code of Civil Procedure Section 995.660(a) and shall be completed on the forms furnished as part of the Contract Documents. Surety companies, to be acceptable to Owner, must meet all requirements of Code of Civil Procedure Section 995.660(a).

If at any time a surety on any such bond fails to comply with Code of Civil Procedure Section 995.660(a), the Contractor shall, within 10 calendar days after notice from the Owner, substitute new bonds with surety companies meeting all requirements of Code of Civil Procedure Section 995.660(a). All premiums on these new bonds shall be paid solely by the Contractor. No further progress payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished new bonds to Owner meeting all requirements of Code of Civil Procedure Section 995.660(a).

The Performance Bond and the Payment Bond, or alternative securities meeting the requirements of Code of Civil Procedure Section 995.710 approved by the Owner, must remain in full effect throughout the period of the Work and for a period of one-year thereafter as required by Article 5-14 ONE-YEAR GUARANTEE.

3-4 INSURANCE REQUIREMENTS

The successful bidder will be required to furnish the Owner proof of full compliance with all insurance requirements as specified in SECTION 8 CONTRACTOR'S INSURANCE. The forms of Certificate of Insurance and Endorsement which the successful bidder, as Contractor, will be required to furnish are included as a part of the Contract Documents.

3-5 FAILURE TO EXECUTE CONTRACT

Failure by a bidder to whom the contract is awarded to execute the contract or to furnish the required bonds or insurance certificates and endorsements within the period of time required by Section 3-2 Execution of Contract shall be just cause for the annulment of the award and the forfeiture of the bid guarantee.

A bidder who is awarded the contract and fails to execute the contract or furnish the required bonds or substitutes, or insurance certificates and endorsements shall be liable to the Owner for all damages resulting therefrom including reasonable attorneys' fees. The bid guarantee forfeited shall not be a limitation thereon.

SECTION 4 SCOPE OF WORK

4-1 WORK TO BE DONE

The work to be done consists of furnishing all transportation, labor, materials, tools, equipment, services, permits, utilities and all other items which are necessary or appurtenant to construct and complete the entire project and construct the project designated in the Contract Documents, and to leave the grounds in a neat and presentable condition.

4-2 CHANGES IN THE WORK

The Owner may require changes in, additions to, or deductions from the work, including complete termination thereof. Adjustment, if any, in the amounts to be paid to the Contractor by reason of any such change, addition, or deduction shall be determined as set forth in SECTION 9 ESTIMATES AND PAYMENTS.

The Owner's Representative may order minor changes in the work not involving an increase or decrease in the contract amount, not involving a change in the time for completion, and not inconsistent with the purposes for which the work is being constructed. **If the Contractor believes that any order for minor changes in the work for which the contract amount or time for completion should be changed, he shall not proceed with the changes in the work so ordered and shall within seven calendar days of the receipt of such order notify the Owner's Representative in writing of his estimate of the changes in the contract amount and time for completion he believes to be appropriate.**

No payment for changes in the work will be made and no changes in the time for completion by reason of changes in the work will be made, unless the changes are covered by a written change order approved by the Owner in advance of the Contractor's proceeding with the changed work.

4-3 OBSTRUCTIONS

The Contractor shall remove and dispose of all structures, debris, or other obstructions of any character necessary to accommodate the work. Where such obstructions consist of improvements not required by law to be removed by the owner thereof, all such improvements shall be removed, maintained, and permanently replaced by the Contractor at his expense except as otherwise specifically provided in the Contract Documents.

4-4 UTILITIES

The Engineer/Architect has endeavored to determine the existence of utilities at the site of the work from the records of the owners of known utilities in the vicinity of the work. The positions of these utilities as derived from such records are shown on the Plans. The service connections to these utilities are not shown on the Plans.

The Contractor shall make his own investigations, including exploratory excavations, to determine the locations and type of existing service laterals or appurtenances when their presence can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of the work. If the Contractor discovers utility facilities not identified in the Plans or Specifications or in a position different from that shown in the Plans and Specifications, he shall immediately notify in writing the Owner's Representative and the owner of the utility facility.

The Owner shall have the responsibility for the timely removal, relocation, protection, and temporary maintenance of existing main or trunkline utility facilities which are not indicated in the Plans and Specifications with reasonable accuracy.

In case it should be necessary to remove, relocate, protect, or temporarily maintain a utility because of interference with the work, the work on such utility shall be performed and paid for as follows:

When it is necessary to remove, relocate, protect, or temporarily maintain an existing main or trunkline utility facility not indicated in the Plans and Specifications with reasonable accuracy, the Owner will compensate the Contractor for the costs of locating, for the costs of repairing damage not due to the failure of the Contractor to exercise reasonable care, for the costs of removing, relocating, protecting, or temporarily maintaining such utility facilities, and for the costs for equipment on the site necessarily idled during such work. These costs, the work to be done by the Contractor in locating, removing, relocating, protecting, or temporarily maintaining such utility facilities shall be covered by a written change order conforming to the provisions of Article 4-2 CHANGES IN THE WORK and Article 9-1 PAYMENT FOR CHANGES IN THE WORK. The Owner may make changes in the alignment and grade of the work to obviate the necessity to remove, relocate, protect, or temporarily maintain such utility facilities or to reduce the costs of the work involved in removing, relocating, protecting, or temporarily maintaining such utility facilities. Changes in alignment and grade will be ordered in accordance with Article 4-2 CHANGES IN THE WORK.

When it is necessary to remove, relocate, protect, or temporarily maintain a utility (other than [1] existing main or trunkline utility facilities not indicated in the Plans and

Specifications with reasonable accuracy, or [2] existing service laterals or appurtenances when their presence cannot be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of the work) the cost of which is not required to be borne by the owner thereof, the Contractor shall bear all expenses incidental to the work on the utility or damage thereto. The work on the utility shall be done in a manner satisfactory to the owner thereof; it being understood that the owner of the utility has the option of doing such work with his own forces, or permitting the work to be done by the Contractor. No representations are made that the obligations to remove, relocate, protect, or temporarily maintain any utility and to pay the cost thereof is or is not required to be borne by the owner of such utility, and it shall be the responsibility of the Contractor to investigate to find out whether or not said cost is required to be borne by the owner of the utility.

The right is reserved to governmental agencies and to owners of utilities to enter at any time upon any street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the work and for the purpose of maintaining and making repairs to their property.

4-5 PLANS AND SPECIFICATIONS FURNISHED BY THE OWNER

The Owner will furnish to the Contractor free of charge up to five (5) full size copies of Plans and Specifications reasonably necessary for the execution of the work. The Contractor shall keep one set of Plans and Specifications in good order with red line changes available to the Owner's Representative at the site of the work.

4-6 FINAL CLEANUP

Upon completion and before making application for acceptance of the work, the Contractor shall clean all rights-of-way, streets, borrow pits, and all other grounds occupied by him in connection with the work of all rubbish, excess materials, temporary structures, and equipment, and all parts of the work and grounds occupied by him shall be left in a neat and presentable condition.

SECTION 5 QUALITY OF THE WORK

5-1 AUTHORITY OF THE OWNER'S REPRESENTATIVE

The Owner's Representative shall decide any and all questions which may arise as to the interpretation of the Plans and Specifications and shall have authority to disapprove or reject materials and equipment furnished and work performed which, in his opinion, is not in accordance with the Contract Documents. The Owner's Representative shall also have the authority to require the Contractor or any subcontractor to replace any workman or supervisor who, in his opinion, is not performing the work in a safe manner, fails to follow the instructions of the Owner's Representative, fails to perform work in accordance with the Contract Documents, fails to properly supervise the work, or demonstrates lack of competence to perform the particular work assigned to the workman or supervisor. The failure of the Contractor or any subcontractor to replace a worker or supervisor as directed by the Owner's Representative shall constitute a material breach of this agreement. Neither the Owner's Representative nor the Owner shall be

liable to Contractor, any subcontractor, or any other person or entity for removing a workman or supervisor in accordance with the terms of this article.

5-2 SUPPLEMENTAL DRAWINGS

The Plans shall be supplemented by such drawings as are necessary to better define the work. All such drawings delivered to the Contractor by the Owner's Representative shall be deemed written instructions to the Contractor. If the Contractor believes that any supplemental drawings call for changes in the work for which the contract amount or time for completion should be changed, he shall not proceed with the changes in the work so called for and shall within seven calendar days of the receipt of the supplemental drawings notify the Owner's Representative in writing of his estimate of the changes in the contract amount and time for completion he believes to be appropriate.

No payment for changes in the work will be made and no change in the time for completion by reason of changes in the work will be made, unless the changes are covered by a written change order approved by the Owner in advance of the Contractor's proceeding with the changed work.

5-3 CONFORMITY WITH CONTRACT DOCUMENTS AND ALLOWABLE DEVIATIONS

The work shall conform to the lines, grades, dimensions, tolerances, and material and equipment requirements shown on the Plans or set forth in the Specifications. Although measurement, sampling, and testing may be considered evidence as to such conformity, the Owner's Representative shall be the sole judge as to whether the work or materials deviate from the Plans and Specifications, and his decision as to any allowable deviations therefrom shall be final.

If specific lines, grades, and dimensions are not shown on the Plans, those furnished by the Owner's Representative shall govern.

5-4 MANUFACTURER'S INSTRUCTIONS

All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, supplier, or distributor, except as otherwise specifically provided in the Contract Documents.

5-5 COORDINATION OF PLANS AND SPECIFICATIONS

The Plans, Specifications, and other Contract Documents are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for the complete work. In the event of an apparent difference between Plans and Specifications, reference shall be made to the Owner's Representative whose decision thereon shall be final.

Special Provisions shall govern over General Provisions and Standard Specifications.

5-6 INTERPRETATION OF PLANS AND SPECIFICATIONS

Figured dimensions on drawings shall govern, but work not dimensioned shall be as directed. Work not particularly shown or specified shall be the same as similar parts that are shown or specified. Large-scale details shall take precedence over smaller scale drawings as to shape and details of construction. Specifications shall govern as to materials and workmanship. Plans and Specifications are intended to be fully complementary and to agree. The Specifications calling for the higher quality material or workmanship shall prevail. Materials or work described in words which so applied have a well known technical or trade meaning shall be deemed to refer to such recognized standards. In the event of any discrepancy between any drawings and the figures thereon, the figures shall be taken as correct. In the event of any doubt or question arising respecting the true meaning of the Plans or Specifications, reference shall be made to the Owner's Representative whose decision thereon shall be final.

5-7 ERRORS OR DISCREPANCIES NOTED BY CONTRACTOR

It is the duty of the Contractor to promptly notify the Owner's Representative in writing of any design, materials, or specified method that the Contractor believes may prove defective or insufficient. If the Contractor believes that a defect or insufficiency exists in design, materials, or specified method and fails to promptly notify the Owner's Representative in writing of this belief, the Contractor waives any right to assert that defect or insufficiency in design, materials, or specified method at any later date in any legal or equitable proceeding against Owner, or in any subsequent mediation, arbitration, or settlement conference between the Owner and the Contractor. The Owner's Representative, on receipt of any such notice, will promptly investigate the circumstances and give appropriate instructions to the Contractor. Until such instructions are given, any work done by the Contractor after he comes to the belief that a defect or insufficiency exists in design, materials, or specified method which is directly or indirectly affected by such alleged defect or insufficiency in design, materials, or specified method will be at his own risk and he shall bear all cost arising therefrom.

If the Contractor, either before commencing work or in the course of the work, finds any discrepancy between the Plans and the Specifications or between either of them and the physical conditions at the site of the work or finds any error or omission in any of the Plans or in any survey, he shall promptly notify the Owner's Representative of such discrepancy, error, or omission. If the Contractor observes that any Plans or Specifications are at variance with any applicable law, ordinance, regulation, order, or decree, he shall promptly notify the Owner's Representative in writing of such conflict. The Owner's Representative, on receipt of any such notice, will promptly investigate the circumstances and give appropriate instructions to the Contractor. Until such instructions are given, any work done by the Contractor after his discovery of such error, discrepancy, or conflict which is directly or indirectly affected by such error, discrepancy, or conflict will be at his own risk and he shall bear all cost arising therefrom.

5-8 SUPERVISION AND SUPERINTENDENCE

The Contractor shall supervise and direct the work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the work in accordance with the Contract Documents.

The Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but the Contractor shall not be solely responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence, or procedure of construction which is indicated in and required by the Contract Documents except as otherwise provided in Article 5-7 ERRORS OR DISCREPANCIES NOTED BY CONTRACTOR.

The Contractor shall be responsible to see that the completed work complies with the Contract Documents.

The Contractor shall designate and keep on the work at all times during its progress a competent superintendent who shall not be replaced without written notice to the Owner's Representative. The superintendent will be the Contractor's representative at the site and shall have authority to act on behalf of the Contractor. All communications given to the superintendent shall be as binding as if given to the Contractor. During periods when the work is suspended, the Contractor shall make appropriate arrangements for any emergency work which may be required.

Whenever the superintendent is not present on any particular part of the work where the Owner's Representative may desire to inform the Contractor relative to interpretation of the Plans and Specifications or to the disapproval or rejection of materials or work performed, the Owner's Representative may so inform the foreman or other worker in charge of the particular part of the work in reference to which the information is given. Information so given shall be as binding as if given to the superintendent.

5-9 SHOP DRAWINGS

Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are prepared by the Contractor or any subcontractor, manufacturer, supplier, or distributor and which illustrates some portion of the work.

The Contractor shall review, mark with his approval, and submit for review by the Owner's Representative shop drawings as called for in the Special Provisions and Standard Specifications or requested by the Owner's Representative. Shop drawings shall be submitted by email as a PDF to the Owner's Representative and be accompanied by the Shop Drawing Submittal Form included at the end of the General Provisions. Shop drawings shall show the name of the project, the name of the Contractor, and, if any, the names of suppliers, manufacturers, and subcontractors. Shop drawings shall be submitted with promptness and in orderly sequence so as to cause no delay in prosecution of the work.

Shop drawings shall be complete in all respects. If the shop drawings show any deviations from the requirements of the Plans and Specifications because of standard shop practices or other reasons, the deviations and the reasons therefor shall be set forth in the Shop Drawing Submittal Form.

By submitting shop drawings, the Contractor represents that material, equipment, and other work shown thereon conforms to the Plans and Specifications, except for any deviations set forth in the Shop Drawing Submittal Form. A log shall be maintained by the Contractor showing the

following information: sequential shop drawings number brief description, date submitted, date approved, any other data relevant to the shop drawings.

Within 30 calendar days after receipt of said shop drawings, the Owner's Representative will return via electronic mail (email), of the shop drawings to the Contractor with any comments noted thereon.

If so noted by the Owner's Representative, the Contractor shall correct the drawings and resubmit them in the same manner as specified for the original submittal. The Contractor in the Shop Drawing Submittal Form accompanying resubmitted shop drawings shall direct specific attention to revisions other than the corrections requested by the Owner's Representative on previous submittals.

The review by the Owner's Representative is only of general conformance with the design concept of the project and general compliance with the Plans and Specifications and shall not be construed as relieving the Contractor of the full responsibility for: providing materials, equipment, and work required by the contract; the proper fitting and construction of the work; the accuracy and completeness of the shop drawings; selecting fabrication processes and techniques of construction; and performing the work in a safe manner.

No portion of the work requiring a shop drawing submittal shall be commenced until the submittal has been reviewed by the Owner's Representative and returned to the Contractor with a notation indicating that resubmittal is not required.

If the Contractor believes that any shop drawing or communication relative thereto calls for changes in the work for which the contract amount or time for completion should be changed, he shall not proceed with the changes in the work so called for and shall within seven calendar days of the receipt of the shop drawings notify the Owner's Representative in writing of his estimates of the changes in the contract amount and time for completion he believes to be appropriate.

No payment for changes in the work will be made and no change in the time for completion by reason of changes in the work will be made, unless the changes are covered by a written change order approved by the Owner in advance of the Contractor's proceeding with the changed work.

5-10 QUALITY AND SAFETY OF MATERIALS AND EQUIPMENT

All equipment, materials, and supplies to be incorporated in the work shall be new, unless otherwise specified. All equipment, materials, and supplies shall be produced in a good and workmanlike manner. When the quality of a material, process, or article is not specifically set forth in the Plans and Specifications, the best available quality of the material, process, or article shall be provided.

Whenever any material, process, or article is indicated or specified by grade, patent or proprietary name, or by name of manufacturer, such Specification shall be deemed to be used for the purpose of facilitating description of the materials, process, or articles desired and shall be deemed to be followed by the words "or equal", and the Contractor may offer any material, process, or article which shall be substantially equal or better in every respect to that so indicated

or specified; provided, however, that if the material, process, or article offered by the Contractor is not, in the opinion of the Owner's Representative, equal or better in every respect to that specified, then the Contractor must furnish the material, process, or article specified or one that in the opinion of the Owner's Representative is the substantial equal or better in every respect. In the event that the Contractor furnishes material, process, or article more expensive than that specified, the difference in cost of such material, process, or article so furnished shall be borne by the Contractor.

In accordance with Public Contract Code Section 3400, the Contractor shall submit data substantiating requests for substitution of "equal" items within 35 calendar days after award of the contract. This 35-day period of time is included in the number of days allowed for the completion of the work.

All materials, equipment, and supplies provided shall, without additional charge to Owner, fully conform with all applicable state and federal safety laws, rules, regulations, and orders, and it shall be Contractor's responsibility to provide only such materials, equipment, and supplies notwithstanding any omission in the Contract Documents therefor or that a particular material, equipment, or supply was specified.

All machinery and equipment provided by the Contractor for the work shall include locking mechanisms capable of locking any shut-down devices on the machinery and equipment before commencement of any repairs or other work. Any machinery or equipment provided by the Contractor, which does not have this locking ability, shall be altered at the expense of the Contractor to provide these locking mechanisms without compromising any safety features on the equipment or machinery prior to the commencement of any repairs or work on the equipment or machinery. The Contractor shall not commence any work or repairs on any machinery or equipment which has been shut down until the locking mechanism has been activated and the Contractor has tagged the applicable machinery or equipment with a tag stating "Danger Do Not Operate." This tag shall include the name of the employee who locked the equipment prior to the commencement of any work or repairs. The Contractor shall insure that all equipment and machinery fully complies with Title 8 of California Administrative Code Sections 3202, 3314, 6003, 2320.4-2320.6, 2530.43, and 2530-86 at all times during performance of the work.

5-11 STANDARDS, CODES, SAMPLES, AND TESTS

Whenever reference is made to a standard, code, Specification, or test and the designation representing the date of adoption or latest revision thereof is omitted, it shall mean the latest revision of such standard, code, Specification, or test in effect on the day the Notice Inviting Sealed Bids is dated.

Tests shall be made in accordance with commonly recognized procedures of technical organizations and such special procedures as may be prescribed elsewhere in the Plans and Specifications. The Contractor shall furnish without charge such samples for testing as may be required by the Owner's Representative.

5-12 OBSERVATION OF WORK BY OWNER'S REPRESENTATIVE

The Owner's Representative shall at all times have access to the work during construction and shall be furnished with every reasonable facility for ascertaining full knowledge respecting the progress, workmanship, and character of materials and equipment used and employed in the work.

Whenever the Contractor varies the normal period during which work or any portion of it is carried on each day, he shall give timely notice to the Owner's Representative so that the Owner's Representative may, if he wishes, be present to observe the work in progress. If the Contractor fails to give such timely notice, any work done in the absence of the Owner's Representative will be subject to rejection.

The Contractor shall give timely notice to the Owner's Representative in advance of backfilling or otherwise covering any part of the work so that the Owner's Representative may, if he wishes, observe such part of the work before it is concealed.

The observation, if any, by the Owner's Representative of the work shall not relieve the Contractor of any of his obligations to fulfill the contract as prescribed. Defective work shall be made good, and materials and equipment furnished and work performed which is not in accordance with the Contract Documents may be rejected notwithstanding the fact that such materials, equipment, and work have been previously observed by the Owner's Representative or that payment therefor has been included in an estimate for payment.

5-13 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

Any work which does not conform the requirements of the Contract Documents or which is found unacceptable or deficient by the Owner or the Owner's Representative shall be remedied or removed and replaced by the Contractor at the Contractor's sole cost and expense, together with any other work which may be displaced in so doing, and no compensation will be allowed the Contractor for such removal, replacement, or remedial work. All materials found inadequate or deficient by the Owner or the Owner's Representative shall be immediately removed from the site.

Any work done beyond the lines and grades shown on the Plans or established by the Owner or any changes in, additions to, or deductions from the work done without written authority from the Owner will be considered as unauthorized and will not be paid for. Work so done will be ordered remedied, removed, or replaced by the Owner or the Owner's Representative at the Contractor's sole cost and expense.

Upon failure on the part of Contractor to comply promptly with any order of the Owner or Owner's Representative made under the provisions of this article the Owner or Owner's Representative shall have authority to cause all non-conforming materials, rejected work, or unauthorized work to be remedied, removed, or replaced at the Contractor's sole cost and expense and to deduct all fees and costs incurred by the Owner including staff time from any monies due or to become due the Contractor under this contract.

5-14 ONE-YEAR GUARANTEE

Besides guarantees required elsewhere, the Contractor shall and hereby does guarantee all work, materials, parts, equipment and supplies to be free from all defects due to faulty materials or workmanship for a period of one-year after the date of formal acceptance of the work by the Board of Directors of Owner except for any portion of the work that is utilized or placed into service by the Owner in accordance with the provisions of Article 6-6 USE OF COMPLETED PORTIONS. The guarantee period for portions of the work so utilized or placed into service shall be one-year commencing on the date of the written notification to the Contractor described in Article 6-6 USE OF COMPLETED PORTIONS. The Contractor shall repair or remove and replace any and all such work, together with any other work which may be displaced in so doing, that is found to be defective by Owner in workmanship and/or materials, equipment, parts or supplies within the one-year period, at the Contractor's sole cost and expense, ordinary wear and tear and unusual abuse or neglect excepted. In the event the Contractor fails to correct all defects identified by the Owner within seven (7) consecutive days after written notice of the defects from Owner, the Owner is hereby authorized to proceed to have the defects remedied and made good at the sole expense of the Contractor who hereby agrees to pay the cost and charges therefore immediately on demand. Such action by the Owner will not relieve the Contractor of the guarantees required by this article or elsewhere in the Contract Documents.

The Performance Bond and the Payment Bond shall continue in full force and effect for the guarantee period.

If, in the opinion of the Owner, defective work creates a dangerous condition or requires immediate correction or attention to prevent further loss to the Owner or to prevent interruption of operations of the Owner, the Owner may require the Contractor to correct the defects in a shorter period of time determined solely by Owner. If the Contractor does not correct the defects within the time specified by Owner, Owner may proceed to make such corrections or provide such attention; and all fees and costs of such correction or attention shall be charged against the Contractor. Such action by the Owner will not relieve the Contractor of the guarantees required by this article or elsewhere in the Contract Documents.

This article does not in any way limit the guarantee on any items for which a longer guaranty is specified or on any items for which a manufacturer or supplier gives a guarantee for a longer period. The Contractor agrees to act as a co-guarantor with such manufacturer or supplier and shall furnish the Owner all appropriate guarantee or warranty certificates upon completion of the project. No guarantee period whether provided for in this article or elsewhere in this contract shall in any way limit the liability of the Contractor or his subcontractors, materialmen, suppliers, sureties or insurers for the full statutory periods provided by California law.

SECTION 6 PROSECUTION AND PROGRESS

6-1 CONTRACTOR'S LIABILITY

The Contractor shall be solely liable and responsible to the Owner for all acts and omissions of the Contractor's directors, officers, agents, owners, and employees and for all acts and omissions of all subcontractors, materialmen and suppliers and their respective directors,

officers, managers, members, agents, owners and employees performing any of the work or providing any materials or supplies included as part of the work. The Owner, the Engineer/Architect and the Owner's Representative shall not be liable in any way for any acts or omissions of the Contractor, any subcontractors, any materialmen, any suppliers, or any of their respective directors, officers, managers, members, agents, employees or owners. Nothing contained in the Contract Documents shall create any contractual relationship between any subcontractor materialman, or supplier and the Owner. The Contractor shall bind all subcontractors to all terms of the Contract Documents for all work being performed by those subcontractors.

The divisions and sections of the Specifications and the identifications of any Drawings shall not control the Contractor in dividing the work among subcontractors.

6-2 ASSIGNMENT

The performance of the contract may not be assigned, except upon the written consent of the Owner. Consent will not be given to any proposed assignment which would relieve the original Contractor or his sureties or insurers of their responsibilities under the contract, nor will the Owner consent to any assignment of a part of the work under the contract.

Upon obtaining a prior written consent of the Owner, the Contractor may assign moneys due or to become due him under the contract, to the extent permitted by law, but any assignment of moneys shall be subject to all proper setoffs in favor of the Owner and to all deductions provided for in the contract, and particularly all money withheld, whether assigned or not, shall be subject to being used by the Owner for the completion of the work in the event that the Contractor should be in default therein.

No assignment of this contract will be approved unless it shall contain a provision that the funds to be paid to the assignee under the assignment are subject to a prior lien for services rendered or materials supplied for performance of the work called for under the contract in favor of all persons, firms, or corporations rendering such services or supplying such materials and that the Owner may withhold funds due until all work required by the Contract Documents is completed to the Owner's satisfaction.

In the event of bankruptcy of the Contractor, whether voluntary or involuntary, this Agreement may be automatically terminated at the election of the Owner. The election to terminate in accordance with this provision shall be deemed effective as of the date the Owner mails notice of termination in accordance with this section to the Contractor at the Contractor's last known address without any further action of any party. Upon termination in accordance with this provision, the Contractor shall be entitled to no further payments over and above the reasonable value of the actual Work completed as of the date the termination notice is mailed.

6-3 CONTRACTOR'S CONSTRUCTION SCHEDULE AND COST BREAKDOWN

Within fourteen (14) days after Notice to Proceed, the Contractor shall deliver to the Owner's Representative a construction progress schedule and cost breakdown in bar chart form showing the proposed dates of commencement and completion and cost of each of the various parts of the work and the anticipated amount of each monthly payment that will become due the

Contractor in accordance therewith. The Owner shall be entitled to terminate this Contract if, in the Owner's opinion, the Contractor is failing to carry on the work diligently or in accordance with the approved construction schedule and breakdown. The Contractor has been advised and understands that time is of the essence with respect to completion of all phases of the work in accordance with the approved construction schedule.

6-4 TIME FOR COMPLETION AND FORFEITURE DUE TO DELAY

The Contractor shall complete all or any designated portion of the work called for under the contract within the time set forth in Special Provisions Section 00810. Time is of the essence in this contract.

Failure of the Contractor to perform any covenant or condition contained in the Contract Documents within the time period specified shall constitute a material breach of this contract entitling the Owner to terminate the contract unless the Contractor applies for, and receives, an extension of time in accordance with the procedures set forth in this article and Article 6-5 EXTENSION OF TIME.

Failure of the Owner to insist upon the performance of any covenant or condition within the time period specified in the Contract Documents shall not constitute a waiver of the Contractor's duty to complete performance within the designated periods unless the waiver is in writing.

The Owner's agreement to waive a specific time provision or to extend the time for performance shall not constitute a waiver of any other time provisions contained in the Contract Documents. Failure of the Contractor to complete performance promptly within the additional time authorized in the waiver or extension of time agreement shall constitute a material breach of this contract entitling the Owner to terminate.

In accordance with Government Code 53069.85, Contractor agrees to forfeit and pay Owner the amount per day set forth in the Special Provisions for each and every day of delay which shall be deducted from any payments due or to become due the Contractor.

The Contractor shall not be deemed in breach of this contract and no forfeiture due to delay shall be made because of any delays in the completion of the work due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor provided the Contractor requests an extension of time in accordance with the procedures set forth in this article and Article 6-5 EXTENSION OF TIME. Unforeseeable causes of delay beyond the control of Contractor shall include acts of God, acts of a public enemy, acts of the government, acts of the Owner, or acts of another contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and weather, or delays of subcontractors due to such causes, or delays caused by failure of the Owner or the owner of a utility to provide for removal or relocation of existing utility facilities. Delays caused by actions or neglect of Contractor or his agents, servants, employees, officers, subcontractors, directors, or of any party contracting to perform part or all of the work or to supply any equipment or materials shall not be excusable delays. Excusable delays (those beyond Contractor's control) shall not entitle the Contractor to any additional compensation. The sole remedy of the Contractor shall be to seek an extension of time.

6-5 EXTENSION OF TIME

The Contractor shall not be entitled to any increase in the contract price as a result of the Owner's approval of any extension of time except to the extent that the Owner approves an increase in the contract price on a properly executed Change Order.

The time specified for completion of all of the work or any part of the work may be extended only by a written change order executed by the Owner or other written form executed by the Owner.

Requests for an extension of time must be delivered to the Owner's Representative within ten consecutive calendar days following the date of the occurrence which caused the delay. The request must be submitted in writing and must state the cause of the delay, the date of the occurrence causing the delay, and the amount of additional time requested. Requests for extensions of time shall be supported by all evidence reasonably available or known to the Contractor which would support the extension of time requested. Requests for extensions of time failing to include the information specified in this article and requests for extensions of time which are not received within the time specified above shall result in the forfeiture of the Contractor's right to receive any extension of time requested.

If the Contractor is requesting an extension of time because of weather, he shall supply daily written reports to the Owner's Representative describing such weather and the work which could not be performed that day because of such weather or conditions resulting therefrom and which he otherwise would have performed.

The Owner's acceptance of the daily reports shall not be deemed an admission of the Contractor's right to receive an extension of time or a waiver of the Owner's right to strictly enforce the time provisions contained in the Contract Documents.

When the Contractor has submitted a request for an extension of time in accordance with the procedures of this article and Article 6-4 TIME FOR COMPLETION AND FORFEITURE DUE TO DELAY, the Owner will ascertain the facts and extent the delay and extend the time for completing the work if, in its judgment, the findings of fact justify such an extension, and its findings of facts thereon shall be final and conclusive. An extension of time may be granted by the Owner after the expiration of the time originally fixed in the contract or as previously extended, and the extension so granted shall be deemed to commence and be effective from the date of such expiration.

Any extension of time shall not release the sureties upon any bond required under the contract.

6-6 USE OF COMPLETED PORTIONS

When the work or any portion of it is sufficiently complete to be utilized or placed into service, the Owner shall have the right upon written notification to the Contractor to utilize such portions of the work and to place the operable portions into service and to operate same.

Upon said notice and commencement of utilization or operation by the Owner, the Contractor shall be relieved of the duty of maintaining the portions so utilized or placed into operation; provided, however, that nothing in this article shall be construed as relieving the Contractor of

the full responsibility for completing the work in its entirety, for making good defective work and materials, for protecting the work from damage, and for being responsible for damage and for the work as set forth in the General Provisions and other Contract Documents nor shall such action by the Owner be deemed completion and acceptance, and such action shall not relieve the Contractor, his sureties, or insurers of the provisions of SECTION 8 CONTRACTOR'S INSURANCE, of Article 7-12 INDEMNITY, and of Article 5-14 ONE-YEAR GUARANTEE.

SECTION 7 LEGAL RELATIONS AND RESPONSIBILITIES

7-1 OBSERVING LAWS AND ORDINANCES

The Contractor shall keep himself fully informed of all existing and future laws, ordinances, and regulations which in any manner affect those engaged or employed to perform any of the work or providing any materials or supplies or which in any way affect the conduct of the work and of all statutes, laws, rules, regulations, orders, decisions, and decrees of any court or governmental agency having any jurisdiction or authority over all or any of the work or the conduct of the work, including all federal, state and local safety rules, regulations, and orders. This shall expressly include all ordinances, rules, regulations, and requirements applying to the work or the conduct of the work enacted by the Owner. If any discrepancy or inconsistency is discovered in the Plans, Specifications, or contract for the work the relation to any such law, rule, regulation, ordinance, order or decree, the Contractor shall forthwith report the same to the Owner's Representative in writing and cease operations on that part of the work until the Owner's Representative has given him appropriate instructions as provided for Article 5-7 ERRORS OR DISCREPANCIES NOTED BY CONTRACTOR.

The Contractor shall at all times observe and comply with and shall cause all of his directors, officers, agents, managers, members, owners, employees, subcontractors, materialmen and suppliers to observe and comply with all existing and future laws, ordinances, regulations, orders, and decrees, and shall hold harmless, indemnify, and defend the Owner, the Water Authority, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents from and against any and all liability, claims, causes of action, damages, losses, claim fees and costs, staff time, expenses, fees, and costs, including all costs of defense and attorneys' fees, arising from or based on the violation any such law, ordinance, regulation, order, or decree by the Contractor, any subcontractor, any materialman or supplier or any of their respective directors, officers, agents, managers, members, owners, or employees.

7-2 PERMITS AND LICENSES

The Contractor shall be solely liable and responsible for securing all permits and licenses necessary to perform all of the work, for paying all fees and charges necessary to secure any such permit, license, or approval, and for giving all notices which are appropriate or necessary to the proper and safe prosecution of the work. The Owner shall have no obligation to procure any permit, license, or approval necessary to perform all or any portion of the work. The Contractor shall also be solely liable and responsible for fully complying with all requirements of any permits, licenses or approvals pertaining to all or any of the work. The failure of Contractor

to strictly comply with all requirements of any permits, licenses, or approvals applying to all or any of the work shall constitute a material breach of the contract.

7-3 INVENTIONS, PATENTS, AND COPYRIGHTS

The Contractor shall pay all royalties and assume all costs arising from the use of any invention, design, process, materials, equipment, product, or device which is the subject of patent rights or copyrights.

The Contractor shall hold harmless, indemnify, and defend the Owner, the Water Authority, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents from and against all claims, damages, losses, expenses, and other costs, including costs of defense and attorneys' fees, arising out of any infringement of patent rights or copyrights incident to the use in the performance of the work or resulting from the incorporation in the work of any invention, design, process, materials, equipment, product or device, and shall defend all such claims in connection with any alleged infringement of such rights.

7-4 PUBLIC CONVENIENCE AND SAFETY

The Contractor shall conduct his operations at all times in a manner that creates the least possible obstruction and inconvenience to the public, and he shall have under construction no greater length or amount of work than he can prosecute properly with due regard to the rights of the public and all property owners in the area of the work. The Contractor shall be solely liable and responsible for ensuring that all of the work is conducted at all times in a safe manner that does not injure or damage any workers, members of the public or private or public property.

Convenient access to driveways, houses, and buildings along the line of work shall be maintained and temporary crossings shall be provided and maintained in good condition at all times during performance of the work. Not more than one crossing or intersecting street or road shall be closed at any one time.

The Contractor shall provide and maintain such fences, barriers, directional signs, lights, and flagmen as are necessary to give adequate warning to the public at all times of any conditions to be encountered as a result of the work and to give directions to the public. The Contractor shall ensure that all unsafe conditions created by the work are promptly remedied and that any unsafe conditions created by the work are protected by barriers, safeguards and warnings preventing vehicular, bicycle or walking access in any unsafe areas.

It shall also be the sole responsibility of the Contractor to ensure that the work is performed at all times in a manner that does not injure or harm any person or injure or damage any real or personal property of any person or entity.

The Contractor shall perform the work only the areas expressly identified in the Contract Documents. The Contractor must operate entirely within the limits of the project site. No equipment or materials may be parked, stockpiled, or stored outside the project site or designated Contractor staging areas. The Contractor shall not enter onto, occupy, or disturb any privately owned land or any public or private habitat not scheduled for removal in the

approved plans with any men, tools, materials, dirt, or equipment except with the prior express written consent of the Owner and all owners of any privately-owned land. The Contractor has been advised, and understands, that any request to enter onto, occupy, or disturb any privately-owned land or habitat must be submitted to the general manager of the Owner for written approval prior to entering onto, occupying, or disturbing any privately-owned land or public or private habitat for any purpose. The violation of this section by Contractor shall constitute a material breach of this contract.

The Contractor and any subcontractors, materialmen, or suppliers shall not, at any time, conduct any of the work in any manner that creates any public or private nuisance or trespass on the land of any private party or public agency. It shall be the sole responsibility of Contractor to conduct the work at all times in a manner that avoids creating any nuisance or trespass on any real or personal property owned by any private party or public agency.

The Contractor hereby agrees to indemnify, defend, and hold harmless the Owner, , Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents from and against any and all liability, claims, causes of action, actions, damages, losses, fees, costs, or expenses, of whatever type or nature, including all costs of defense, attorneys' fees, and claim fees or costs, arising out of or resulting from performance of any of the work by the Contractor, its subcontractors, materialmen, or suppliers, or their respective directors, officers, agents, managers, members, owners, or employees which results in any injury or damage to persons or property including wrongful death regardless of whether or not such claim, cause of action, damage, loss or expense is caused in whole or in part by the negligence, active or passive, of Owner, the Engineer/Architect, or the Owner's Representative excepting only those claims and causes of action caused by the sole active negligence or intentional misconduct of the Owner, the Engineer/Architect, or the Owner's Representative. From and after the date of submission of any claim or demand to Owner, the indemnified parties shall recover from the Contractor all attorneys fees, expert fees and costs, claim costs, and staff time involved in handling the claim or any subsequent action on the claim at the standard hourly rates for staff handling the claim or action.

7-5 RESPONSIBILITY FOR LOSS, DAMAGE, OR INJURIES

The Contractor shall be solely responsible for all liability, claims, causes of action, demands, losses, costs, fees, expenses, and damages, of whatever type or nature, from any cause arising out of or resulting from or in connection with the performance of any of the work, excepting only those claims and causes of action caused solely and exclusively by the active negligence or intentional misconduct of the Owner, the Engineer/Architect, the Owner's Representative, or their consultants, directors, officers, employees, and agents. This exclusive responsibility shall extend to all liability, claims, causes of action, demands, losses, costs, fees, and expenses, of whatever type or nature, after completion of the work as well as during the progress of the work.

In the event any hazardous or toxic materials, including but not limited to asbestos, are utilized in construction or hazardous or toxic materials are otherwise encountered during construction, the Contractor shall take all appropriate precautions to protect persons and property and shall comply with all applicable regulations for the installation and handling of such hazardous or toxic materials. The Contractor is solely responsible for protection of all persons and property that

could be affected by any construction or work and for the proper handling and disposal of all such hazardous or toxic materials.

Contractor has been advised that the Owner has Material Safety Sheets (hereinafter "MSS") available for review on any hazardous chemical they may be exposed to while working in or around Owner facilities. It shall be the sole responsibility of Contractor to request and inspect these MSS forms prior to commencement of any work and to alert all employees and agents of Contractor of potential hazardous waste exposure from Owner facilities. It shall be the sole responsibility of Contractor to provide the Owner's Representative with completed MSS forms for all hazardous or toxic substances that the Contractor utilizes as part of the work prior to the use of any hazardous or toxic substances and to provide these MSS forms to the Contractor's agents and employees prior to their exposure to any hazardous or toxic substance utilized by the Contractor. Further, Contractor shall comply with all provisions contained in General Industry Safety Orders Section 5194 of Title 8 of the California Administrative Code (the California Hazardous Communication Regulation) at all times during performance of the work.

7-6 CONTRACTOR'S RESPONSIBILITY FOR THE WORK

Until formal acceptance of the work by action of the Board of Directors of Owner, the Contractor shall be solely liable and responsible for all aspects of the work and all equipment materials and supplies to be provided as part of the work (including materials for which he has received partial payment or materials which have been furnished by the Owner) and shall bear the sole risk of injury, loss, or damage to any of the work, or any materials, supplies, or equipment being used or provided in conjunction with the work from any act of nature or the elements and from all other causes, whether arising from the execution or from the non-execution of the work.

The Contractor, at the Contractor's sole cost and expense, shall rebuild, repair, restore, and make good all injuries, losses, or damages whatsoever to any portion of the work or to any materials, equipment, or supplies from any cause before completion and formal acceptance of the work by formal action of the Board of Directors of Owner and shall solely bear the expense thereof. Where the Owner or the Owner's Representative determines it is necessary to protect the work or materials from any damage or injury, the Contractor shall at his sole expense provide suitable drainage and erect any additional structures and take all additional protective actions determined necessary or appropriate by either the Owner or the Owner's Representative to protect the work or materials from further damage or injury. The suspension of the work or the granting of an extension of time from any cause whatsoever shall not relieve the Contractor of his sole responsibility for the work, materials, or equipment as specified herein.

In an emergency affecting the safety of life or property, including any adjoining property, the Contractor, without special instructions or authorizations, shall promptly act to prevent such threatened loss or injury. The Contractor shall also promptly implement any and all directions given by the Owner or the Owner's Representative to protect the safety of life or property during any emergency as determined by Owner.

Notwithstanding the foregoing provisions of this section, the Contractor shall not be responsible for the cost of repairing or restoring damage to the work where the damage has been determined to have been caused solely by an Act of God in excess of 5% of the contract and amount

provided that the work damaged is built in accordance with accepted and applicable building standards and in strict compliance with the Plans and Specifications. For the purpose of this paragraph, "Acts of God" shall include only earthquakes in excess of a magnitude of 3.5 on the Richter Scale and tidal waves. No other actions of the elements, nature, or man shall be treated as Acts of God under this paragraph.

7-7 PRESERVATION OF PROPERTY

The Contractor shall be solely liable and responsible for avoiding injury or damage or interfering with the construction or operation of any and all existing improvements or facilities, all utility facilities, all personal and real property whether owned by any public agency or private party, and any and all trees, shrubbery, landscaping and habitat that are not to be removed. The Contractor shall be solely liable and responsible for any and all damage and injury to any real or personal property of any person or entity both during and after performance of the work.

All trees, shrubbery, and landscaping that are not to be removed, and all lines, fences, signs, survey markers and monuments, buildings and structures, conduits, pipelines both under or above ground, all sewer and water pipelines or facilities, all highway or street facilities, and any and all other improvements, facilities, habitat, trees, or landscaping within or adjacent to the work not to be removed in the approved plans shall be protected by the Contractor from all injury or damage and the Contractor shall provide and install suitable safeguards to protect all such objects from any injury or damage. If any of the foregoing objects are injured or damaged either during or after performance of the work, they shall be promptly replaced or restored to a condition as good as when the Contractor commenced work or as good as required by the Plans and Specifications if any such objects or are part of the work being performed, at the Contractors sole cost and expense. The Owner, the Engineer/Architect and the Owners Representative and their respective Directors, officers, agents and employees shall have no liability whatsoever for any injury or damage caused in whole or in part by the actions or omissions of the Contractor, any subcontractor, any materialmen or supplier, or any of their respective directors, officers, agents, employees, managers, or members except where the injury or damage is caused by the sole and exclusive active negligence or intentional misconduct of the Owner, the Engineer/Architect, the Owners Representative, or their consultants, directors, officers, employees, and agents. The Contractor shall also be solely liable and responsible for any and all damage or injury to any landscaping or habitat caused in whole or in part by the actions or omissions of the Contractor, any subcontractor, any materialmen or supplier, or their respective directors, officers, agents, employees, managers, owners, or members.

The fact that any pipeline or other underground facility is not shown on the Plans, shall not relieve the Contractor of his responsibility under this section.

In addition to any requirements imposed by law, the Contractor shall shore up, brace, underpin, and protect all foundations, structures, or improvements adjacent to or adjoining the site of the work which are in any way affected by the excavations or by any of the work. Whenever any notice is required to be given by the Owner or the Contractor at any adjacent or adjoining landowner or other party before commencement of any work, this notice shall be given by the Contractor.

7-8 REGIONAL NOTIFICATION CENTER CONTACT

The Contractor, except in an emergency, shall contact the appropriate regional notification center prior to commencing any excavation work. Notify the center at least two working days in advance or up to a maximum of 14 calendar days in advance of any excavation work. The Contractor shall delineate the proposed excavation site with white paint on paved surfaces or with markings such as flags or stakes in unpaved areas. The Contractor shall provide the regional notification center with all job site location information. The regional notification center will assign to the Contractor a Dig Alert Number which validates the Contractor's excavation permit and will notify all of its members having subsurface installations in the area. No excavation shall be commenced and carried out by the Contractor until all existing subsurface installations have been field marked and the Owner has been given the Dig Alert Number by the Contractor.

Emergency shall be defined as a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services. Emergency includes such occurrences as fire, flood, earthquake, or other soil or geologic movements, as well as such occurrences as riot, accident, or sabotage (Government Code Section 4216).

Subsurface installation means any underground pipeline, conduit, duct, wire, or other structure operated or maintained in or across a public street or public right-of-way (Government Code Section 4216).

7-9 EXCAVATION PLANS FOR WORKER PROTECTION REQUIRED BY LABOR CODE SECTION 6705

If the total amount of the contract is in excess of \$25,000, the Contractor shall submit to the Owner for acceptance, in advance of excavation, a detailed Plans showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches 5 feet or more in depth. The Plans shall be prepared by a registered civil or structural engineer. As a part of the Plans, a note shall be included stating that the registered civil or structural engineer certifies that the Plans complies with all CAL-OSHA Construction Safety Orders and regulations, or that the registered civil or structural engineer certifies that the Plans is not less effective than the shoring, bracing, sloping, or other provisions of the Safety Orders and regulations.

The Owner or the Engineer/Architect or their consultants may have made investigations of subsurface conditions in areas where the work is to be performed. If so, these investigations are identified in the Special Provisions and the records of such investigations are available for inspection at the office of the Engineer/Architect. The detailed Plans showing the design of shoring, etc., which the Contractor is required to submit to the Owner for acceptance in advance of excavation will not be accepted by the Owner if the Plans are based on subsurface conditions which are more favorable than those revealed by the investigations made by the Owner or the Engineer/Architect or their consultants; nor will the Plans be accepted if it is based on soils-related design criteria which is less restrictive than the criteria set forth in the report on the aforesaid investigations of subsurface conditions.

The detailed Plans showing the design of shoring, etc., shall include surcharge loads for nearby embankments and structures, for spoil banks, and for construction equipment and other construction loadings.

The Plans shall indicate for all trench conditions the minimum horizontal distances from the side of the trench at its top to the near side of the surcharge loads.

Nothing contained in this article shall be construed as relieving the Contractor of the full responsibility for providing shoring, bracing, sloping, or other provisions which are adequate for worker protection.

7-10 SAFETY

In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the work, and the Contractor shall fully comply with all state, federal and other laws, rules, regulations, and orders relating to safety of the public and workers.

The right of the Engineer/Architect or the Owner's Representative to conduct construction review or observation of the Contractor's performance will not include review or observation of the adequacy of the Contractor's safety measures in, on, or near the construction site.

7-11 PERSONAL LIABILITY

No director, officer, employee, or agent of the Owner, the Engineer/Architect, the Owner's Representative, or their consultants shall be personally responsible for any liability arising under or by virtue of the contract.

7-12 DEFENSE AND INDEMNITY

The Contractor hereby agrees to indemnify, defend, and hold harmless the Owner, the Engineer/Architect, and the Owner's Representative and their respective directors, officers, agents, employees and consultants from and against any and all liability, claims, demands, causes of action, actions, damages, losses, fees, costs, or expenses, of whatever type or nature, including all costs of defense and attorneys' fees, caused in whole or in part, or claimed to be caused in whole or in part, by any act or omission of the Contractor, any subcontractor, any supplier or materialman or any of their respective directors, officers, agents, employees, managers, members, or owners except only those claims and causes of action caused by the sole active negligence or intentional misconduct of the Owner, the Engineer/Architect or the Owner's Representative or their respective agents or employees. This indemnification shall extend to all claims, demands, causes of action, actions, or liability occurring after completion of the project as well as during the progress of the Work.

The Contractor further agrees to indemnify, defend, and hold harmless the Owner, the Engineer/Architect, and Owner's Representative and their respective directors, officers, agents, employees, and consultants from and against any and all liability, claims, causes of action, actions, losses, fees, costs, expenses, or damages, of whatever type or nature, including all costs of defense and attorneys' fees, as a result of the failure of or claimed failure of the

Contractor to strictly comply with any of the Contractor's obligations under this contract. This indemnity shall expressly include claims by the Owner for any injury, damages, losses, costs, fees or expenses arising from or related to the failure of the Contractor or any of his subcontractors, materialmen, or suppliers to strictly comply with all terms of this contract or as a result of any improper workmanship or defective supplies or materials.

The Contractor's indemnity obligations as contained in this section shall remain in full force and effect and shall apply whether or not the claim, cause of action, damage, cost, fee, or expense is covered by any applicable insurance policy and regardless of any position that may be taken by any insurance company regarding a defense or coverage for any claim or cause of action asserted. From and after the date any claim or demand is submitted to Owner covered by these indemnity provisions, the indemnified parties shall be entitled to recover from Contractor all fees and costs incurred in investigating the claim, all staff time involved in handling the claim or any subsequent action on the claim at staff's ordinary hourly rates, all expert fees and costs, all attorneys' fees, and all court costs. The Contractor shall also be solely liable and responsible for paying any and all damages, fees or costs awarded to the claimant as a result of any settlement or final judgment of any cause of action or action covered by these indemnity provisions. This indemnity shall expressly include all wrongful death actions as well as any actions asserting any damage or injury to any persons or real or personal property.

From and after submission of any claim or demand to any of the indemnified parties, the indemnified party shall be entitled to appoint their own independent counsel to represent them and the Contractor shall pay all fees, costs, and expenses of whatever type or nature (including all staff time) incurred by each of the indemnified parties within thirty (30) consecutive days of receipt of a demand for reimbursement of these costs, fees, or expenses by each of the indemnified parties. A breach of this indemnity provision by Contractor shall constitute a material breach of the contract.

7-13 HOURS OF LABOR

The Contractor shall forfeit as a penalty to the Owner \$25 for each worker employed in the execution of the contract by the Contractor or any subcontractor under him for each calendar day during which such worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of the Labor Code and, in particular, Section 1810 to Section 1815 thereof, inclusive, except that work performed by employees of Contractors in excess of 8 hours per day and 40 hours during any one week shall be permitted upon compensation for all hours worked in excess of 8 hours per day at not less than one and one-half times the basic rate of pay as provided in said Section 1815.

7-14 PREVAILING WAGE

The Contractor shall comply with Labor Code Section 1775. In accordance with said Section 1775, the Contractor shall forfeit as a penalty to the Owner \$50 for each calendar day or portion thereof for each worker paid less than the stipulated prevailing rates for such work or craft in which such worker is employed for any work done under the contract by him or her or by any subcontractor under him or her in violation of the provisions of the Labor Code and in particular,

Labor Code Sections 1770 to 1780, inclusive. In addition to said penalty and pursuant to said Section 1775, the difference between such stipulated prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the stipulated prevailing wage rate shall be paid to each worker by the Contractor. Pursuant to Labor Code Section 1775, to the extent there is insufficient money due a contractor to cover all penalties forfeited and amounts due, the Division of Labor Standards Enforcement shall be notified of the violation and the Division of Labor Standards Enforcement shall be entitled to maintain an action in any court of competent jurisdiction to recover the penalties and the amounts due pursuant to Labor Code Section 1775.

Section 1776 of the Labor Code requires each contractor and its subcontractors to keep accurate payroll records showing the name, address, social security number, work classification, straight time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the work required by these Contract Documents. These payroll records shall be made available for inspection or furnished to all employees, any representative of the Owner, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations. Contractor shall provide a certified copy of these payroll records to any of the aforementioned parties within 10 calendar days after receipt of a written request for these records. Contractor understands that it is the responsibility of the Contractor to ensure that these payroll records are maintained by Contractor and all subcontractors performing the work in accordance with Labor Code Section 1776(h). The payroll records shall be on forms provided by the Division of Labor Standard Enforcement or provide the same information as the information required by this form.

Pursuant to Labor Code Section 1777.1, whenever any contractor or subcontractor performing a public works project is found by the Labor Commissioner or the Owner to be in violation of Labor Code Section 1770 et seq., except Section 1775, the contractor or subcontractor or any firm, corporation, partnership, or association of which the contractor or any subcontractor has a substantial interest, shall be ineligible to bid on or to receive any public works contract for a period of not less than one-year or more than three years. The period of debarment shall run from the date the determination of the violation is made by the Labor Commissioner.

The Owner shall be entitled to withhold wages and penalties due as a result of any violation of the Labor Code from Payments due the Contractor in accordance with Labor Code Section 1726. These withheld amounts shall be paid to the Labor Commissioner for disbursement in accordance with Labor Code Section 1730. The Contractor's right to recover these wages and penalties shall be limited as provided in the Labor Code.

7-15 TRAVEL AND SUBSISTENCE PAYMENTS

Each worker needed to execute the work must be paid travel and subsistence payments as defined in the applicable collective bargaining agreements filed in accordance with Labor Code Section 1773.8.

7-16 APPRENTICES

Attention is directed to the provisions in Sections 1777.5, 1777.6, and 1777.7 of the Labor Code concerning the employment of apprentices by the Contractor or any subcontractor under him.

The Contractor and any subcontractor under him shall comply with the requirements of Sections 1777.5 and 1777.6 of the Labor Code in the employment of apprentices.

Information relative to apprenticeship standards, wage schedules, and other requirements may be obtained from the Director of Industrial Relations, ex officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.

Willful violations of Section 1777.5 will result in the Contractor, and the business entity under which the Contractor is doing business, being denied the right to bid on, or to receive, any public works contract for a period of up to one year for the first violation and for a period of up to three years for the second and subsequent violations commencing from the date the determination of noncompliance by the Administrator of Apprenticeship Council. In addition, if the Contractor violates Section 1777.5, he will forfeit as a civil penalty the sum of \$50 for each calendar day of non-compliance which shall be withheld from progress payments by Owner upon notice from the Department of Industrial Relations. (Labor Code Section 1777.7.)

7-17 WARRANTY OF TITLE

No materials, supplies, or equipment for the work under this contract shall be purchased subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest therein or any part thereof is retained by the seller or supplier. The Contractor warrants clear and good title to all materials, supplies, and equipment installed and incorporated in the work and agrees upon completion of all work to deliver the premises together with all improvements and appurtenances constructed or placed thereon by him to the Owner free from any claims, liens, encumbrances, or charges and further agrees that neither he nor any person, firm, or corporation furnishing any material or labor for any work covered by the contract shall have any right to a lien upon the premises or any improvement or appurtenance thereon, provided that this shall not preclude the Contractor from installing metering devices or other equipment of utility companies or of municipalities, the title of which is commonly retained by the utility company or the municipality. Nothing contained in this article, however, shall defeat or impair the right of such persons furnishing materials or labor under any bond given by the Contractor for their protection or any right under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this article shall be inserted in all subcontracts and material contracts, and notices of its provision shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

7-18 PROPERTY RIGHTS IN MATERIALS

Nothing in the contract shall be construed as vesting in the Contractor any right of property in the materials used after they have been attached or affixed to the work or the soil. All such materials shall become the property of the Owner upon being so attached or affixed. Soil, stone, gravel, and other materials found at the site of the work and which conform to the Plans and

Specifications for incorporation into the work may be used in the work. No other use shall be made of such materials except as may be otherwise described in the Plans and Specifications.

7-19 MUTUAL RESPONSIBILITY OF CONTRACTORS

Nothing in the contract shall be interpreted as granting to the Contractor exclusive occupancy of the site of the project. The Contractor must ascertain to his own satisfaction the scope of the project and the nature of any other contracts that have been or may be awarded by the Owner in the construction of the project, to the end that the Contractor may perform this contract in the light of such other contracts, if any.

The Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the project. If the performance of any contract for the project is likely to be interfered with by the simultaneous performance of some other contract or contracts, the Owner's Representative shall decide which contractor shall cease work temporarily and which contractor shall continue or whether the work under the contracts can be coordinated so that the contractors

may proceed simultaneously. On all questions concerning conflicting interest of contractors performing related work, the decision of the Owner's Representative shall be binding upon all contractors concerned and the Owner, the Engineer/Architect, the Owner's Representative, and their consultants shall not be responsible for any damages suffered or extra costs incurred by the Contractor resulting directly or indirectly from the award or performance or attempted performance of any other contract or contracts on the project or caused by a decision or omission of the Owner's Representative respecting the order of precedence in the performance of the contracts.

If through acts of neglect on the part of the Contractor, any other contractor or any subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration, if such other contractor or subcontractor will so settle. If such other contractor or subcontractor shall assert any claim against the Owner, the Engineer/Architect, the Owner's Representative, or their consultants or any of their directors, officers, employees, or agents on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor who shall hold harmless, indemnify, and defend the Owner, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents against any such claim, including all attorneys' fees and any other costs incurred by the indemnified parties relative to any such claim.

7-20 TERMINATION FOR BREACH

If the Contractor refuses or fails to prosecute the work or any separable part thereof with such diligence as will ensure its completion within the time specified herein, or any extension thereof, or fails to complete such work within such time, or if the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he files a petition to take advantage of any debtor's act, or if he or any of his subcontractors should violate any of the provisions of the contract, or if he should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or

proper materials to complete the work in the time specified, or if he should fail to make prompt payment to subcontractors or for material or labor, or if he should persistently disregard laws, ordinances, or instructions given by the Owner or Owner's Representative, the Owner may, without prejudice to any other right or remedy, serve written notice upon the Contractor and his surety of his intention to terminate the contract, said notice to contain the reasons for such intention to terminate the contract, and unless within ten days after the service of such notice such violations shall cease and satisfactory arrangements for the corrections thereof be made, the contract shall upon the expiration of said ten days cease and terminate. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished.

In the event of any such termination, the Owner shall immediately serve written notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the contract; provided, however, that if the surety within 15 calendar days after the serving upon it of a notice of termination does not give the Owner written notice of its intention to take over and perform the contract or does not commence performance thereof within 30 calendar days from the date of serving said notice, the Owner may take over the work and prosecute the same to completion by contract or by any other method it may deem advisable for the account and at the expense of the Contractor, and his surety shall be liable to the Owner for any excess cost or other damage occasioned the Owner thereby, and in such event the Owner may, without liability for so

doing, take possession of and utilize in completing the work such materials, appliances, plants, and other property belonging to the Contractor that may be on the site of the work and be necessary therefor. For any portion of such work that the Owner elects to complete by furnishing its own employees, materials, tools, and equipment, the Owner shall be compensated for such in accordance with the schedule of compensation for force account work in Article 9-1 PAYMENT FOR CHANGES IN THE WORK.

If the unpaid balance of the contract price exceeds the direct and indirect costs of completing the work, including, but not limited to, all costs to Owner arising from professional services and

attorneys' fees and all costs generated to insure or bond the work of substituted contractors or subcontractors utilized to complete the work, such excess shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to Owner promptly upon demand; on failure of Contractor to pay, the surety shall pay on demand by Owner. Any portion of such difference not paid by Contractor or surety within 30 calendar days following the mailing of a demand for such costs by Owner shall earn interest at the rate of 10% per annum or the maximum rate authorized by California law, whichever is lower.

The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to the Owner.

7-21 NOTICE AND SERVICE THEREOF

Any notice required or given under the contract shall be in writing, be dated, and signed by the party giving such notice or his duly authorized representative, and be served as follows:

If to the Owner, by personal delivery or by deposit in the United States mail.

If to the Contractor, by personal delivery to the Contractor or to his authorized representative at the site of the project or by deposit in the United States mail.

If to the surety or any other person, by personal delivery to said surety or other person or by deposit in the United States mail.

All mailed notices shall be in sealed envelopes, shall be sent by certified mail with postage prepaid, and shall be addressed to the addresses in the Contract Documents or such substitute addresses which a party designates in writing and serves as set forth herein.

7-22 PARTIAL INVALIDITY

If any provision of this contract is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions shall nevertheless continue in full force without being impaired or invalidated in any way.

7-23 ATTORNEYS' FEES

In the event any arbitration proceeding, administrative proceeding or litigation in law or in equity, including an action for declaratory relief, is brought to invalidate, enforce, or interpret any term or provision of this contract, the prevailing party shall recover all attorneys' fees, all expert fees and costs, and all costs of the proceeding which shall be determined by the Court or the presiding officer at the proceeding authorized to make a determination of the issues or in a separate action brought for that purpose, in addition to any other relief provided by California law.

If any party to this agreement becomes a party to any litigation, administrative proceeding or arbitration concerning the invalidation, enforcement or interpretation of the provisions of this agreement or the performance of this agreement by reason of any act or omission of another party or authorized representative of another party to this agreement and not by any act or omission of a party that becomes a party to that proceeding or any act or omission of its authorized representatives, the party that causes another party to become involved in the proceeding shall be liable to that party for all expert fees and costs, all attorneys' fees, and all costs of the proceeding. The award of these expert fees and costs, attorneys' fees, and costs shall be determined as provided above.

From and after any date of submission of any demand or claim to Owner or any of the other indemnified parties covered by any indemnity provisions of this contract, the indemnified party shall be entitled to appoint their own independent counsel to represent them and the Contractor shall pay all fees and costs incurred by the indemnified parties to investigate and evaluate the claim or cause of action, for all staff time at the hourly rates of each staff member handling the claim or cause of action, all attorneys' fees, all expert fees and costs, and all court costs when and as these fees and costs are incurred by each of the indemnified parties. The Contractor agrees to pay all of these fees, costs, and expenses to each of the indemnified parties not later than thirty (30) days following a demand for reimbursement of these fees, costs, and expenses by each of the indemnified parties. Amounts not paid by the Contractor within this thirty (30) day period shall earn interest at the rate of one percent (1%) per month until paid by Contractor in full.

In the event opposing parties have each prevailed on one or more cause of action actually contested or admitted by pleadings or pre-hearing documents on file, the presiding officer may offset such fees and costs between prevailing parties after considering the necessity of the proceeding and the importance of the issue or issues upon which a party has prevailed. However, the court or presiding officer shall have no authority to relieve the Contractor of the Contractor's obligation to pay all damages, fees, costs, and expenses of each of the indemnified parties as provided in the indemnity provisions of this contract.

The term "prevail" as used in this section shall include any action at law, in equity, or pursuant to arbitration in which either party has been successful including, but not limited to, demurrers, motions to strike, judgments on the pleadings, summary judgments or summary adjudications of issues, any other motion of whatever type or nature, or any trial proceeding or motion.

7-24 LANDS AND RIGHTS-OF-WAY

The lands and rights-of-way for the facility to be constructed will be provided by the Owner. The Contractor shall make his own arrangements and pay all expenses for additional area required by him outside the limits of the Owner's lands and rights-of-way.

Work in public right-of-way shall be done in accordance with the requirements of the permit issued by the public agency in whose right-of-way the work is located in addition to conforming to the Plans and Specifications. If a permit is not required, the work shall conform to the standards of the public agency involved in addition to conforming to the Plans and Specifications.

7-25 NO WAIVER OF RIGHTS OR REMEDIES

No action or failure to act by the Owner, Engineer/Architect, or Owner's Representative shall constitute a waiver of any right or duty afforded any of them under the Contract Documents, nor shall any such action or failure to act constitute an approval of or acquiescence in a breach of this contract by Contractor. No oral waiver of any rights or remedies granted to the Owner, Engineer/Architect, or Owner's Representative shall be effective for any purpose. To be effective, the waiver must be in writing and executed by an authorized representative of Owner, the Engineer/Architect, or the Owner's Representative. Contractor has been informed, and understands, that the Engineer/Architect and Owner's Representative have no authority whatsoever to waive any rights or remedies granted to the Owner by this contract or to alter any term or provision of the Contracts Documents or the approved Plans and Specifications. Any such purported waiver shall be void and unenforceable.

7-26 TAXES

The Contractor shall pay all sales, consumer, use, and other taxes.

NOTICE OF TAXABLE POSSESSORY INTEREST - The terms of this document may result in the creation of a possessory interest. If such a possessory interest is vested in a private party to this document, the private party may be subjected to the payment of personal property taxes levied on such interest.

7-27 ASSIGNMENT OF ANTI-TRUST ACTIONS

In entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

Contractor shall insure that a comparable provision is included in all subcontracts at all tier levels which are executed pursuant to this Agreement.

7-28 PAYROLL RECORDS

It shall be the responsibility of the Contractor to maintain an accurate payroll record showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each employee in accordance with Labor Code Section 1776, and to ensure that each subcontractor also complies with all provisions of Labor Code Section 1776 and this contract provision.

All payroll records shall be certified as accurate by the applicable contractor or subcontractor or its agent having authority over such matters.

The Contractor shall ensure that all payroll records are available for inspection at the Contractor's principal office during normal business hours and shall notify the Owner, in writing, of the place where all payroll records are located from time to time.

The Contractor shall furnish a copy of all payroll records, upon request, to employees or their authorized agents, to the Owner, to the Division of Labor Standards Enforcement, and to the Division of Apprenticeship Standards of the Department of Industrial Relations. The Contractor shall also furnish a copy of payroll records to the general public upon request provided the public request is made through the Owner, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement of the Department of Industrial Relations. In no event shall members of the general public be given access to payroll records at the Contractor's principal office.

Records made available to the general public in accordance with the prior paragraph shall be marked or obliterated in such a manner that the name and address of the Contractor and/or

subcontractor and the name, address, and telephone number of all employees does not appear on the modified record.

The Contractor shall file a certified copy of any requested payroll records with the entity that requested such records within ten days of the date a written request for payroll records has been received.

Failure of the Contractor to comply with any provisions of this article or Labor Code Section 1776 within ten days of the date of a written request for compliance is received shall result in a forfeiture of up to \$50 per calendar day or portion thereof, for each worker, until strict compliance is obtained. Upon notification by the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement of the Department of Industrial Relations, the Owner shall withhold penalties under this article or Labor Code Section 1776 from the Contractor's payments then due.

7-29 MODIFICATION

This contract may not be altered in whole or in part except by modification in writing and properly executed by all parties hereto or by change as provided herein.

7-30 JURISDICTION AND VENUE

In the event any legal or equitable proceeding is commenced to invalidate, enforce, or interpret any of the terms or provisions of this contract, the parties expressly agree that jurisdiction and venue shall lie only in the Superior Court located in the North County Judicial District, County of San Diego, State of California. The Contractor acknowledges and agrees that this contract has been executed and requires performance solely within the jurisdiction and venue of the North County Judicial District and that the contract requires work solely within the jurisdiction and venue of the North County Judicial District.

7-31 HAZARDOUS WASTE

It shall be the responsibility of the Contractor to pay all fees and costs associated with removal and cleanup of any hazardous waste used at or brought to the job site by the Contractor, any subcontractor, or any agent, representative, or employee of the Contractor or any subcontractor.

The Contractor shall identify and remove all such hazardous waste in accordance with all federal, state, and local rules and regulations and shall promptly notify the Owner's Representative of any such hazardous waste. If hazardous waste is discovered during performance of the work which has not been brought to, or used at, the job site by the Contractor, any subcontractor, or any agent, representative, or employee of the Contractor or any subcontractor, the Contractor shall identify and remove this hazardous waste in accordance with all federal, state, and local rules and regulations and in accordance with directions of the Owner and the Contractor shall be entitled to request an increase in compensation due for these removal and cleanup costs in accordance with Article 9-1 PAYMENT FOR CHANGES IN THE WORK.

7-32 EXCAVATIONS BELOW FOUR (4) FEET

If any work required by this contract includes digging trenches or other excavations that extend deeper than four feet below the surface, the Contractor shall promptly, and before the following conditions are disturbed, notify the Owner in writing of any:

Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law.

Subsurface or latent physical conditions at the site differing from those indicated.

Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

Nothing in this article is intended to relieve the Contractor of his responsibility to carefully examine the Contract Documents and the site where the work is to be performed in accordance with Article 2-8 EXISTING CONDITIONS AND EXAMINATION OF CONTRACT DOCUMENTS; to familiarize himself with all local conditions and federal, state, and local laws, ordinances, rules, and regulations that may affect the performance of any work; to study all surveys and investigation reports about subsurface and latent physical conditions pertaining to the job site; to perform such additional surveys and investigations as the Contractor deems necessary to complete the work at his bid price; and to correlate the results of all such data with the requirements of the Contract Documents.

If the Owner determines that hazardous waste exists and that conditions exist which Contractor could not discover through the investigations required by the preceding paragraph, the Owner shall notify the Contractor and the Contractor may request a change order in accordance with Article 9-1 PAYMENT FOR CHANGES IN THE WORK. Nothing in this article shall relieve the Contractor of the obligation to pay all fees and costs associated with removal and cleanup of any hazardous waste used at, or brought to, the job site by the Contractor as specified in Article 7-31 HAZARDOUS WASTE. Nor shall this article relieve the Contractor of responsibility for site conditions discoverable by any investigation required by the preceding paragraph.

In the event that a dispute arises between the Owner and the Contractor involving hazardous waste and whether site conditions differ materially from those the Contractor could or should have discovered by the investigations required by this contract, the Contractor shall not be excused from the scheduled completion date provided in the Contract Documents and shall proceed with all work in the manner and in the time required by the Contract Documents.

7-33 ARBITRATION

All public works claims between the Contractor and Owner relating to this contract where the total claims of both parties are equal to or less than \$375,000 shall be submitted to mediation first and then to arbitration in accordance with Public Contract Code Section 20104, et seq. A copy of Public Contract Code Section 20104, et seq stating these arbitration requirements is attached following the General Provisions. When a total payment of the Contractor and the Owner exceed a total of \$375,000, this section shall not apply and neither the Owner nor the Contractor shall have any obligation to arbitrate the claim.

SECTION 8 CONTRACTOR'S INSURANCE

8-1 GENERAL

The Contractor shall not commence or continue to perform any work unless he, at his own expense, has in full force and effect all required insurance. The Contractor shall not permit any subcontractor to perform work on this project unless the Workers' Compensation Insurance requirements have been complied with by such subcontractor.

The types of insurance the Contractor shall obtain and maintain are Workers' Compensation Insurance and Employer's Liability Insurance, Liability Insurance, Builders' Risk "All Risk" Insurance, all as set forth herein.

Workers' Compensation Insurance and Employer's Liability Insurance and Liability Insurance shall be maintained in effect for the full guarantee period.

Insurers must be authorized to do business and have an agent for service of process in California, have an "A" policyholder's rating and a financial rating of at least Class VI in accordance with the most current rating by A.M. Best Company.

As evidence of specified insurance coverage, the Contractor shall provide certificates of insurance and endorsements on the forms provided as a part of the Contract Documents. No alteration or substitution of said forms will be allowed.

8-2 WORKERS' COMPENSATION INSURANCE AND EMPLOYER'S LIABILITY INSURANCE

Upon execution of the Agreement, the Contractor shall provide a Certificate(s) of Insurance certifying that he has obtained for the period of the contract full Workers' Compensation Insurance coverage for no less than the statutory limits and Employer's Liability Insurance coverage in limits not less than the amounts set forth in the Special Provisions, for all persons whom he employs or may employ in carrying out the work under the contract. At the same time, the Contractor shall provide the Insurance Endorsement(s) on the forms provided as part of the Contract Documents. This insurance shall be in strict accordance with the requirements of the most current and applicable state Workers' Compensation Insurance laws.

8-3 LIABILITY INSURANCE

Upon execution of the Agreement, the Contractor shall provide a Certificate(s) of Insurance showing that he has Liability Insurance coverage in limits not less than the amounts set forth in the Special Provisions. At the same time, the Contractor shall provide the Insurance Endorsement(s) on the forms provided as part of the Contract Documents.

All liability insurance shall include occurrence coverage with a deductible amount not exceeding the amount specified on the liability certificate form.

Included in such insurance shall be a "Cross Liability" or "Severability of Interest" clause.

The Liability Insurance coverage shall include each of the following types of insurance:

A. General Liability

- (1) Comprehensive Form.
- (2) Premises-Operations.
- (3) Explosion and Collapse Hazard.
- (4) Underground Hazard.
- (5) Products/Completed Operations Hazard.
- (6) Contractual Insurance.
- (7) Broad Form Property Damage Including Completed Operations.
- (8) Independent Contractors.
- (9) Personal Injury.

B. Automobile Liability

- (1) Comprehensive Form Including Loading and Unloading.
- (2) Owned.
- (3) Hired.
- (4) Non-Owned.

The Liability Insurance shall include as additional insureds: the Owner, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents. The insurance afforded to these additional insureds shall be primary insurance. If the additional insureds have other insurance which might be applicable to any loss, the amount of the insurance provided under this article on LIABILITY INSURANCE shall not be reduced or prorated by the existence of such other insurance.

8-4 BUILDERS' RISK "ALL RISK" INSURANCE

Upon execution of the Agreement, the Contractor shall provide a Certificate(s) of Insurance showing that he has obtained for the period of the contract Builders' Risk "All Risk" completed value insurance coverage (including any damage attributable directly or indirectly to surface water, runoff, rainfall or flood but excluding earthquake and tidal wave) upon the entire project which is the subject of the contract and including completed work and work in progress. At the same time, the Contractor shall provide the Insurance Endorsement(s) on the forms provided as a part of the Contract Documents. Such insurance shall include as additional insureds: the Owner, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents.

Such insurance may have a deductible clause but not to exceed \$25,000.

8-5 CONTRACTOR'S LIABILITY NOT LIMITED BY INSURANCE

Nothing contained in these insurance requirements is to be construed as limiting the liability of the Contractor or the right of the Owner to secure damages in excess of any insurance which may be provided.

SECTION 9 ESTIMATES AND PAYMENTS

9-1 PAYMENT FOR CHANGES IN THE WORK

The Contractor shall not be entitled to any increase in the contract price due to any change in the work unless the Contractor submits a written request within seven calendar days from the date of the event which causes the Contractor to request a change in the price.

Changes in, additions to, or deductions from the work, including increases or decreases in the quantity of any item or portion of the work, shall be set forth in a written change order executed by the Owner and by the Contractor which shall specify:

The changes, additions, and deductions to be made.

The increase or decrease in compensation due the Contractor, if any.

Adjustment in the time of completion, if any.

Adjustment in the compensation due the Contractor shall be determined by one or more of the following methods in the order of precedence listed below:

Unit price contained in the contract.

Mutually agreeable lump sum or unit prices. If requested by the Owner's Representative, the Contractor shall furnish an itemized breakdown of the quantities and prices used in computing proposed lump sum and unit prices.

Force account whereby the Contractor is compensated for furnishing labor, materials, tools, and equipment as follows:

Cost of labor plus 15% for workers directly engaged in the performance of the work. Cost of labor shall include actual wages paid including employer payments to or on behalf of the workers for health and welfare, pension, vacation, and similar purposes plus payments imposed on payroll amounts by state and federal laws plus subsistence and travel allowance payments to workers.

Cost of material plus 15%. Cost of material shall include sales tax, freight, and delivery charges. The Owner reserves the right to furnish such materials as he deems advisable and the Contractor shall not be paid the 15% markup on such materials.

For tools and equipment actually engaged in the performance of the work, rental rates plus 15%. The rental rates shall be those prevailing in the area where the work is performed. No rental charge shall be made for the use of tools or equipment having a replacement value of \$500 or less.

Subcontractor invoices to the Contractor plus 5%. Subcontractor invoices shall be based on the above-described cost of labor plus 15%, cost of material plus 15%, and tool and equipment rental rates plus 15%.

No payment shall be made for any item not set forth above, including without limitation, Contractor's overhead, general administrative expense, supervision, or damages claimed for delay in prosecuting the remainder of the work.

For force account work, the Contractor shall submit to the Owner's Representative for his verification, daily work sheets showing an itemized breakdown of labor, materials, tools, and equipment used in performing the work. No payment will be made for work not verified by the Owner's Representative.

9-2 PROGRESS PAYMENTS

The Contractor shall, on or before the third day of each calendar month after actual construction work is started, prepare the Progress Estimate and Payment Form included at the end of the General Provisions. The Contractor and the Owner's Representative shall review each work item and agree on the total value of work performed during the previous month. In the event the Contractor and the Owner's Representative cannot agree on the estimated total value of work during the previous month, the estimated total value of work performed as determined by the Owner's Representative during the previous month shall be used. No progress payment will be processed by the Owner until all information required by the Progress Estimate and Payment Form has been completed and the Contractor has signed the form. By signing the Progress Estimate and Payment Form, the Contractor expressly waives and releases any claims the Contractor may have, of whatever type or nature, for the period specified which is not shown as a retention amount or a disputed claim on the Release Form included at the end of the General Provisions. The Contractor shall submit to the Owner at CIP_AccountsPayable@olivenhain.com within seven days from signing the Progress Estimate and Payment Form a completed and

signed Release Form that corresponds to the same pay estimate work period. The Owner shall have no obligation to pay the Contractor for any work done until the Release Form has been executed by the Contractor and submitted to the Owner for the corresponding pay period in accordance with Article 9-6 REQUIRED RELEASES.

Properly submitted Progress Estimate and Payment Form with corresponding Release Form shall be paid by the Owner within thirty days after receipt. Properly submitted forms not paid within this thirty-day period shall earn interest at the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure. The Contractor and Owner agree that the thirty-day period for payment shall not commence until the Contractor has executed and submitted the Release Form to the Owner for the corresponding pay period.

In preparing any progress payment with the Contractor, the Owner's Representative will may use the cost breakdown in by Article 6-3 CONTRACTOR'S CONSTRUCTION SCHEDULE AND COST BREAKDOWN. No allowance shall be made for materials delivered but not installed. In evaluating any progress payment, the Owner's Representative may take into consideration any facts and conditions deemed proper by him or her in his or her sole discretion including, but not limited to, the ratio of the difficulty or cost of the work done to the probable difficulty or cost of the work remaining to be done under the contract, the value of the work actually completed, and the estimated cost to complete all of the work in accordance with the contract price. In the event of any dispute between the Owner and the Contractor on the amount that should be paid for any progress payment, the determination of the Owner or the Owner's Representative shall control and be binding on the Contractor. No dispute between the Contractor and the Owner concerning the amount to be paid for any progress payment shall relieve the Contractor of its continuing obligation to complete all contract work within the time required by the Contract Documents, and to complete the work for the contract price and shall not relieve the Contractor of any other obligations contained in the Contract Documents. Owner shall retain five percent (5%) of each progress payment approved by the Owner's Representative as part security for the fulfillment of the contract by Contractor, unless Contractor has substituted adequate equivalent securities as required by Article 9-5 WITHHELD CONTRACT FUNDS. The total amount retained will equal 5% of the contract price. In the event of a dispute between the Owner and Contractor, the Owner shall have the right to withhold an amount up to 150% of the disputed amount in accordance with Public Contract Code Section 7107(c). As part of any progress payment the Owner shall have the express right to deduct and withhold from any payments due the Contractor any amounts the Owner or the Owner's Representative determines are necessary or appropriate to cover all fees, costs, expenses, and damages incurred or estimated by the Owner as a result of any breach of this contract by the Contractor and to cover any and all damages suffered or estimated by the Owner as a result of the breach of any term or provision of the contract by the Contractor. Amounts the Owner may withhold also expressly include any and all liquidated damages authorized by the terms of this contract.

9-3 FINAL ESTIMATE AND PAYMENT

Contractor shall not make any request for the final payment until all work required by the Plans and Specifications of the Contract Documents has been completed to the satisfaction of the Owner's Representative. Upon receipt of a request from Contractor for final payment, the Owner's Representative will make a final inspection of the work done and advise the Contractor

of additional work required before final payment will be processed. All prior progress estimates and payments shall be subject to correction in the final estimate and payment.

The final payment shall not be due and payable until 60 calendar days after the date of filing a Notice of Completion of the accepted work. The date of completion shall be determined in accordance with Public Contract Code Section 7107. In the event of a dispute between the Owner and the Contractor, Owner shall be entitled to withhold an amount up to 150% of the disputed amount.

It is mutually agreed between the parties to the contract that no certificate given or payment made under this contract shall constitute evidence of performance of the contract and no payment by Owner shall be construed as an acceptance of any defective work or improper materials.

Contractor shall not be entitled to payment of the final amount due until Contractor has executed a Release Form in accordance with Article 9-6 REQUIRED RELEASES. Contractor hereby expressly agrees that payment of the final amount due under the contract shall release the Owner, the Engineer/Architect, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents, from any and all claims relating to the work for which Contractor is being paid. It is the declared intention of the parties that this provision comply with Public Contract Code Section 7100 and that this section shall be construed as in compliance with Public Contract Code Section 7100 to the maximum feasible extent.

9-4 OWNER'S RIGHT TO WITHHOLD CERTAIN AMOUNTS AND MAKE APPLICATION THEREOF

In addition to the amounts which the Owner may retain under Sections 9-2 and 9-3 of this contract, the Owner may withhold a sufficient amount or amounts from any payment otherwise due to the Contractor (including any final payment) as may be necessary or appropriate in Owner's sole and exclusive judgment to cover each of the following:

Payments which are or may be past due and payable for properly filed claims against the Contractor or any subcontractors for any labor, materials, or equipment furnished in or about the performance of the work on the project under this contract including any amounts asserted as attorneys' fees, costs, or interest by the claimant.

All fees, costs, and expenses estimated by the Owner for correcting any work determined to be defective by the Owner.

Any amounts determined appropriate or necessary by the Owner to cover the Owner's estimate of any damages paid or payable as a result of any claim or cause of action on the contract caused, or claimed to be caused by any action or omission of Contractor, any subcontractor, supplier or materialmen or their respective directors, officers, agents, employees, members, managers or consultants and all fees, costs, and expenses, including all attorneys' fees, expert fees and costs, staff time at each staff members' normal hourly rates and all court costs estimated by the Owner in responding to the claim or cause of action.

Any amounts determined necessary or appropriate by Owner to cover all of the indemnity obligations of Contractor under this contract.

Any amounts claimed by the Owner as forfeiture due to delay and any and all other amounts, fees, costs, or expenses estimated by the Owner as offsets.

The Owner has the express authority to withhold any amount or amounts determined appropriate by Owner from time to time from any payments otherwise due Contractor to cover all or any of the preceding items in the Owner's sole and exclusive judgment. The Owner may also apply all or any portion of any such withheld amount or amounts to the payment of any claims in such amounts and at such times as are determined appropriate by Owner, in Owner's discretion. In withholding any sums permitted by this section or in paying any claims, the Owner shall be deemed the agent of the Contractor and any payments made by the Owner on any claim shall be considered as a payment made under the contract by the Owner to the Contractor. The Owner shall not be liable to the Contractor for Owner's withholding of any and all amounts permitted by this section or Owner's payment of any claims as permitted by this section. Such withholdings and payments may be made by Owner at any time without prior judicial determination of the merits of any claims or causes of action. The Owner will render to the Contractor a proper account of any funds withheld or disbursed as permitted by this section.

9-5 WITHHELD CONTRACT FUNDS

Pursuant to Public Contract Code Section 22300, the Contractor may substitute equivalent securities for retention amounts which this Contract requires. However, the Owner reserves the right to solely determine the adequacy of the securities being proposed by the Contractor and the value of those securities. The Owner shall also be entitled to charge an administrative fee, as determined by Owner in its sole discretion, for substituting equivalent securities for retention amounts.

The Contractor agrees that the Owner's decision with respect to the administration of the provisions of Section 22300 shall be final and binding and not subject to subsequent litigation or arbitration of any kind as to acceptance of any securities being proposed, the value of these securities, the costs of administration and the determination of whether or not the administration should be accomplished by an independent agency or by the Owner. The Owner shall be entitled, at any time, to request the deposit of additional securities of a value designated by the Owner, in Owner's sole discretion, to satisfy this requirement. If the Owner does not receive satisfactory securities within 12 calendar days of the date of the written request, Owner shall be entitled to withhold amounts due Contractor until securities of satisfactory value to Owner have been received.

9-6 REQUIRED RELEASES

In accordance with Public Contract Code Section 7100, the Contractor shall not be entitled to any payment specified in this Contract which is undisputed until such time as the Contractor has executed the Release Form(s) included at the end of the General Provisions releasing the Owner from all claims relating to work for which the Contractor is being paid. The Release Form contains space for the Contractor to claim any disputed amount and to designate the retention amount

for each pay period associated with the release. Contractor hereby expressly agrees that failure on his part to designate any disputed amount or to designate the correct retention amount for each release period on the Release Form shall constitute an express waiver of the right of the Contractor to claim any disputed amount or any retention amount at any later date. The Owner shall have no obligation to pay the Contractor for any work done until the Release Form at the end of the General Provisions has been executed by the Contractor and submitted to the Owner.

9-7 AB 626

State of California Assembly Bill 626 (AB 626) establishes, for contracts entered into on or after January 1, 2017, a claims resolution process that must be applied to any and all claims by contractors in connection with a public works project. AB 626 also creates a process whereby a subcontractor, who may lack legal standing to assert a claim against a public entity, may make a claim through the contractor.

A claim is defined as a separate demand by the contractor for one or more of the following: (i) a time extension for relief from damages or penalties for delay, (ii) payment of money or damages arising from work done pursuant to the contract for a public work, or (iii) payment of an amount disputed by the public entity, as specified.

AB 626 requires a public entity, upon receipt of a claim sent by registered or certified mail, to conduct a reasonable review, within 45 days, provide a written statement identifying the disputed and undisputed portions of the claim. The 45-day period may be extended by mutual agreement or, until after the next meeting of the governing body of the public entity, if the governing body must approve the disputed and undisputed portions of the claim. The Bill also requires any payment due on the undisputed portion of the claim to be processed within 60 days.

If the claimant disputes the public entity's written response or if the public entity fails to respond to a claim within the time prescribed, the claimant must demand, in writing, a meet and confer for settlement of the issues in dispute. The public entity must then schedule a meet and confer conference within 30 days for settlement of the dispute. AB 626 requires any disputed portion of the claim that remains in dispute after the meet and confer conference to be subject to nonbinding mediation, as specified. The public entity can also require arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if the mediation does not resolve the dispute.

If the public entity fails to respond to a claim from a contractor within the time periods prescribed in AB 626, the claim is deemed rejected in its entirety and alternate dispute resolution processes may be pursued. AB 626 provides that unpaid claim amounts which are not paid in a timely manner shall accrue interest at 7% per annum.

SECTION 10 AUTHORITY AND STATUS OF OWNERS REPRESENTATIVES

10-1 STATUS OF OWNERS REPRESENTATIVES

The Contractor has been informed, and understands, that the Engineer/Architect and the Owner's Representative are not agents or employees of Owner. They are independent contractors retained by Owner to assist in preparation of the design plans for the work and in

supervising the work to be performed by the Contractor. Owner does not direct the Engineer/Architect or the Owner's Representative in the performance of their respective duties and obligations. Owner shall not be liable for any errors or omissions of the Engineer/Architect, the Owners Representative or their respective directors, officers, agents or employees.

10-2 AUTHORITY OF OWNER'S REPRESENTATIVES

Contractor has been informed, and understands, that the Engineer/Architect and the Owner's Representative have no authority to alter any of the terms or provisions of the Contract Documents

or to alter any of the requirements contained in the plans and specifications approved by Owner. In the event that Contractor desires to modify any term or provision of the Contract Documents or to modify any of the requirements of the approved plans and specifications, a written request must be submitted with the requested changes to the Owner through the Owner's Representative. Only the general manager of Owner has the authority to alter or modify any of the terms or provisions of the Contract Documents. No modification or change to the Contract Documents shall be effective for any purpose unless the change or modification has been expressly approved, in writing, by the general manager of Owner. Any requested changes by the Contractor to the approved plans and specifications must be submitted to the Owner's Engineer for review and approval through the Owner's Representative. No changes to the approved plans or specifications shall be effective for any purpose unless the Owner's Engineer has expressly approved of the change, in writing. The Contractor is expressly prohibited from entering onto private property, disturbing any habitat, or using private property to stockpile, store, or spread any men, tools, equipment, materials, or dirt without the express prior written consent of the general manager of Owner. The violation of this section by Contractor or any of its subcontractors, materialmen, or suppliers or their respective directors, officers, managers, members, agents, consultants or employees shall constitute a material breach of this Agreement.

SECTION 11 FORMS

11-1 SHOP DRAWING SUBMITTAL FORM

The Contractor shall complete the Shop Drawing Submittal Form included at the end of the General Provisions when submitting Shop Drawings as called for in the Special Provisions and Standard Specifications or requested by the Owner's Representative. Duplication of this form is permissible to comply with the requirements of the Contract Documents. No substitution or revision to this form will be accepted and approved by the Owner.

11-2 PROGRESS ESTIMATE AND PAYMENT FORM

The Contractor will use the Progress Estimate and Payment Form included at the end of the General Provisions when preparing the monthly progress payment for review. No progress payment will be processed to pay the Contractor until the progress estimate and payment form

and the release form included at the end of these general provisions have been fully completed and submitted by the Contractor to the Owner's Representative and approved by the Owner.

11-3 RELEASE FORM(S)

The Contractor shall complete the Conditional and/or Final Release Forms (as appropriate) included at the end of the General Provisions and submit to the Owner for the corresponding pay period in accordance with Article 9-6, REQUIRED RELEASES. Duplication of this form is permissible to comply with the requirements of the Contract Documents. No substitution or revision to this form will be accepted. No payment request to the Contractor will be processed until the Release Form has been fully completed and submitted by the Contractor.

END OF SECTION

SHOP DRAWING SUBMITTAL FORM

TO: OWNER'S REPRESENTATIVE
c/o Olivenhain Municipal Water District
1966 Olivenhain Road
Encinitas, CA 92024

From: (Contractor)
(Address)

Contractor Job Number _____

Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**

OMWD PN: _____

Project: **[PROGRAMMABLE LOGIC CONTROLLER (PLC) REPLACEMENT PROJECT]** OWNER'S REP ACCT NO. _____

SUBMITTAL NO.: _____

RESUBMITTAL: ☐ Yes ☐ No

SPECIFICATION SECTION: _____

DESCRIPTION: _____

This Shop Drawing Submittal has been prepared by the Contractor or any subcontractor, manufacturer, supplier, or distributor and illustrates some portion of the work. The Contractor warrants one of the following conditions:

☐ The Contractor has approved this submittal and represents that the material, equipment, and other work shown conforms to the Plans and Specifications.

☐ The Contractor has approved this submittal but represents that this is a deviation from the requirements of the Plans and Specifications and has set forth the reasons for the deviation below.

DEVIATION/REVISIONS:

By: _____

Title: _____

(BLANK)

PROGRESS ESTIMATE AND PAYMENT FORM

Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT** OMWD _____

Project: **PROGRAMMABLE LOGIC CONTROLLER (PLC)** Contract End Date _____
REPLACEMENT PROJECT Revised Contract End Date _____

Contractor: _____

PAY ESTIMATE NO. _____

PERIOD WORK PERFORMED: _____ Contract Job No. _____

Date Created _____

Work Item	Description of Work Item	Total Cost of Work Item	Percent Complete	Value of Work

Total Project Cost of Work Items			
Estimated Total Value of Work Performed			
Less Five Percent (5%) of Such Estimated Total Value			
Total Amount Due for Work Performed			
Less All Previous Payments			
AMOUNT DUE AND PAYABLE TO THE CONTRACTOR			

Prepared by Owner's Representative

Accepted by CONTRACTOR Approved by OWNER

By: _____ By: _____

Date: _____ Date: _____

Distribution: ☐ Owner ☐ Contractor ☐ Engineer ☐ Finance

(BLANK)

**CONDITIONAL WAIVER AND RELEASE ON
PROGRESS PAYMENT**

(CA CIVIL CODE §8132) (1)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Identifying Information:

Name of Claimant: _____

Name of Customer: **Olivenhain Municipal Water District**

Job Location: _____

Owner: Olivenhain Municipal Water District

Through Date: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: Olivenhain Municipal Water District

Amount of Check: _____

Check Payable to: _____

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:
Date(s) of waiver and release: _____
Amount(s) of unpaid progress payment(s): \$ _____
- (4) Contract rights, including:
(A) a right based on rescission, abandonment, or breach of contract, and
(B) the right to recover compensation for work not compensated by the payment.

SIGNATURE

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

(BLANK)

**CONDITIONAL WAIVER AND RELEASE ON
FINAL PAYMENT**
(CA CIVIL CODE §8136) (3)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Identifying Information:

Name of Claimant: _____

Name of Customer: **Olivenhain Municipal Water District** _____

Job Location: _____

Owner: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: Olivenhain Municipal Water District _____

Amount of Check: _____

Check Payable To: _____

Exceptions

This document does not affect any of the following:

Disputed claims for extras in the amount of: \$ _____

SIGNATURE

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

(BLANK)

PROPOSED CHANGE ORDER

Owner: **OLIVENHAIN MUNICIPAL WATER DISTRICT**

Project: **[PROGRAMMABLE LOGIC CONTROLLER
(PLC) REPLACEMENT PROJECT]**

Contractor: _____

PROPOSED CHANGE ORDER NO. _____

Date: _____

*A change to the contract documents for the above referenced project is being considered. Please provide cost and schedule impact(s) for the following described work:

DESCRIPTION OF CHANGE / PCO's

Cost Impact

Schedule Impact

\$ _____

_____ Day(s)

TOTAL

\$ _____

Calendar Day(s)

NOTE: Attention is called to the sections in the General Provisions on Scope of Work and Estimates and Payments.

THIS PROPOSED CHANGE ORDER IS NOT EFFECTIVE UNTIL A CONTRACT CHANGE ORDER HAS BEEN APPROVED BY OWNER.

This PCO was initiated by _____ On _____

Submitted _____ On _____
Contractor

(BLANK)

Article 1.5

RESOLUTION OF CONSTRUCTION CLAIMS

Section	Section
20104. Application of article; provisions included in plans and specifications.	20104.6. Payment on undisputed portion of claim; interest on arbitration awards or judgments
20104.2. Claims; requirements; tort claims excluded.	20104.8. Repealed.
20104.4. Civil action procedures; mediation and arbitration; trial de novo; witnesses.	

Article 1.5 was added by Stats. 1994, c. 726 (A.B. 3069), § 22, eff. Sept. 22, 1994.

Former Article 1.5, Resolution of Construction Claims, consisting of §§20104 to 20104.8, added by Stats. 1990, c. 1414 (A.B. 4165), § 2, was repealed by Stats. 1990, c. 1414 (A.B. 4165), § 2, operative Jan. 1, 1994.

§ 20104. Application of article; provisions included in plans and specifications

(a) (1) This article applies to all public works claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between a contractor and local agency.

(2) This article shall not apply to any claims resulting from a contract between a contractor and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2.

(b) (1) “Public work” has the same meaning as in Sections 3100 and 3106 of the Civil Code, except that “public work” does not include any work or improvement contracted for by the state or the Regents of the University of California.

(2) “Claim” means a separate demand by the contractor for (A) a time extension, (B) payment of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.

(c) The provisions of this article or a summary thereof shall be set forth in the plans or specifications for any work which may give rise to a claim under this article.

(d) This article applies only to contracts entered into on or after January 1, 1991.

(Added by Stats. 1994, c. 726 (A.B. 3069), § 22, eff. Sept. 22, 1994.)

Historical and Statutory Notes

1990 Legislation

Former § 20104 was renumbered Public Contract Code § 20103.5 and amended by Stats. 1990, c. 1414 (A.B. 4165), § 1.

Former § 20104, added by Stats. 1990, c. 1414 (A.B. 4165), § 2, relating to application of article regarding resolution

of construction claims, was repealed by Stats. 1990, c. 1414 (A.B. 4165), § 2, operative Jan. 1, 1994. See, now, this section.

Derivation: Former § 20104, added by Stats. 1990, c. 1414, § 2.

§ 20104.2 Claims; requirements; tort claims excluded

For any claim subject to this article, the following requirements apply:

(a) The claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.

(b) (1) For claims of less than fifty thousand dollars (\$50,000), the local agency shall respond in writing to any written claim within 45 days of receipt of the claim, or may request, in writing, within 80 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

(c) (1) For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the local agency shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

(d) If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the local agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(e) Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

(f) This article does not apply to tort claims and nothing in this article is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of Government Code.

(Added by Stats. 1994, c. 726 (A.B. 3069), § 22, eff. Sept. 22, 1994.)

Historical and Statutory Notes

1990 Legislation

Former § 20104.2, added by Stats. 1990, c. 1414 (A.B. 4165), § 2, amended by Stats. 1991, c. 1029 (A.B. 1086), § 1, relating to requirements for claims filed under the article,

was repealed by Stats. 1990, c. 1414 (A.B. 4165), § 2, operative Jan. 1, 1994. See, now, this section.

Derivation: Former § 20104.2, added by Stats. 1990, c. 1414, § 2, amended by Stats. 1991, c. 1029, § 1.

Library Reference

California Practice Guide: Alternative Dispute Resolution, Knight, Fannin & Disco, see Guide's Table of Statutes for chapter paragraph number references to paragraphs discussing this section.

Civil Procedure Before Trial, Well & Brown, Guide's Table of Statutes for chapter paragraph number references to paragraphs discussing this section.

§ 20104.4 Civil action procedures, mediation and arbitration; trial de novo; witnesses

The following procedures are established for all civil actions filed to resolve claims subject to the article:

(a) Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

(b) (1) If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

(2) Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

(3) In addition to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, any party who after receiving an arbitration award requests a trial de novo but does not obtain more favorable judgment shall, in addition to payment of costs and fees under that chapter, pay the attorney's fees of the other party arising out of the trial de novo.

(c) The court may, upon request by any party, order any witnesses to participate in the mediation or arbitration process.

(Added by Stats. 1994, c. 726 (A.B. 3069), § 22, eff. Sept. 22, 1994.)

Historical and Statutory Notes

1990 Legislation

Former § 20104.4, added by Stats. 1990, c. 1414 (A.B. 4165), § 2, amended by Stats. 1991, c. 1029 (A.B. 1086), § 2, relating to procedures for civil actions filed to resolve construction claims, was repealed by Stats. 1990, c. 1414

(A.B. 4165), § 2, operative Jan. 1, 1994. See, now, this section.

Derivation: §20104.4, added by Stats. 1990, c. 1414, § 2, amended by Stats. 1991, c. 1029, § 2.

Library Reference

California Practice Guide: Alternative Dispute Resolution,
Knight, Fannin & Disco, see Guide's Table of Statutes

for chapter paragraph number references to paragraphs
discussing this section.

§ 20104.6 Payment on undisputed portion of claim; interest on arbitration awards or judgments

(a) No local agency shall fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the contract.

(b) In any suit filed under Section 20104.4, the local agency shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

(Added by Stats. 1994, c. 726 (A.B. 3069), § 22, eff. Sept. 22, 1994.)

Historical and Statutory Notes

1990 Legislation

Former § 20104.6, added by Stats. 1990, c. 1414 (A.B. 4165),
§ 2, relating to payment of undisputed portion of claims, was
repealed by Stats. 1990, c. 1414 (A.B. 4165), § 2, operative Jan.
1, 1994. See, now, this section.

Derivation: Former § 20104.6, added by Stats. 1990, c.
1414, § 2.

§ 20104.8 Repealed by Stats. 1990, c. 1414 (A.B. 4165), § 2, operative Jan. 1, 1994

Historical and Statutory Notes

The repealed section, added by Stats. 1990, c. 1414 (A.B.
4165), § 2, related to application of the article to specified

contracts and provided for repeal of the article on Jan 1, 1994.

SECTION 00810 – SPECIAL PROVISIONS

1.01 DEFINITIONS

Whenever the following terms occur in the Contract Documents, the meaning shall be interpreted as follows:

ATTORNEY FOR Owner – Alfred E. Smith, Nossaman LLP, 777 South Figueroa Street, 34th Floor, Los Angeles, CA 90017, (213) 612-7831

BOARD OF DIRECTORS – Board of Directors of the Olivenhain Municipal Water District.

CITY – City of Encinitas, 505 South Vulcan Ave. Encinitas, CA 92024

CONTRACT TIME – The number of consecutive days stated in the contract documents commencing from the date of the notice of award, for completion of the Work.

DATE OF AWARD OF CONTRACT – The date of the District Resolution (formal action of the Board of Directors of the District) awarding the Contract.

DISTRICT – Olivenhain Municipal Water District (OMWD), 1966 Olivenhain Road, Encinitas, California 92024, (760) 753-6466.

DISTRICT'S REPRESENTATIVE – The Owner's Representative.

DRAWINGS or PLANS – Exhibits located in Appendix A of the Contract Documents. For items not included in Appendix A, construct the item in accordance with Regional Standard Drawings.

ENGINEER – The Owner's Representative.

OWNER – Olivenhain Municipal Water District (OMWD), 1966 Olivenhain Road, Encinitas, California 92024, Tel: (760) 753-6466; Fax: (760) 753-1578.

OWNER'S REPRESENTATIVE – The person or engineering/architectural firm authorized by the District to represent it during the performance of the work and until final acceptance. The Owner's Representative is referred to throughout the Contract Documents as if singular in number and masculine in gender. The Owner's Representative means the Owner's Representative and his assistants.

PUBLIC WORKS SPECIFICATIONS – Standard Specifications for Public Works Construction Current Edition by APWA/AGC, the "GREENBOOK", Current Edition.

REGIONAL STANDARD DRAWINGS – Standard Drawings for Agencies in the San Diego Region as recommended by the Regional Standards Committee and published by the San Diego County Department of Public Works, Current Edition.

SPECIAL PROVISIONS – Section 00810 of the specifications.

SPECIFICATIONS – Division 1 to 15 of the technical specifications contained in these Contract Documents, and those technical specifications contained in the Drawings.

STANDARD DRAWINGS – Drawings A-1.1 through G-15 of the Olivenhain Municipal Water District, Standard Specifications and Drawings for the Construction of Water, Recycled Water, and Sewer Facilities, dated December 2017, with revisions.

STANDARD SPECIFICATIONS – Divisions 1 through 15 of the Olivenhain Municipal Water District, Standard Specifications and Drawings for the Construction of Water, Recycled Water, and Sewer Facilities, dated February 2017, with revisions.

STATE STANDARD SPECIFICATIONS – State of California, Department of Transportation, Standard Specifications, Current Edition, Caltrans.

STATE STANDARD PLANS – State of California, Department of Transportation, Standard Plans, Current Edition, Caltrans.

WATER AUTHORITY – San Diego County Water Authority

Whenever the following terms appear in the State Standard Specifications or Public Works Specifications, the meaning shall be interpreted as follows:

AGENCY, BOARD or DEPARTMENT – The Owner.

ENGINEER – The Owner's Representative.

1.02 TERMS

- A. Command type sentences used in the Contract Documents refer to and are directed to the Contractor.

1.03 ABBREVIATIONS

- A. Interpret abbreviations used on the Drawings and in the Specifications as explained on the Drawings.

1.04 MARKING AND ADDRESSING BID ENVELOPE

BID FOR CONSTRUCTION OF:
PROGRAMMABLE LOGIC CONTROLLER (PLC) REPLACEMENT PROJECT

OLIVENHAIN MUNICIPAL WATER DISTRICT
Attention: Pre-Bid, Engineering Department
1966 Olivenhain Road
Encinitas, California 92024

IN-PERSON BIDS MUST BE SEALED AND RECEIVED AS SPECIFIED ABOVE BY THE DISTRICT FRONT OFFICE BEFORE THE DAY AND HOUR SET FOR THE OPENING OF THE BIDS.

MAILED BIDS SHALL BE IN SEALED ENVELOPES, SHALL BE SENT AT BIDDER'S RISK VIA CERTIFIED MAIL (OR EQUIVALENT TRACKABLE DELIVERY) WITH POSTAGE PREPAID, SHALL BE MARKED AND ADDRESSED AS INDICATED ABOVE, AND RECEIVED BEFORE THE

DAY AND HOUR SET FOR THE OPENING OF THE BIDS. ANY BIDDER ELECTING TO SUBMIT A BID BY MAIL MUST NOTIFY THE DISTRICT PRIOR TO THE BID OPENING AT PREBID@OLIVENHAIN.COM OF A MAILED BID AND PROVIDE THE TRACKING NUMBER SO DISTRICT CAN VALIDATE RECEIPT.

ELECTRONICALLY TRANSMITTED BIDS ARE NOT CONSIDERED SEALED BIDS AND WILL NOT BE ACCEPTED.

Whether the bidder submits by mail or in-person, it is the sole responsibility of the bidder to see that his/her bid is received as specified.

1.05 AWARD OF CONTRACT OR REJECTION OF BIDS

- A. Within a period of 60 calendar days after the opening of bids, the District will accept or reject the bids.

1.06 CONTRACTOR'S LICENSING REQUIREMENTS

- A. The District has determined the license classification necessary to bid and perform the subject contract. In no case shall this contract be awarded to a specialty contractor whose classification constitutes less than a majority of the portion of the work of this contract, all work to be performed outside of the contractor's license specialty, except work specifically authorized by District, shall be performed by a licensed subcontractor in compliance with the Subletting and Subcontractor Fair Practices Act commencing with Section 4100 et seq., of the Public Contract Code. See Business and Professions Code Section 7059.
- B. The Contractor's license classification required for this project is a California State Contractor's License A – General Engineering.
- C. It is the District's intent that "plans", as used in Public Contract Code Section 3300, is defined as the construction Contract Documents, which include both the Drawings and the Specifications

1.07 TIME FOR COMPLETION AND FORFEITURE DUE TO DELAY

- A. The work shall be completed within **SEVEN HUNDRED THIRTY (730) CONSECUTIVE DAYS** from Notice to Proceed.
- B. The Contractor will not be permitted to begin work until the agreement, bonds or substitutes, insurance certificates and endorsements are acceptable to the District and Attorney for District. This period of time is set forth in Paragraph 3-2 Execution of Contract in the General Provisions. Time is of the essence in this contract.
- C. The Contractor shall complete all work in its entirety as specified in the Contract Documents within these time periods. Time of completion shall also include time for all submittals and coordination required to satisfy the requirements of these Contract Documents.

- D. The Contractor agrees that the work shall be prosecuted regularly, diligently, and uninterruptedly and at such rate of progress as will ensure full completion thereof within the Time for completion stated above including minimizing Construction Highline and customer interruption of water service. It is expressly understood and agreed, by and between Contractor and District that the Time for completion is reasonable for the completion of the WORK, taking into consideration the average climatic range, usual industrial conditions prevailing in this locality, and lead time required to procure equipment.
- E. The Contractor shall provide proof of delays caused from equipment or material procurement outside of his/her control for approval by the Owner. Approved delays shall be remedied by additional time to the contract and shall not include additional compensation.
- F. The Contractor shall provide submittals to the Owner for long-lead items seven (7) working days after issuance of the Notice to Proceed. Delays to the contract time for completion as a result of the Contractors failure to provide submittals for long-lead items within this time period will not be considered by the Owner for requests for additional time.

1.08 LIQUIDATED DAMAGES

- A. Pursuant to Government Code 53069.85, forfeiture for each day project completion is delayed beyond the time allowed shall be at the rate of \$2,000.00 per day, except as noted below.

1.09 PERMITS

- A. The Contractor shall obtain and pay for all required permits and provide copies of all permits to the District's Representative prior to starting work, including the San Diego County Air Pollution Control District's permits for construction and operation of diesel generators, if used. The Contractor shall comply with the ordinances, directives, and regulations of the respective agencies with jurisdiction over the area of the work. All work not specifically covered in the required permits shall conform to the requirements of these Specifications. The cost of all permits and plan check review shall be borne by the Contractor and included in the Contractor's bid.
- B. The Contractor shall be responsible for developing haul routes for the importing or exporting of materials or equipment for the project and obtaining and paying for all required permits from the affected agencies of jurisdiction, i.e., City of Encinitas. The Contractor shall provide copies of all required permits to the District's Representative prior to starting work. The Contractor shall comply with the ordinances, directives, and regulations of the respective agencies with jurisdiction over the area of the work. All costs for transport fees, dump fees, plan or haul route reviews, permits, and related incidentals shall be borne by the Contractor and included in the Contractor's bid.

1.10 USE OF ASBESTOS PRODUCTS NOT PERMITTED

The intent of the Contract Documents is to provide asbestos-free components throughout the project in accordance with the recent Environment Protection Agency stated policy seeking a

ban on the use of all products containing asbestos. Where the Contract Documents or the referenced specifications, standards, codes, or tests refer to products containing asbestos, the Contractor shall provide acceptable alternatives under those documents, or in the absence of such referenced alternatives, he shall submit a proposed substitute to the District's Representative for review and acceptance.

1.11 ABATEMENT OF AIR POLLUTION

- A. Comply with all applicable Federal, State, County, and City laws and regulations concerning the prevention and control of air pollution.
- B. Conduct construction activities and equipment in a manner so as to minimize atmospheric emissions or discharges of air contaminants. Equipment or vehicles that show excessive emissions of exhaust gases shall not be operated on the site.

1.12 NOISE CONTROL REQUIREMENTS

- A. The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the Contract.
- B. The Contractor shall familiarize themselves with the City or County Zoning Performance Standards applicable to night work and day work.
- C. Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler.
- D. Each vehicle equipped with a back-up alarm shall use a white noise back-up alarm Brigade BBS-97 or equal at all times.
- E. Noise level requirements shall apply to all equipment on the job or related to the job, including but not limited to trucks and transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety for the protection of personnel.
- F. All work shall be coordinated with OMWD Staff as to insure minimal disruption to daily operations on the OMWD Campus.

1.13 AMOUNT OF LIABILITY INSURANCE

- A. Employer's Liability Insurance:
 - 1. Bodily injury coverage by accident shall be for not less than \$1,000,000 for each employee and \$1,000,000 for each accident.
- B. General Liability:

2. Bodily injury, personal injury, and property damage coverage shall be in a combined single limit of not less than \$1,000,000 for each occurrence and \$2,000,000 aggregate.

C. Automobile Liability:

1. Bodily injury and property damage coverage shall be in a combined single limit of not less than \$1,000,000 for each occurrence and \$2,000,000 aggregate.

D. Builder's Risk Insurance:

1. Builder's Risk Insurance shall be provided for the full contract amount.

E. Earthquake and Tidal Wave Insurance:

1. Earthquake and Tidal Wave Insurance is not required for this project.

F. Additional Insured:

1. In addition to the additional insureds required for Liability insurance in the General Provisions, 8-3 LIABILITY INSURANCE, and 8-4 BUILDER'S RISK "ALL RISK" INSURANCE, the District and each of its directors, officers, employees, and agents and its Design Engineer shall be named as additional insureds for all Liability insurance and Builders' Risk Insurance provided herein.

1.14 USE OF THE STANDARD DRAWINGS

- A. Where the Drawings or Specifications make reference to the Standard Drawings, construct the item in accordance with the details and materials as specified in the Contract Documents. For items not included in the Standard Drawings that are part of the Contract Documents, construct the item in accordance with the Olivenhain Municipal Water District, Standard Specifications and Drawings for the Construction of Water, Recycled Water, and Sewer Facilities dated June 2008 with revisions. These District Standard Drawings and Standard Specifications are available for purchase at the office of the District.

1.15 CONSTRUCTION SCHEDULE AND BID BREAKDOWN

- A. The Contractor shall conform to the requirements of Article 6-3 Contractor's CONSTRUCTION SCHEDULE AND COST BREAKDOWN of the General Provisions within 15 days after the date of award of contract. Submit to the District's Representative a construction progress schedule and bid breakdown in bar chart form. Divide each lump sum bid item into its major elements of work and show separately labor, materials and equipment costs. The District's Representative will use this cost breakdown as a basis for the monthly progress estimate and payment. The schedule shall specifically include and identify the construction sequence requirements defined on the plans.

1.16 STORM DRAIN PROTECTION

A. The Contractor shall comply with all local ordinances, County of San Diego Ordinance No. 9424, National Pollutant Discharge Elimination Permit Number CAS 0108758 and State Water Resources Control Board NPDES Permit No. CAS000002. The Contractor shall install and maintain Best Management Practices (BMPs) to the Maximum Extent Practicable (MEP) to prevent or reduce pollutant discharges to local storm drain/storm water conveyance systems and/or receiving waters from construction activities. The Contractor shall manage the Work to prevent or reduce pollutant discharges to local storm drain/storm water conveyance systems and/or receiving waters. BMPs to be implemented are detailed in the County of San Diego "Stormwater Standards Manual" and shall be applied in the following areas, if applicable to the project:

- (1) Erosion control on slopes;
- (2) Erosion control on flat areas; or BMPs to desilt runoff from flat areas;
- (3) Runoff velocity reduction;
- (4) Sediment control;
- (5) Offsite sediment tracking control;
- (6) Materials management;
- (7) Waste management;
- (8) Vehicle and equipment management;
- (9) Water conservation;
- (10) Structure construction and painting;
- (11) Paving operations;
- (12) Dewatering operations;
- (13) Planned construction operations;
- (14) Downstream erosion control;
- (15) Prevention of non-stormwater discharges;
- (16) Management of run-on discharges;
- (17) Protection of ground water; and

BMPs shall include post-construction BMPs for permanent control of erosion from slopes. These BMPs can include structures to convey runoff safely from the tops of slopes, vegetation or alternative stabilization of all disturbed slopes and/or the use of natural drainage systems to the MEP.

1.17 PROTECTION OF EXISTING UTILITIES

- A. The Contractor shall coordinate their efforts with the District and shall take every precaution to protect all existing utilities and structures at the project site. The Contractor shall be responsible for all Underground Service Alert notification and mark outs prior to the beginning of work.

1.18 COORDINATION WITH DISTRICT OPERATIONS

- A. The Contractor shall coordinate all work with the District sufficiently ahead of time so as to not interfere with the District's operations. The Contractor shall submit a detailed sequence of work to the District for all work in accordance with Section 01043. This proposed sequence of work shall be reviewed and approved with the District prior to construction for consistency with the Sequence of Work as described in these Contract Documents and the District's required operation. .
- B. The District will occupy the site and existing adjacent buildings during the entire construction period and construction shall be phased to maintain site access and employee and customer parking. The Work shall be completed in 3 phases per Section 01043.
- C. The jobsite is located within a secured facility. Access to the site shall be provided by the District to allow work to commence in accordance with the contract documents. Contractor shall abide by the District's terms of site access at all times including but not limited to abiding by approved working hours, restrictions to access, and maintaining designated laydown areas. The Contractor shall follow the District's safety protocols or the Contractor's safety protocols (whichever is more restrictive) at all times while on District Property.
- D. District Driveway Access/Entrance Gates shall be accessible at all times, unless specifically approved in writing and coordinated with the District not less than 5 business days in advance.

1.19 PRE-CONSTRUCTION CONFERENCE AND PROGRESS MEETINGS

- A. A Pre-Construction Conference shall be scheduled prior to start of project as described in Section 01201 Preconstruction Conference. The District, the Contractor, and the District's Construction Manager shall be present. The Contractor's detailed sequence of work and a list of labor, material and equipment rates for additional work shall be established and maintained throughout the project. Contractor shall identify all personnel assigned to the project and a complete set of approved submittal data for use by inspection personnel. Contractor shall have a designated representative for this project.

- B. The Contractor shall also attend project progress meetings as described in Specification Section 01202, Progress Meetings.

1.20 HOURS OF WORK

Hours of work shall be 8:00 A.M. to 4:30 P.M. unless otherwise specified in writing and agreed to by the District. **Absolutely no equipment shall be started or warmed up prior to 8:00 AM or after 4:30 PM.** Overtime and shift work may be established as short-term procedure by Contractor with written notice to and written permission from District. No work other than overtime and shift work approved by District shall be done between the hours of 4:30 P.M. and 8:00 A.M., nor on weekends, or District recognized holidays, except such work as is necessary for the proper care and protection of the work already performed, except in case of emergency, or as otherwise specified by the District, and as specified herein. Special consideration may be given outside of these established working ours to minimize impact to District Staff and normal business operations. Any special work hours or dates must be arranged and approved by the District in advance of the planned work in writing. The District reserves the right to require any work that interferes with normal scheduled business to be rescheduled. The District recognized holidays are as follows:

- New Year's Day
- Martin Luther King, Jr. Day
- Presidents' Day
- Memorial Day
- Independence Day
- Labor Day
- Veterans Day
- Thanksgiving Day And The Following Friday
- Christmas Day

In the event that a national holiday falls on a Saturday, the previous Friday shall be Considered a holiday. If a national holiday falls on a Sunday, the following Monday shall be considered a holiday.

1.21 CONSTRUCTION SURVEYS

A. LAND MONUMENTS

The Contractor shall notify the District and the District's Representative of any existing Federal, State, City, County, and private land monuments encountered. All monuments shall be preserved, or if necessary to be destroyed during performance of the Work, shall be replaced by a licensed surveyor under contract to the Contractor. Appropriate record of survey drawings shall be filed with the City of Encinitas and County of San Diego for all replaced monuments. When government monuments are encountered, the Contractor shall notify the District's Representative at least two (2) weeks in advance of the proposed construction and provide for surveying of the existing monument before it is disturbed or destroyed.

1.22 GEOTECHNICAL WORK

A. SUBSURFACE INVESTIGATIONS

1. Geotechnical investigations were not performed or prepared for this project. The District may make agreed to subsurface, soil, or geotechnical investigations relevant to construction at the project site to obtain reasonable information upon which to base their bid.
2. The contractor shall make their own independent evaluation of the agreed to subsurface investigation(s) and the project site should be thoroughly reviewed by each potential Contractor prior to submission of a bid.

B. CONSTRUCTION TESTING

1. The District shall furnish compaction testing for all bedding, backfill, and soil compaction testing.
2. The District shall furnish all materials testing and special inspections called for in the Contract Documents, including, but not limited to concrete and asphalt pavement.
3. When any work is determined to be unsatisfactory, faulty or defective, or does not conform to the requirements of the Contract Documents, the costs incurred by the District for additional tests or inspections shall be reimbursed by the Contractor. Said costs shall be paid by the District and deducted from progress payments to the Contractor.
4. Contractor shall provide at least 72-hour written notice of its readiness for all special inspection and testing.
5. When tests or inspections cannot be performed after such notice, the Contractor shall reimburse the District for laboratory personnel and travel expenses incurred due to the Contractor's negligence.

1.23 CONSTRUCTION WATER

- A. The Contractor shall obtain and pay for a construction water meter from the District and shall be responsible for all highlines and other temporary equipment and facilities necessary to provide adequate construction water to the project site. The Contractor shall coordinate the locations of water supply with the District.

1.24 POWER AND LIGHTING

- A. The Contractor shall provide all power required for construction operations, and shall provide and maintain all temporary power facilities required to perform the work in a safe and satisfactory manner. All electrical facilities shall conform to the requirements of the of the requirements of Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders, of the California Code of Regulation; and Subpart K of the OSHA Safety and Health Standards for Construction.

- B. The Contractor shall provide adequate light for work conducted at night or under low light conditions to provide adequate facilities for inspection and safe working conditions and to insure proper work.
- C. Temporary connections for electricity shall be subject to approval of the District's Representative and the power company representative. Remove temporary electrical connections in like manner prior to final acceptance of the work.

1.25 CONTRACTOR STAGING AND LAYDOWN AREA

- A. The District will make available to the contractor onsite, adequate space and area for staging and materials storage necessary for completion of this project. Staging and laydown areas must be established with the District prior to delivery of materials or equipment to the site and are limited to the confines established and agreed to prior to construction.
- B. Throughout all phases of construction, including suspension of work, and until final acceptance of the project, the Contractor shall keep the work site clean and free from rubbish and debris. The Contractor shall also abate dust nuisance by cleaning or sweeping and sprinkling with water or other means as necessary, in accordance with the San Diego Air Pollution Control District's regulations. The use of water resulting in mud on public streets and/or private property will not be permitted as a substitute for cleaning, sweeping, or other methods. Every day, and as required by the District's Representative, the Contractor shall furnish and operate a motorized, self-loaded sweeper with water spray nozzles to keep paved areas affected by the work acceptably clean and dust free.
- C. The Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. Contractor shall provide adequate trash receptacles about the site, and shall promptly empty the containers when filled. Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and antipollution laws. Volatile wastes shall be properly stored in covered metal containers and removed daily. Construction materials shall be neatly stacked by the Contractor when not in use. The Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.

1.26 SANITATION AND DRINKING WATER

- A. The Contractor shall provide toilet and wash-up facilities for his work force at the site of work. They shall comply with applicable laws, ordinances, and regulations pertaining to the public health and sanitation of dwellings and camps. The facilities shall be stored within the staging areas overnight and on weekends. The Contractor shall maintain the sanitary facilities in an acceptable condition from the beginning of work to completion and shall remove the facilities and disinfect the premises.
- B. The Contractor shall provide safe drinking water at all times at the jobsite.

1.27 SAFETY

- A. District and its inspectors, consultants, agents and other representatives are in no way responsible for safety and are there only to observe the work compliance with plans and specifications.
- B. The Contractor acknowledges responsibility for jobsite and acknowledges that the District, Engineer and their agents, employees, consultants and representatives will not have any such responsibility. To the fullest extent permitted by law the Contractor shall indemnify, defend and hold harmless the District, Engineer, their present companies, subsidiaries, agents, and employees from and against all claims, damages, losses and expenses, including but not limited to attorney fees and claim costs, arising out of or resulting from performance of work by the Contractor, its subcontractors, or their agents and employees, which results in damage, loss or expense is caused in whole or in part by the negligence, active or passive, of District, Engineer, their parent and subsidiary companies, as well as their agents and employees, excepting only the sole negligence of District, Engineer, their parent or subsidiary companies and their agents and employees.

1.28 INDEMNIFICATION

- A. Contractor hereby releases and agrees to indemnify, defend, hold harmless the District, the City, Engineer, their parent and subsidiary companies, agents, employees, consultants and representatives for any and all damage to persons or property or wrongful death regardless of whether or not such claim, damage, loss or expense is caused in whole or in part by the negligence, active or passive, of District, Engineer, their parent and subsidiary companies, as well as their agents and employees, excepting only the sole negligence of District, Engineer, their parent or subsidiary companies and their agents and employees to the fullest extent permitted by law. Such indemnification shall extend to all claims, demands, actions, or liability for injuries, death or damages occurring after completion of the project, as well as during the work's progress. Contractor further agrees that it shall accomplish the above at its own cost, expense and risk exclusive of and regardless of any applicable insurance policy or position taken by any insurance company regarding coverage.
- B. Contractor shall defend, indemnify and hold the District, the City, Engineer, its employees, officers, or agents, harmless against any and all claims by any parties arising from, or related to, any and all damages, including legal costs and attorney's fees, resulting from interference with, interruption of, damage to, or any and all injuries which result from damage caused to subsurface installation, which is unforeseen and despite Engineer's/Architect's effort during the design process was not located, excepting only the gross negligence or willful misconduct of Engineer in providing its services.

1.29 AUDIO-VIDEO DOCUMENTATION OF PROJECT SITE

- A. Contractor shall coordinate with District personnel prior to construction for Photo documentation of pre-existing conditions.

1.30 MEASUREMENT AND PAYMENT

A. General:

1. The measurement and payment provisions of these Contract Documents shall govern over those of referenced standards, if any.
2. The price set forth in the Bid Form for the work shall include all costs and expenses incidental to completing the work, and payment of the price bid will be payment in full under this contract, except as provided by Article 9-1 PAYMENT FOR CHANGES IN THE WORK of the General Provisions.
3. As a condition precedent to approval of the Contractor's monthly payment application by the District's Representative, the Contractor shall attend all progress or issue resolution meetings scheduled by the District's Representative. In addition, the Contractor shall submit a monthly construction schedule properly updated and accurately showing the work completed to date and the work yet to be performed in the remaining Contract time. The Contractor agrees failure to comply with the foregoing to the satisfaction of the District's Representative shall delay the monthly progress payment to the Contractor without penalty to the District.

B. Lump Sum Work Items Listed in the Bid Schedule:

1. The lump sum prices include full compensation for furnishing the labor, materials, tools, and equipment and doing all the work involved to complete the work included in lump sum work items listed in the Bid Schedule and defined by the Contract Documents.
2. The application for payment for a lump sum payment item will be for that specific work item based on the percentage completed. The percentage complete will be based on the value of partially completed work relative to the value of the item when entirely completed and ready for service. The application for payment will be in accordance with Article 9-2 PROGRESS PAYMENTS of the General Provisions.

C. Unit Price Work Items Listed in the Bid Schedule:

1. The unit prices include full compensation for furnishing the labor, materials, tools, and equipment and doing all the work involved to complete the work included in the unit price work items listed in the Bid Schedule and defined by the Contract Documents.
2. The application for payment for a unit price payment item will be for that specific work item based on the units of work that are entirely completed and ready for service. The application for payment will be in accordance with Article 9-2 PROGRESS PAYMENTS of the General Provisions.

D. Work Items Not Listed in the Bid Schedule:

1. The General Provisions and items in the Special Provisions which are not listed in the Bid Schedule of the Bid Form are, in general, applicable to more than one listed work item, and no separate work item is provided therefor. Include the cost of work not listed but necessary to complete the project designated in the Contract Documents in the various listed work items of the Bid Form.
2. The bids for the work are intended to establish a total cost for the work in its entirety. Should the Contractor feel that the cost for the work has not been established by specific items in the Bid Form, he shall include the cost for that work in some related bid item so that his proposal for the project does reflect his total cost for completing the work in its entirety.

1.31 NOTICE OF COMPLETION

- A. Contractor shall apply for acceptance of the work encompassed in the Bid Schedule. Upon substantial completion of the work encompassed in the Bid Schedule, the District, at the District's sole discretion, will issue a Notice of Substantial Completion for this work.
- B. Upon completion of all work in the Bid Schedule, Contractor shall apply for acceptance of the work. Upon acceptance of the work encompassed in the Bid Schedule, the District, at the District's sole discretion, will prepare a Notice of Completion for consideration and approval by the District Board of Directors.

1.32 GUARANTEE

- A. For all work encompassed in the Bid Schedule a one-year guarantee shall be furnished by the Contractor as required in the General Provisions, Article 5-14, except that any guarantee included for materials or equipment beyond the period specified herein shall be solely the responsibility of the guarantor and not the Contractor. This guarantee period shall commence with the District's issuance of a Notice of Substantial Completion or Notice of Completion for the Bid Schedule, whichever is first. Plant establishment shall not be subject to the one-year guarantee and shall be completed in accordance with the Contract Drawings.

1.33 LABOR COMPLIANCE PROGRAM AND CONTRACTOR REGISTRATION WITH STATE OF CALIFORNIA

- A. In accordance with requirements defined by the California State Legislature via Senate Bill 854, all contractors and subcontractors involved with public works project shall be registered with the State Department of Industrial Relations. Registration is completed through an on-line application process and the payment of a fee to the State. The registration process requires contractors and subcontractors to provide workers' compensation coverage to its employees, hold a valid Contractors State Board License, have no delinquent unpaid wage or penalty assessments, and not be subject federal or state debarment. The registration form is located on the State Department of Industrial Relations website:

- B. Prior to start of construction, the Contractor shall submit to the District evidence of completing this registration for the prime firm and all subcontracting firms. Failure to submit the requested documentation shall be cause for delay of the project and subject to forfeiture due to delay in accordance with paragraph 1.07 of the Supplement to General Provisions.

1.34 PUBLIC NOTICE BY CONTRACTOR

- A. Contractor shall furnish and coordinate public notices to be distributed by the District at least 1 week before starting construction in the form of door hangers using a format submitted to and approved by the District. This notice shall be distributed to all:
 - 1. Residents and occupants within 300 feet of where construction work is to be performed.

1.35 SITE RESTORATION

- A. Contractor shall return all disturbed areas to pre-construction conditions including, but not limited to topographic elevations, grade and material of existing surface, slopes, curb and gutter, sidewalks, driveways, striping, seal coatings, landscaping, sod grass, fences, irrigation lines and facilities, railroad ties, District facilities, and structures.

1.36 TREE AND LANDSCAPE PROTECTION

- A. Contractor shall protect trees and existing landscape in place in accordance with the Contract Documents. No tree shall be cut or trimmed without approval of a certified arborist and a District Representative. The cutting of roots greater than 2-inches in diameter shall not be allowed and hand-digging will be required.

END OF SECTION

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PART II

TECHNICAL SPECIFICATIONS

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SECTION 01010 – SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK OF THIS SECTION

- A. The work to be performed under this Contract shall consist of furnishing all plant, tools, equipment, materials, supplies, and manufactured articles and furnishing all labor, transportation and services, including fuel, power, water, and essential communications, and performing all work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The work shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the work in good faith shall be provided by the Contractor as though originally so indicated, at no increase in cost to the Owner.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Record Drawings and Submittals
- B. Section 17000 – Instrumentation and Controls

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Provide two(2) phase execution, inclusive of two(2) sub-phases each, for replacement and upgrade a total of 42 “end of life” Allen Bradley 1746 SLC and three(3) associated Remote IO Chassis, as well two(2) 1766 MicroLogix PLC’s in accordance with 17300 – Appendix A as follows, in general order of execution and delivery:

1. Phase 1 – Remote Sites

- a. Delivery of Phase 1 shall be in accordance with Section 01115 Construction Sequence.
- b. **Phase 1a** - Upgrade and replacement of 1746 SLC PLC with 5069 CompactLogix at other Remote Wastewater handling sites throughout the District, including:

(4S-103)	- Avenida Apice SPS
(4S-105)	- Cerro Del Sol 1 SPS #1
(4S-106)	- Cerro Del Sol 2 SPS #2
(4S-107)	- Camino Sin Puente SPS #1
(4S-108)	- Camino Sin Puente SPS #2
(4S-109)	- Camino Sin Puente SPS #3
(4S-110)	- Camino Sin Puente SPS #4
(4S-111)	- Del Dios SPS
(4S-113)	- Fire Station SPS
(4S-114)	- Midpoint SPS
(4S-115)	- Neighborhood 3 SPS
(4S-120)	- Santaluz SPS
(4S-121)	- Avenida Orilla SPS

SECTION 01010 – SUMMARY OF WORK

- c. **Phase 1b** - Upgrade and replacement of 1746 SLC PLC with 5069 CompactLogix at other Remote Water Distribution sites throughout the District, including:

(D-001)	- 520 PRS / Flow Control
(D-002)	- 4S-1 Reservoir - (<u>inclusive of full backpanel replacement</u>)
(D-003)	- Connemara PS
(D-004)	- Cielo PS
(D-005)	- Crosby 3 and 4 PRS
(D-007)	- Gano Reservoir
(D-008)	- Gaty Reservoir
(D-009)	- Oak South #1 PRS
(D-010)	- Miller Reservoir / Hydro
(D-011)	- Oak South #3
(D-012)	- Peay Reservoir / Flow Control)
(D-013)	- Santa Fe Valley PS
(D-014)	- Unit M Flow Control
(D-015)	- Unit Z Pump Station
(D-016)	- Via De Las Flores PRS
(D-017)	- Village Park Recycled PS
(D-018)	- Zorro Reservoir

2. **Phase 2 – DCMWTP Treatment and 4SWRF Reclamation Facilities**

- a. Delivery of Phase 2 shall be in accordance with Section 01115 Construction Sequence.

b. **Phase 2a** - 4S Water Reclamation Facility (4SWRF)

- 1) Upgrade and replacement of 1746 SLC PLC's with 5069 CompactLogix, including:

(4S-101)	- Headworks Odor Control
(4S-102)	- Solids Processing Odor Control
(4S-104)	- Blower Control
(4S-116)	- PLC-2A
(4S-117)	- PLC-2B
(4S-118)	- Reclaimed Water Pump Station
(4S-119)	- Pond System Reservoir/ Pump Station

- 2) Upgrade and replacement of 1746 SLC PLC with 1756 ControlLogix, including:

(4S-112)	- Filters PLC
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SECTION 01010 – SUMMARY OF WORK

c. Phase 2b - David C McCollom Water Treatment Plant (DCMWTP)

- 1) (M-204 and M-205) - Upgrade and replacement of 1746 SLC ICP2 & 3 and integrate as ethernet Remote IO to CC-MBR Remote as 1756 ControlLogix
- 2) (M-206) - Upgrade and replacement of One(1) Ammonia Feed Facility PLC from 1746 SLC to 1756 ControlLogix
- 3) (M-201 thru M-203) - Sub-contract upgrade and replacement of ERT 1746 SLC PLC's and Remote IO's to OEM Canyon Hydo.

1.4 PROJECT LOCATION

- A. Multiple District owned parcel located in the southern portion of the 4S Ranch area in the City of San Diego. Addresses are listed per 17300 – Appendix A.

1.5 WORK BY OTHERS

- A. The Contractor's attention is directed to the fact that work may be conducted concurrently at or near the site by other Contractors during the performance of the work under this Contract. The Contractor shall conduct its operations so as to cause a minimum of interference with the work of such other Contractors, and shall cooperate fully with such Contractors to provide continued safe access to their respective portions of the site, as required to perform work under their respective contracts.
- B. Interference with work on utilities: The Contractor shall cooperate fully with all utility forces of the District or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of utilities which interfere with the progress of work by others, and shall schedule the work so as to minimize interference with said relocation, altering, or other rearranging of facilities.

PART 2 – MEASUREMENT AND PAYMENT GENERAL

2.1 GENERAL

- A. The Contractor shall provide all labor, materials, equipment and incidentals for the work described within these Specifications and Construction Drawings. Payment for each bid item shall be included in the contract unit price or unit price shown on the Bidder's proposal. Measurement for payment of unit items will be based on the component parts listed in the Bid Items, as required in this specification. Payment for component parts will be based on the Schedule of Values approved by the Engineer. The cost breakdown shall include quantities and items aggregating the Bid Item in payments during construction. All measurements of quantities shall be approved by the Engineer. Payment for each bid item shall include full compensation for all labor, materials, tools, equipment, supplies, subcontracts, and incidentals necessary to complete the work in its entirety and no additional compensation will be allowed. This includes the cost of work not specifically listed in the Bid Schedule or Schedule of Values, but is necessary to complete the project as described and shown in the Contract Documents. Work for which no separate

SECTION 01010 – SUMMARY OF WORK

payment has been provided will be considered a subsidiary obligation of the Contractor, and the cost therefore shall be included in the applicable contract price for the item to which the work applies. All measurements of work done will be made by the District or its representative.

****END OF SECTION****

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SECTION 01039 – COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section specifies the methods and requirements of coordination and meetings required for project coordination.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. A. Section 01170 – Special Technical Provisions
- B. B. Section 01310 – Construction Progress Schedules
- C. C. Section 01370 – Schedule of Values

1.3 COORDINATION AND PROJECT CONDITIONS

- A. Contractor shall coordinate scheduling, submittals, and Work of the various sections of the Project to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Where Engineer is designated throughout the specifications stated herein, the District may designate an “Owner’s Representative” to perform duties related to coordination, facilitation, oversight, and monitoring during the execution of project construction phases.

1.4 PRECONSTRUCTION MEETING

- A. A Project Kick-Off Meeting shall be initiated by the Contractor within twenty-one (21) calendar days from Notice to Proceed.
- B. The Contractor’s detailed sequence of work and a list of labor, material and equipment rates for additional work shall be established and maintained throughout the project. Contractor shall identify all personnel assigned to the project and a complete set of approved submittal data for use by inspection personnel. Contractor shall have a designated representative for this project.
- C. Attendance Required: The District, Engineer, District’s Representative, Contractor’s Project Manager and Projected Engineer and Representatives from Subcontractors.
- D. The Engineer will distribute an agenda including, but not limited to the following items:
 - 1. Distribution of Contract Documents.
 - 2. Submission of list of Subcontractors and project schedule provided by Contractor prior to meeting.
 - 3. Designation of personnel representing the parties in Contract.

SECTION 01039 – COORDINATION AND MEETINGS

4. Procedures and processing of field decisions, submittals, substitutions, applications for progress payments, proposal request, Change Orders, and Contract closeout procedures.
 5. Scheduling.
 6. Scheduling activities of Subcontractors.
 7. Procedures for testing.
 8. Procedures for maintaining record documents.
- E. Engineer shall record minutes and distribute copies after meeting to participants and those affected by decisions made.

1.5 PROGRESS MEETINGS

- A. Engineer shall schedule, set location and administer meetings throughout progress of the Work at a maximum interval of every two weeks. At the Engineer's discretion, meetings may be held via video-conference.
- B. Engineer will arrange meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Contractors attendance at progress meetings shall include the - Project Manager and the Project Engineer. The PLC and HMI/OIT Programmer as well as any associated subcontractor(s) shall also be in attendance as appropriate for each meeting.,.
- D. The scheduled progress meetings will include, but is not limited to the following agenda items:
 1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Safety Discussion
 5. Review of 3 week lookahead schedule
 6. Review RFI schedule and status
 7. Identification of problems which impede planned progress.
 8. Review of submittals schedule and status of submittals.
 9. Review of off-site fabrication and delivery schedules.
 10. Maintenance of progress schedule.

SECTION 01039 – COORDINATION AND MEETINGS

11. Corrective measures to regain projected schedules.
 12. Planned progress during succeeding work period.
 13. Coordination of projected progress.
 14. Maintenance of quality and work standards.
 15. Effect of proposed changes on progress schedule and coordination.
 16. Other business relating to Work.
- E. Engineer will record minutes and distribute copies after meeting to participants and those affected by decisions made.
- F. Additional coordination meetings may be schedule as required by the additional specifications herein.

****END OF SECTION****

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SECTION 01043 – COORDINATION WITH DISTRICT’S OPERATIONS

PART 1 GENERAL

1.1 MAINTENANCE OF EXISTING FACILITIES/CONDITIONS

- A. The Contractor will be performing work contained in these drawings and specifications. Under these conditions, precautions will be necessary to assure that no damage or unscheduled shutdowns occur to any facilities, including tanks, piping, utilities, roads, and structures, that are to remain in operation and are not to be modified or replaced. Any temporary facilities, materials, equipment and labor required to achieve this objective shall be provided by the Contractor at his own expense. At the completion of work, all such temporary facilities, materials and equipment remaining shall be removed from the site.
- B. For any connections to existing buried piping and facilities at or adjacent to the site, it shall be the responsibility of the Contractor to uncover and verify their locations, elevations, materials, and dimensions prior to beginning construction or fabrication of any new materials or facilities which are dependent on the location of existing facilities.
- C. The Contractor shall coordinate all work with the District sufficiently ahead of time so as to not interfere with the District’s operation of their system. The Contractor shall submit a detailed sequence of work to the District for all work, as stated in Section 01115. This proposed sequence of work shall be reviewed with the District prior to construction for consistency with the Sequence of Work as described in these Contract Documents and the District’s required operation and shut-down plan.
- D. The District will operate all existing valves, pump and associated facility/process equipment.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01310 – Construction Progress Schedules
- B. Section 01115 – Construction and Sequence

1.3 ORDER OF THE WORK

- A. The work shall be carried on at such places on the project and also in such order or precedence as may be found necessary by the Contractor to expedite the completion of the project with due consideration for District operations. After work has begun on any portion or designated part of the project, it shall be carried forward to its final completion. The Engineer has the right to change the precedence of work as needed to maintain the District’s operation.

1.4 SHUTDOWNS

- A. Any proposed shutdowns must be indicated on the Contractor’s preliminary schedule to be submitted for review by the Engineer at the Preconstruction Meeting. The actual allowable durations of the shutdowns will be determined during the preparation of the detailed construction schedule.

SECTION 01043 – COORDINATION WITH DISTRICT’S OPERATIONS

- B. The Contractor shall compile a detailed list of all items of work which must be accomplished during any shutdown. The Contractor shall coordinate his work to minimize the required number of shutdowns by accomplishing as many tasks as possible during each shutdown period. The Contractor shall submit this list of items to the Engineer for his review as a part of the construction schedule defined within Section 01310. The schedule shall indicate all periods and duration of each proposed shutdown and the items of work which will be accomplished, unless otherwise specified herein or noted on the drawings. The Contractor shall make specific written requests for all shutdowns ten (10) working days in advance of the proposed shutdown for review and approval by the Engineer. The written request shall include a complete detailed plan of the Contractor's proposed activities including schedule, manpower, equipment, materials and methods which will be utilized to perform the required work during the proposed shutdown. Should the Engineer feel that the Contractor's proposed plan is insufficient to successfully complete the required work during the period of the shutdown, the Contractor shall make the appropriate revisions in his proposed plan to the satisfaction of the Engineer.

****END OF SECTION****

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SECTION 01090 – REFERENCE STANDARDS

PART 1 GENERAL

1.1 DESCRIPTION

- A. **Applicable Publications:** Whenever in these specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the drawings shall be waived because of any provision of, or omission from, said standards or requirements.

When a reference standard is specified, comply with requirements and recommendations stated in that standard, except when they are modified by the Contract Documents, or when applicable laws, ordinances, rules, regulations or codes establish stricter standards. The latest provisions of applicable standards shall apply to the Work.

- B. Reference standards include, but are not necessarily limited to, the following:
1. Institute of Electrical and Electronics Engineers.
 2. National Electrical Manufacturer's Association
 3. National Fire Protection Association, National Electric Code
 4. All other applicable standards listed in the Specifications, and the standards of utility service companies, where applicable.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Record Drawings and Submittals

1.3 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. Without limiting the generality of other requirements of the specifications, all Work specified herein shall conform to or exceed the requirements of all applicable codes and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of these Specifications nor the applicable codes.
- B. References herein to "Standard Specifications" shall mean the Olivenhain Municipal Water District Standard Specifications and Drawings for the Construction of Water, Recycled Water, and Sewer Facilities, latest edition, which are hereby incorporated in and made a part of these Contract Documents, to the extent of the applicable references thereto.
- C. References herein to "Building Code" or UBC shall mean the Uniform Building Code of the International Conference of Building Officials (ICBO). The latest edition

SECTION 01090 – REFERENCE STANDARDS

of the code as approved and used by the local agency as of the date of award, as adopted by the agency having jurisdiction, shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

- D. No provisions of any referenced standard specification, manual or code, whether or not specifically incorporated by reference in the Contract Documents, shall be effective to change the duties and responsibilities of the District, Engineer, or Contractor from those set forth in the Contract Documents. Nor shall they be effective to assign to the Engineer any duty of authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of the Contract Documents.
- E. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflict shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.
- F. Applicable Standard Specifications: The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.
- G. References herein to "SSPWC" or "Green Book" shall mean "Standard Specifications for Public Works Construction," latest edition, including the County of San Diego Regional and City of San Diego Supplement Amendments.
- H. References to "Regional Standard Drawings" or "SDRSD" shall mean the "San Diego Area Regional Standard Drawings", latest edition, including all current supplements, addenda, and revisions thereof.
- I. References herein to "Cal-OSHA" shall mean State of California, Department of Industrial Relations, Construction Safety Orders, as amended to date, and all changes and amendments thereto which are effective as of the date of construction.
- J. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- K. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

****END OF SECTION****

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SECTION 01115 – CONSTRUCTION SEQUENCE

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall execute the Work in the sequence as described herein and elsewhere in the Contract Documents in order to meet permitting timeframes and operational or other requirements of the Owner.
- B. Alternate sequences of work which meet the requirements of the project may be proposed by the Contractor and discussed with the District at the Pre-construction meeting. The Contractor shall not proceed with alternate sequences of work without written approval by the District.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01010 – Summary of Work
- B. Section 01300 – Record Drawings and Submittals
- C. Section 01310 – Construction Progress Schedule
- D. Section 17000 – Instrumentation and Controls
- E. Section 17490 – Factory and Field Testing

1.3 RECORD DRAWINGS AND SUBMITTALS

- A. The Contractor shall furnish submittals in accordance with Section 01300.

1.4 SCHEDULING

- A. Prior to mobilization and beginning any work, the Contractor shall submit a detailed, written work plan and schedule which describes the Contractor's proposed work schedule and sequence of major tasks and event milestones to complete the project in general accordance with the sequence of work as described in the Contract Documents. A critical path shall be identified on the schedule in accordance with Section 01310.
- B. The following sub-schedules and grouping shall apply to submittals, product delivery and construction work:
 - 1. Phase 1a - Remotes Sites (4S Wastewater Handling)
 - 2. Phase 1b - Remotes Sites (Distribution)
 - 3. Phase 2a – 4SWRF
 - 4. Phase 2b – DCMWTP

1.5 SEQUENCE OF WORK REQUIREMENTS

- A. Activities: Submit schedule of key activities and anticipated submittal dates for the

SECTION 01115 – CONSTRUCTION SEQUENCE

following activities based upon the following sequence and pre-requisites to commencement of activities:

1. **Phase 1a - 4S Wastewater Remote Sites – Work Activities by Sequence and Pre-Requisites:**

a. **Project Plan Submittal**

Pre-requisites:

- 1) Project Kick-Off Meeting, and minutes approved by the Owner and Engineer

Deliverables:

- 1) Project Plan and Schedule

b. **Control Panel and Wiring Diagrams Submittal:**

Pre-requisites:

- 1) Field Surveys conducted as needed by SI.
- 2) Completion of Hardware Design Workshop, and minutes approved by the Engineer

Deliverables:

- 1) Engineer Approved - Project Bill of Materials
- 2) Engineer Approved - Control Panel and Wiring Diagrams

c. **Hardware/Equipment Purchase and Manufacturing:**

Pre-requisites:

- 1) Control Panel and Wiring Diagrams, with Bill of Materials submittals has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Hardware and Equipment Receipt and Packing Lists
- 2) Assembled PLC Rack Systems for Factory Testing

d. **PLC Programming:**

SECTION 01115 – CONSTRUCTION SEQUENCE

Pre-requisites:

- 1) Completion of PLC, HMI, OIT Programming Workshop, and minutes approved by the Engineer.
- 2) PLC Programming Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Engineer Approved - PLC Programs Converted to ControlLogix Environment

e. **HMI/OIT Programming:**

Pre-requisites:

- 1) Completion of PLC, HMI, OIT Programming Workshop, and minutes approved by the Engineer
- 2) HMI and OIT Programming Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Engineer Approved - HMI and OIT graphics, database, configuration and program files for interface to new PLC's.

f. **Factory Testing – Unwitnessed Factory Test (UFT) – Hardware:**

Pre-requisites:

- 1) Hardware - UFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Hardware and Equipment has been received to Factory and assembled.

Deliverables:

- 1) Signed Hardware - UFT Test Procedures
- 2) Hardware UFT Punchlist Items Resolved

SECTION 01115 – CONSTRUCTION SEQUENCE

g. **Factory Testing – UFT– Software:**

Pre-requisites:

- 1) PLC, HMI and OIT Software Program Conversion Completed. Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”.
- 2) Factory Testing Hardware – UFT Complete
- 3) Software - UFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Signed Software - UFT Test Procedures
- 2) Software UFT Punchlist Items Resolved – Engineer Approved

h. **Factory Testing – WITNESSED FACTORY TEST (WFT) – Hardware:**

Pre-requisites:

- 1) Hardware - WFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Hardware and Equipment has been received to Factory and assembled.

Deliverables:

- 1) Signed Hardware - WFT Test Procedures
- 2) Hardware WFT Punchlist Items Resolved

i. **Factory Testing – WFT – Software:**

Pre-requisites:

- 1) PLC, HMI and OIT Software Program Conversion Completed. Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”.

SECTION 01115 – CONSTRUCTION SEQUENCE

- 2) Factory Testing Hardware – WFT Complete
- 3) Software - WFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Signed Software - WFT Test Procedures
- 2) Software WFT Punchlist Items Resolved – Engineer Approved

j. **Field Installation:**

Pre-requisites:

- 1) Factory Testing – UFT & WFT Hardware and Software Complete and Release Notes Submitted
- 2) Installation and Commissioning Workshop complete, and minutes approved by the Engineer.
- 3) Equipment Shipment to Owner Site
- 4) Factory Control Panel and Wiring Diagrams, with Bill of Materials submittals has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Wiring and installation completed. Replacement PLC equipment installed per Engineer Approved Control Panel and Wiring Diagrams

k. **Field Testing – Pre-Energization & Inspection Tests:**

Pre-requisites:

- 1) Field Installation Completed.

Deliverables:

- 1) PLC, HMI and OIT Software Programs Loaded and Readied
- 2) Inspection and Pre-Energization Check List Completed.

SECTION 01115 – CONSTRUCTION SEQUENCE

l. Field Testing – Pre-Operational Tests

Pre-requisites:

- 1) Pre-Energization & Inspection Tests Completed.
Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Field Testing – Pre-Operation Tests and Check List Completed

m. Field Testing – Operational Tests:

Pre-requisites:

- 1) Field Testing – Pre-Operation Test and Check List Completed

Deliverables:

- 1) Field Testing – Operation Tests and Check List Completed
- 2) Updated PLC, HMI and OIT Software Release Notes

n. Training:

Pre-requisites:

- 1) Field Testing – Operational Tests and Check List Completed
- 2) Training Plan submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Owner Personnel Trained

o. Trial Period:

Pre-requisites:

SECTION 01115 – CONSTRUCTION SEQUENCE

- 1) Field Testing – Operational Tests and Check List Completed

Deliverables:

- 1) Uninterrupted Operation of Facility (per site) for Five(5) Consecutive Days
- 2) Delivery of Finalized As-Built Drawing Documentation Sets in Electronic Format and Hard-Copy placed at Site.

p. **Warranty Period:**

Pre-requisites:

- 1) Trials Period completed for all Facilities within Phase 1

Deliverables:

- 1) Completed Warranty Support from 1 Year date of Beneficial Occupancy to Owner on all combined Phase 1a Facilities.

SECTION 01115 – CONSTRUCTION SEQUENCE

2. Phase 1b Distribution Remote Sites – Work Activities by Sequence and Pre-Requisites:

a. Project Plan Submittal

Pre-requisites:

- 1) Project Kick-Off Meeting, and minutes approved by the Owner and Engineer

Deliverables:

- 2) Project Plan and Schedule

b. Control Panel and Wiring Diagrams Submittal:

Pre-requisites:

- 1) Field Surveys conducted as needed by SI.
- 2) Completion of Hardware Design Workshop, and minutes approved by the Engineer

Deliverables:

- 1) Engineer Approved - Project Bill of Materials
- 2) Engineer Approved - Control Panel and Wiring Diagrams

c. Hardware/Equipment Purchase and Manufacturing:

Pre-requisites:

- 1) Control Panel and Wiring Diagrams, with Bill of Materials submittals has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Hardware and Equipment Receipt and Packing Lists
- 2) Assembled PLC Rack Systems for Factory Testing

d. PLC Programming:

Pre-requisites:

- 1) Completion of PLC, HMI, OIT Programming Workshop, and minutes approved by the Engineer.

SECTION 01115 – CONSTRUCTION SEQUENCE

- 2) PLC Programming Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Engineer Approved - PLC Programs Converted to ControlLogix Environment

e. **HMI/OIT Programming:**

Pre-requisites:

- 1) Completion of PLC, HMI, OIT Programming Workshop, and minutes approved by the Engineer
- 2) HMI and OIT Programming Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Engineer Approved - HMI and OIT graphics, database, configuration and program files for interface to new PLC's.

f. **Factory Testing – Unwitnessed Factory Test (UFT) – Hardware:**

Pre-requisites:

- 1) Hardware - UFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Hardware and Equipment has been received to Factory and assembled.

Deliverables:

- 1) Signed Hardware - UFT Test Procedures
- 2) Hardware UFT Punchlist Items Resolved

g. **Factory Testing – UFT– Software:**

SECTION 01115 – CONSTRUCTION SEQUENCE

Pre-requisites:

- 1) PLC, HMI and OIT Software Program Conversion Completed. Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”.
- 2) Factory Testing Hardware – UFT Complete
- 3) Software - UFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Signed Software - UFT Test Procedures
- 2) Software UFT Punchlist Items Resolved – Engineer Approved

h. Factory Testing – WITNESSED FACTORY TEST (WFT) – Hardware:

Pre-requisites:

- 1) Hardware - WFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Hardware and Equipment has been received to Factory and assembled.

Deliverables:

- 1) Signed Hardware - WFT Test Procedures
- 2) Hardware WFT Punchlist Items Resolved

i. Factory Testing – WFT – Software:

Pre-requisites:

- 1) PLC, HMI and OIT Software Program Conversion Completed. Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”.
- 2) Factory Testing Hardware – WFT Complete

SECTION 01115 – CONSTRUCTION SEQUENCE

- 3) Software - WFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Signed Software - WFT Test Procedures
- 2) Software WFT Punchlist Items Resolved – Engineer Approved

j. **Field Installation:**

Pre-requisites:

- 1) Factory Testing – UFT & WFT Hardware and Software Complete and Release Notes Submitted
- 2) Installation and Commissioning Workshop complete, and minutes approved by the Engineer.
- 3) Equipment Shipment to Owner Site
- 4) Factory Control Panel and Wiring Diagrams, with Bill of Materials submittals has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Wiring and installation completed. Replacement PLC equipment installed per Engineer Approved Control Panel and Wiring Diagrams

k. **Field Testing – Pre-Energization & Inspection Tests:**

Pre-requisites:

- 1) Field Installation Completed.

Deliverables:

- 1) PLC, HMI and OIT Software Programs Loaded and Readied
- 2) Inspection and Pre-Energization Check List Completed.

l. **Field Testing – Pre-Operational Tests**

SECTION 01115 – CONSTRUCTION SEQUENCE

Pre-requisites:

- 1) Pre-Energization & Inspection Tests Completed.
Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Field Testing – Pre-Operation Tests and Check List Completed

m. **Field Testing – Operational Tests:**

Pre-requisites:

- 1) Field Testing – Pre-Operation Test and Check List Completed

Deliverables:

- 1) Field Testing – Operation Tests and Check List Completed
- 2) Updated PLC, HMI and OIT Software Release Notes

n. **Training:**

Pre-requisites:

- 1) Field Testing – Operational Tests and Check List Completed
- 2) Training Plan submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Owner Personnel Trained

o. **Trial Period:**

Pre-requisites:

- 1) Field Testing – Operational Tests and Check List Completed

Deliverables:

SECTION 01115 – CONSTRUCTION SEQUENCE

- 1) Uninterrupted Operation of Facility (per site) for Five(5) Consecutive Days
- 2) Delivery of Finalized As-Built Drawing Documentation Sets in Electronic Format and Hard-Copy placed at Site.

p. **Warranty Period:**

Pre-requisites:

- 1) Trials Period completed for all Facilities within Phase 1

Deliverables:

- 2) Completed Warranty Support from 1 Year date of Beneficial Occupancy to Owner on all combined Phase 1b Facilities.

SECTION 01115 – CONSTRUCTION SEQUENCE

3. Phase 2a (4SWRF) – Work Activities by Sequence and Pre-Requisites:

a. Project Plan Submittal

Pre-requisites:

- 1) Project Kick-Off Meeting, and minutes approved by the Owner and Engineer.

Deliverables:

- 1) Project Plan and Schedule

b. Control Panel and Wiring Diagrams Design:

Pre-requisites:

- 1) Field Surveys conducted as needed by SI
- 2) Completion of Hardware Design Workshop, and minutes approved by the Engineer

Deliverables:

- 1) Field Survey Report
- 2) Engineer Approved - Project Bill of Materials
- 3) Engineer Approved - Control Panel and Wiring Diagrams

c. Hardware/Equipment Purchase and Manufacturing:

Pre-requisites:

- 1) Control Panel and Wiring Diagrams, with Bill of Materials submittals has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Hardware and Equipment Receipt and Packing Lists
- 2) Assembled PLC Rack Systems for Factory Testing

d. PLC Programming and PLC Simulator:

Pre-requisites:

SECTION 01115 – CONSTRUCTION SEQUENCE

- 1) Completion of PLC, HMI, OIT Programming and PLC Simulator Workshop, and minutes approved by the Engineer.
- 2) PLC Programming Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 3) PLC Control Logic Simulator Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Engineer Approved - PLC Programs Converted to ControlLogix Environment
- 2) Engineer approved PLC ControlLogic Simulator Program

e. **HMI/OIT Programming:**

Pre-requisites:

- 1) Completion of PLC, HMI, OIT Programming Workshop, and minutes approved by the Engineer.
- 2) HMI and OIT Programming Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Engineer Approved - HMI and OIT graphics, database, configuration and program files for interface to new PLC's.

f. **Factory Testing – UFT – Hardware:**

Pre-requisites:

- 1) Hardware - UFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Hardware and Equipment has been received to Factory and assembled.

Deliverables:

SECTION 01115 – CONSTRUCTION SEQUENCE

- 1) Signed Hardware - UFT Test Procedures
- 2) Hardware UFT Punchlist Items Resolved

g. **Factory Testing – UFT – Software:**

Pre-requisites:

- 1) PLC, HMI and OIT Software Program Conversion Completed. Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”.
- 2) Factory Testing Hardware – UFT Complete
- 3) Software - UFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Signed Software - UFT Test Procedures
- 2) Software UFT Punchlist Items Resolved – Engineer Approved

h. **Factory Testing – WFT – Hardware:**

Pre-requisites:

- 1) Hardware - WFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Hardware and Equipment has been received to Factory and assembled.

Deliverables:

- 1) Signed Hardware - WFT Test Procedures
- 2) Hardware WFT Punchlist Items Resolved

i. **Factory Testing – WFT – Software:**

Pre-requisites:

SECTION 01115 – CONSTRUCTION SEQUENCE

- 1) PLC, HMI and OIT Software Program Conversion Completed. Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”.
- 2) Factory Testing Hardware – WFT Complete
- 3) Software - WFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Signed Software - WFT Test Procedures
- 2) Software WFT Punchlist Items Resolved – Engineer Approved

j. **Field Installation:**

Pre-requisites:

- 1) Factory Testing – UFT & WFT Hardware and Software Complete and Release Notes Submitted
- 2) Installation and Commissioning Workshop complete, and minutes approved by the Engineer.
- 3) Equipment Shipment to Owner Site
- 4) Factory Control Panel and Wiring Diagrams, with Bill of Materials submittals has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Wiring and installation completed. Replacement PLC equipment installed per Engineer Approved Control Panel and Wiring Diagrams

k. **Field Testing – Pre-Energization & Inspection Tests:**

Pre-requisites:

- 1) Field Installation Completed.

SECTION 01115 – CONSTRUCTION SEQUENCE

Deliverables:

- 1) PLC, HMI and OIT Software Programs Loaded and Readied
- 2) Inspection and Pre-Energization Check List Completed

I. Field Testing – Pre-Operational Tests

Pre-requisites:

- 1) Pre-Energization & Inspection Tests Completed.
Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Field Testing – Pre-Operation Tests and Check List Completed.

m. Field Testing – Operational Tests:

Pre-requisites:

- 1) Field Testing – Pre-Operation Test and Check List Completed

Deliverables:

- 1) Field Testing – Operation Tests and Check List Completed
- 2) Updated PLC, HMI and OIT Software Release Notes

n. Training:

Pre-requisites:

- 1) Field Testing – Operational Tests and Check List Completed

Training Plan submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Owner Personnel Trained

SECTION 01115 – CONSTRUCTION SEQUENCE

o. **Trial Period:**

Pre-requisites:

- 1) Field Testing – Operational Tests and Check List Completed

Deliverables:

- 1) Uninterrupted Operation of Facility for Thirty (30) Consecutive Days

p. **Warranty Period:**

Pre-requisites:

- 1) Trials Period completed for all Facilities within Phase 2a

Deliverables:

- 1) Completed Warranty Support from 1 year date of Beneficial Occupancy to Owner for Phase 2a Facility.

SECTION 01115 – CONSTRUCTION SEQUENCE

4. Phase 2b (DCMWTP) – Work Activities by Sequence and Pre-Requisites:

a. Project Plan Submittal

Pre-requisites:

- 1) Project Kick-Off Meeting, and minutes approved by the Owner and Engineer

Deliverables:

- 1) Project Plan and Schedule

b. Control Panel and Wiring Diagrams Design:

Pre-requisites:

- 1) Field Surveys conducted as needed by SI.
- 2) Completion of Hardware Design Workshop, and minutes approved by the Engineer

Deliverables:

- 1) Field Survey Report
- 2) Engineer Approved - Project Bill of Materials
- 3) Engineer Approved - Control Panel and Wiring Diagrams

c. Hardware/Equipment Purchase and Manufacturing:

Pre-requisites:

- 1) Control Panel and Wiring Diagrams, with Bill of Materials submittals has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Hardware and Equipment Receipt and Packing Lists
- 2) Assembled PLC Rack Systems for Factory Testing

d. PLC Programming:

Pre-requisites:

SECTION 01115 – CONSTRUCTION SEQUENCE

- 1) Completion of PLC, HMI, OIT Programming Workshop, and minutes approved by the Engineer
- 2) PLC Programming Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 3) PLC Control Logix Simulator (4SWRF Only)

Deliverables:

- 1) Engineer Approved - PLC Programs Converted to ControlLogix Environment

e. **HMI/OIT Programming:**

Pre-requisites:

- 1) Completion of PLC, HMI, OIT Programming Workshop, and minutes approved by the Engineer
- 2) HMI and OIT Programming Design Specification Submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Engineer Approved - HMI and OIT graphics, database, configuration and program files for interface to new PLC's

f. **Factory Testing – UFT – Hardware:**

Pre-requisites:

- 1) Hardware - UFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Hardware and Equipment has been received to Factory and assembled.

Deliverables:

- 1) Signed Hardware - UFT Test Procedures
- 2) Hardware UFT Punchlist Items Resolved

SECTION 01115 – CONSTRUCTION SEQUENCE

g. **Factory Testing – UFT – Software:**

Pre-requisites:

- 1) PLC, HMI and OIT Software Program Conversion Completed. Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Factory Testing Hardware – UFT Complete
- 3) Software - UFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Signed Software - UFT Test Procedures
- 2) Software UFT Punchlist Items Resolved – Engineer Approved

h. **Factory Testing – WFT – Hardware:**

Pre-requisites:

- 1) Hardware - WFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Hardware and Equipment has been received to Factory and assembled.

Deliverables:

- 1) Signed Hardware - WFT Test Procedures
- 2) Hardware WFT Punchlist Items Resolved

i. **Factory Testing – WFT – Software:**

Pre-requisites:

- 1) PLC, HMI and OIT Software Program Conversion Completed. Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”
- 2) Factory Testing Hardware – WFT Complete

SECTION 01115 – CONSTRUCTION SEQUENCE

- 3) Software - WFT Factory Test submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Signed Software - WFT Test Procedures
- 2) Software WFT Punchlist Items Resolved – Engineer Approved

j. **Field Installation:**

Pre-requisites:

- 1) Factory Testing – UFT & WFT Hardware and Software Complete and Release Notes Submitted
- 2) Installation and Commissioning Workshop complete, and minutes approved by the Engineer.
- 3) Equipment Shipment to Owner Site
- 4) Factory Control Panel and Wiring Diagrams, with Bill of Materials submittals has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Wiring and installation completed. Replacement PLC equipment installed per Engineer Approved Control Panel and Wiring Diagrams

k. **Field Testing – Pre-Energization & Inspection Tests:**

Pre-requisites:

- 1) Field Installation Completed

Deliverables:

- 1) PLC, HMI and OIT Software Programs Loaded and Readied
- 2) Inspection and Pre-Energization Check List Completed

SECTION 01115 – CONSTRUCTION SEQUENCE

I. **Field Testing – Pre-Operational Tests**

Pre-requisites:

- 1) Pre-Energization & Inspection Tests Completed.
Completed program submittals have been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Field Testing – Pre-Operation Tests and Check List Completed

m. **Field Testing – Operational Tests:**

Pre-requisites:

- 1) Field Testing – Pre-Operation Test and Check List Completed

Deliverables:

- 1) Field Testing – Operation Tests and Check List Completed
- 2) Updated PLC, HMI and OIT Software Release Notes

n. **Training:**

Pre-requisites:

- 1) Field Testing – Operational Tests and Check List Completed
- 2) Training Plan submittal has been designated as “No Exceptions Noted”, or “Corrections Required: Revise Only”

Deliverables:

- 1) Owner Personnel Trained.

o. **Trial Period:**

Pre-requisites:

- 1) Field Testing – Operational Tests and Check List Completed

SECTION 01115 – CONSTRUCTION SEQUENCE

Deliverables:

- 1) Uninterrupted Operation of Facility for Thirty (30) Consecutive Days.

p. **Warranty Period:**

Pre-requisites:

- 1) Trials Period completed for all Facilities within Phase 2

Deliverables:

- 1) Completed Warranty Support from 1 year date of Final Completion to Owner for Phase 2b Facility.

****END OF SECTION****

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SECTION 01150 – MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. Measurement and payment for bid items listed in the proposal shall be based upon use of a lump sum. Extra work or changes in the work shall be accomplished as provided in the General Provisions.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01010 – Summary of Work
- B. Section 01170 – Special Technical Provisions

1.3 SUBMITTALS (NOT USED)

1.4 PAYMENT

- A. Payment for lump sum bid items shall be based upon the amount shown in the Bid Schedule and shall include full compensation for furnishing all labor, transportation, materials, equipment, tools and appurtenances required for construction of the unit complete in place in accordance with the Plans and Specifications.
- B. Payment for Mobilization/De-Mobilization (item 000) on the Bid Schedule shall Not Exceed 5% of the Total Contract Value (60% at Mob and 40% at De-Mob), including but not limited to: required insurance, bonds, permits, movement of personnel, equipment, supplies, and incidentals to the project site.
- C. Items 001-042 on the Bid Schedule are for all labor, transportation, materials, equipment, tools, and appurtenances to replace that specific PLC. Progress payment for each PLC on the Bid Schedule (Items 001-042) will be based upon the Schedule of Values defined in Section 01370

PART 2 EXECUTION

2.1 GENERAL

- A. This section covers methods of measurement and payment for items of Work under this Contract. The total Bid Price shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid.

****END OF SECTION****

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SECTION 01170 – SPECIAL TECHICAL PROVISIONS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01039 – Coordination and Meetings
- B. Section 01300 – Record Drawings and Submittals
- C. Section 01115 – Construction Sequence

1.2 COMMON REFERENCES

- A. The references throughout the Contract Documents to Owner, District, Owner's Representative, District's Representative, Resident Engineer, Consulting Engineer, and Engineer shall be interchangeable and in no way shall the Contractor construe the meaning of such reference to relieve him from some obligation set forth by these Contract Documents.

1.3 SEQUENCE AND PROGRESS OF WORK

- A. The sequence of work shall be per Section 01115.

1.4 CONTRACTOR WORK AREA

- A. The use of the project area will not be available beyond the limits of the project sites as identified on the drawings. The Contractor must operate entirely within the limits of a project site. No equipment or materials may be parked or stock piled outside a project site or designated Contractor staging areas. If the Contractor needs additional space for staging and storage, the Contractor shall obtain such space and shall submit to the District written permission for such use from the property's owner.
- B. It shall be understood that responsibility for protection and safekeeping of equipment and materials on or near a site will be entirely that of the Contractor and that no claim shall be made against the Owner or his authorized representatives by reason of any act. It shall be further understood that should any occasion arise necessitating access to the sites occupied by these stored material or equipment, the Engineer shall direct the Contractor owning or responsible for the stored materials and equipment to immediately move the same. No materials or equipment may be placed upon the property of the Owner other than the designated areas on the Drawings unless the Engineer has agreed to the location contemplated by the Contractor to be used for storage.

1.5 CONFINED SPACE PROGRAM

- A. The Contractor is required to provide the Owner with a copy of the Contractor's Confined Space Program for Owner's receipt prior to beginning work. Contractor's Confined Space Program shall be in compliance with Cal-OSHA's Confined Space regulatory requirements. The Contractor is required to perform all Work in accordance with Cal-OSHA Confined Space requirements.

SECTION 01170 – SPECIAL TECHICAL PROVISIONS

1.6 JOB SAFETY

- A. The Contractor is required to provide the Owner with a copy of the Injury and Illness Prevention Program (IIP) for Owner's review prior to beginning work. The Contractor's IIP shall be in compliance with Cal-OHSA requirements.
- B. Owner and its inspectors, consultants, agents and other representatives are in no way responsible for safety and are there only to observe the work compliance with plans and specifications.
- C. Contractor acknowledges responsibility for job-site safety and acknowledges that the Engineer will not have any such responsibility. To the fullest extent permitted by law the Contractor shall indemnify, defend and hold harmless Owner, Design Engineer, their present companies, subsidiaries, agents, and employees from and against all claims, damages, losses and expenses, including but not limited to attorney fees and claim costs, arising out of or resulting from performance of work by the Contractor, its subcontractors, or their agents and employees, which results in damage to persons or property including wrongful death regardless of whether or not such claim, damage, loss or expense is caused in whole or in part by the negligence, active or passive, of Owner, Design Engineer, their parent and subsidiary companies, as well as their agents and employees, excepting only the sole negligence of Owner, Design Engineer, their parent or subsidiary companies and their agents and employees.

****END OF SECTION****

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SECTION 01300 – RECORD DRAWINGS AND SUBMITTALS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The term "submittal" as used herein shall be understood to include working drawings, detail design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, samples, and similar items. Unless otherwise required, such submittals shall be submitted electronically to the Engineer. Engineer will review and distribute all submittals in accordance with this section within thirty(30) calendar days following their receipt by the Engineer.

1.2 SCOPE

- A. Submittals for work scope covered in this contract are expected to be as follows. This list is intended to be a guideline and not to be specific of all submittals required. Project circumstances or lead times or availability will each impact the order and division of submittals.
 - 1. Project Plan and Schedule
 - 2. Coordination Workshop Agenda
 - 3. Control Panel and Wiring Diagrams, including:
 - a. Bill of Materials
 - b. Updated Shop Drawings
 - 4. PLC Programming Design Specification
 - 5. HMI and OIT Programming Design Specification
 - 6. PLC Simulator Design Specification (4SWRF Only)
 - 7. PLC Programs converted to ControlLogix
 - 8. Modified HMI and OIT graphics, database, configuration and program files
 - 9. Hardware UFT/WFT – Test Procedures
 - 10. Software UFT/WFT – Test Procedures
 - 11. Field Test Procedures, including:
 - a. Pre-Energization and Inspection Tests
 - b. Pre-Operational Tests
 - c. Operational Tests

SECTION 01300 – RECORD DRAWINGS AND SUBMITTALS

- 12. Training Plan
- 13. Operations and Maintenance Manuals

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01090 – Reference Standards
- B. Section 01370 – Schedule of Values
- C. Section 01400 – Quality Control
- D. Section 01700 – Project Closeout
- E. Section 17000 – Instrumentation and Controls

1.4 SHOP DRAWINGS AND PRODUCT DATA

- A. The Contractor shall modify the original site Control Panel and Wiring Diagrams to the project, which will constitute as the basis for “Shop Drawings” to the project.
- B. Original AutoCAD control panel drawings exist for some (but not all) facilities and control panels, as identified per 17300 Appendix-A. AutoCAD submittals shall be provided by the Contractor for all PLC Control Panel Upgrades as follows:
 - 1. Where original AutoCAD drawing files do exist, they shall be updated to the latest version of AutoCAD, modified by the Contractor to include original owner markups as well as modifications for the PLC Replacement Project. All changes shall be identified with a clearly identifiable cloud bubble and reference note on the original AutoCAD file.
 - 2. Where original AutoCAD drawing files do not exist, new AutoCAD source files shall be furnished by the Contractor to reflect control panel configuration and wiring. PDF to AutoCAD conversions will not be accepted. Only sheets affected by the PLC upgrades shall be re-produced in AutoCAD. All changes and redlines from the original interpreted PDF shall be identified with a clearly identifiable cloud bubble and reference note on the original AutoCAD file.
- C. Mark each copy to identify the specific quantity, product, model, options, and other data applicable to each unit being furnished for the Project. Supplement manufacturers' standard data to provide information unique to this Project.
- D. Shop drawings or equipment drawings, including dimensions, size and location of connections to other work, and weight of equipment.
- E. Catalog information and cuts.
- F. Installation or placing drawings for equipment bases.
- G. Supporting calculations for equipment and associated supports specified to be designed by equipment manufacturers or suppliers.

SECTION 01300 – RECORD DRAWINGS AND SUBMITTALS

- H. Wiring and control diagrams of systems and equipment.
- I. Complete manufacturer's specifications, including materials description and paint system.
- J. Suggested spare parts list with current price information.
- K. List of special tools required for checking, testing, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics.)
- L. List of special tools furnished with the equipment.
- M. List of materials and supplies required for the equipment prior to, and during startup.
- N. List of materials and supplies furnished with equipment.
- O. Samples of finish colors for selection.
- P. Special handling instructions.
- Q. Material Safety Data Sheets (MSDS) and warning label for each chemical to be used in the work.
- R. Requirements for storage and protection prior to installation.
- S. Requirements for routine maintenance required prior to initial start-up.
- T. List of all requested exceptions to the Contract Documents.
- U. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700.

1.5 MANUFACTURERS' INSTRUCTIONS

- A. When specified in individual Specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.6 MANUFACTURERS' CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturers' certificate to the Engineer for review, in quantities specified for Product Data.
- B. Indicate that the material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

SECTION 01300 – RECORD DRAWINGS AND SUBMITTALS

- C. Certificates may be recent or previous test results on material or product, but must be acceptable to the Engineer.

1.7 AS-BUILT DRAWING DESCRIPTION

- A. Contractor shall provide and maintain on the jobsite one complete set of prints of all Plans which form a part of the contract. Immediately after each portion of the work is installed, indicate all deviations from the original design shown on the Plans either by additional sketches or marked in red ink thereon and reviewed by the Engineer. Upon completion of the job, deliver this record set to the Engineer.
- B. As-Built Drawings shall be submitted with final request of progress payment.
- C. Final Released Drawings shall be issued within 14 days from completion of each respective Site Trial Period.
- D. Protect the record set from damage or loss.
- E. After District's review, the Contractor shall incorporate final updates to the project AutoCAD files. Two(2) print 11x17 hard-copies shall subsequently be delivered to the District. Original AutoCAD files and Electronic PDF copies shall also be provided to the District.

1.8 DETAILED REQUIREMENTS

- A. The Contractor shall provide As-Built Drawings which shall clearly show all differences between the contract Work as drawn and as installed for all concealed construction, as well as construction added to the Contract, which is not indicated on the Contract Drawings.
- B. Concealed shall mean construction installed underground or in an area which cannot be readily inspected by use of access panels, inspection plates or other removable features.
- C. Show all changes in the Work, or Work added on the As-Built Drawings in a contrasting color.
- D. In showing changes in the Work, or added Work, use the same legends that are used on the Contract Drawings. Indicate exact locations by dimensions and exact elevations. Give dimensions from a permanent point.
- E. Record by marking on the Drawings all changes in the Work which occur during construction, including adding approved change orders.
- F. Show locations by key dimensions, depths, elevations of all underground lines, conduit runs, sensor lines, valves, capped ends, branch fittings, pull boxes, etc.
- G. Record information on how to maintain and/or service concealed Work.
- H. Make a record of finalized hydraulic and electrical equipment control settings in the tables and spaces provided on the Drawings.

SECTION 01300 – RECORD DRAWINGS AND SUBMITTALS

- I. The Contractor shall perform all work required for as-built aerial topography, including 1 foot contours, spot elevations, and H & V shots. The as-built aerial topography shall be performed by the Contractor 10 working days following completion, except weather related delay as determined by District.
- J. District will not approve a Notice of Completion until the As-Built Drawings package has been approved by the District.

****END OF SECTION****

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SECTION 01310 – CONSTRUCTION PROGRESS SCHEDULES

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall provide a construction schedule, which conforms to the requirements below, unless otherwise approved by the Engineer.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01010 – Summary of Work
- B. Section 01150 – Measurement and Payment
- C. Section 01300 – Submittals
- D. Section 01370 – Schedule of Values

1.3 FORMAT

- A. Prepare network analysis system using the critical path method, as outlined in The Associated General Contractors of America (AGC) publication "The Use of CPM in Construction - A Manual for General Contractors".
- B. Sheet Size: 24-inches by 36-inches.
- C. Time Scale: Indicate first date in each work week.
- D. Organization:
 - 1. The following sub-schedules and grouping shall apply to submittals, product delivery and construction work:
 - a. Phase 1a - Remotes Sites (4S Wastewater Handling)
 - b. Phase 1b - Remotes Sites (Distribution)
 - c. Phase 2a – 4SWRF
 - d. Phase 2b – DCMWTP
 - 2. Group critical activities, which dictate the rate of progress into a separate sub- schedule.
 - 3. Organize each sub-schedule by Specification Section number.

1.4 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by Specification Section number.

SECTION 01310 – CONSTRUCTION PROGRESS SCHEDULES

- C. Arrange construction Work into logically grouped activities.
- D. Provide sub-schedules for each stage of Work identified in the Bid Schedule.
- E. Provide sub-schedules to define critical portions of the entire Schedule.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- G. Provide separate schedule of submittal dates for shop drawings, product data, factory and field testing dates, and dates reviewed submittals will be required from the Engineer.
- H. Indicate delivery dates for any Owner furnished items.
- I. Coordinate content with Schedule of Values specified in Section 01370.

1.5 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of separate contractors, if any.

1.6 CONTRACTOR SUBMITTALS

- A. Submit initial Schedules within 14 calendar days after Notice To Proceed . After review, resubmit required revised data within ten(10) calendar days thereafter. Submit schedule in both printed and electronic forms.
- B. Submit revised Progress Schedules every month with progress payment, or as directed by the Engineer. Submit schedule in both printed and electronic forms.
- C. Attach a letter of transmittal to each submittal and include the following information in the letter:
 - 1. A listing of items which have changed since the last submittal.
 - 2. Discussion of problems causing delays, anticipated length of delays, and proposed solutions.
 - 3. Schedule narrative including the following:
 - 4. Critical path.
 - 5. Activities started, in progress and completed.

SECTION 01310 – CONSTRUCTION PROGRESS SCHEDULES

6. Description of logic changes from previous update.
7. Current problems.
8. Milestone status.
9. Potential problem areas.

1.7 DISTRIBUTION

- A. Distribute copies of reviewed Schedules to project site file, Subcontractors, suppliers, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in Schedules.
- C. Provide updated 3 week look ahead at each progress meeting.

****END OF SECTION****

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SECTION 01342 – PROGRESS SAMPLES

PART 1 GENERAL

1.1 DESCRIPTION

- A. The submittal of Samples shall conform to the procedures described in this Section.
- B. Samples and Shop Drawings which are related to the same unit of Work or Specification Section shall be submitted at the same time. If related Shop Drawings and Samples are submitted at different times, they cannot be reviewed until both are furnished to the Engineer.

1.2 PROCEDURE

- A. Contractor shall review, approve, and submit Samples to the Engineer. Samples shall be identified with correct reference to Specification Section, page, article and paragraph number, and Drawing No. when applicable. Samples shall clearly illustrate functional characteristics of the product and all related parts and attachments, and full range of color, texture, pattern and material. Samples shall be furnished at least ten (10) working days prior to fabrication so as not to delay fabrication, allowing the Engineer reasonable time for the consideration of the Samples submitted.
- B. Contractor shall submit at least three (3) Samples of each item required for the Engineer's approval. Submission of Samples shall conform to all applicable provisions under Shop Drawing Submittal and Correspondence Procedure. Two (2) of the Samples shall be delivered to the Engineer's home office unless otherwise authorized by the Engineer. One Sample shall be delivered to the Engineer's field office. If the Contractor requires a Sample for the Contractor's use, an additional sample shall be ordered.
- C. The Contractor shall make all corrections required and shall resubmit the required number of new Samples until approved.

1.3 SAMPLES FOR TESTS

- A. Contractor shall furnish such Samples of material as may be required for examination and test. All Samples of materials for tests shall be taken according to standard methods and as required by the Contract Documents.

****END OF SECTION****

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SECTION 01370 – SCHEDULE OF VALUES

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Schedule of Values is an itemized list of the value or cost of each Bid Item of work and the associated time of expenditures. It shall be used as the basis for submitting progress payments and projecting future payment schedule.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01039 – Coordination and Meetings

1.3 PREPARATION

- A. The Schedule of Values shall be prepared by the Contractor, and based on bid items and anticipated units completed each month.
- B. Schedule of Values shall be prepared on 8-1/2-inch by 11-inch white paper.
- C. The sum of the individual values shown on the Schedule of Values must equal the total Contract Price.
- D. Progress payment for each site PLC on the Bid Schedule (items 001-042) and will be based upon measurement of work completed per Site PLC identified as described below:

- 1. Item A: “Completion of Submittals” - 15% of Site Value, including:

- a. Measurement and Payment: This item is furnishing finalized electronic and hard-copy submittals as defined in Section 17000, including:

- 1) Incorporation into Project Plan Submittal
- 2) Control Panel and Wiring Diagram Submittal
- 3) PLC Programing Submittals
- 4) HMI and OIT Programing Submittals
- 5) PLC Control Logic Simulation Submittal (4WRF Only)

- 2. Item B: “Witnessed Factory Test – Hardware” - 30% of Site Value

- a. Measurement and Payment: This item is for completion of Witnessed Hardware Testing for each respective site on the bid, with all punch-list items resolved to the satisfaction of the Engineer or Owner’s designated representative.

- 3. Item C: “Witnessed Factory Test – Software” - 30% of Site Value

- a. Measurement and Payment: This item is for completion of Witnessed Software Testing for each respective site on the bid, with all punch-list items resolved to the satisfaction of the Engineer or Owner’s designated representative.

SECTION 01370 – SCHEDULE OF VALUES

4. Item D: “Field Testing” - 15% of Site Value
 - a. Measurement and Payment: This item is for completion of all Field Testing defined in Section 17490 to the satisfaction of the Engineer or Owner’s designated representative.
5. Item E: “Operations and Maintenance Manuals / Punch-List Close-Out” - 10% of Site Value
 - a. Measurement and Payment: This item is furnishing finalized:
 - 1) Electronic and hard-copy Operations and Maintenance Manuals as defined in Section 17000.
 - 2) Punch-List close-out, including all work not specifically Called Out in Items A-E above for a functioning site.

1.4 CONTRACTOR SUBMITTAL

- A. A tentative schedule of values shall be submitted prior to or at the pre-construction meeting in accordance with Section 01039 of this specification. The submitted schedule of values shall include at a minimum the items contained in the attached spreadsheet table.
- B. The Contractor and Engineer shall meet and jointly review the preliminary schedule of values and make any adjustments in value allocation if, in the opinion of the Engineer, these are necessary to establish fair and reasonable allocation of values for the major Work components. Front end loading will not be permitted. This review and any necessary revisions or reallocation of the schedule of values shall be completed within 10 working days from the date of the Notice to Proceed.
- C. Submit three copies of monthly updates of the schedule of values to the Engineer with request for project payments.

****END OF SECTION****

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SECTION 01400 – QUALITY CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

- A. Specific quality control requirements for the Work are indicated throughout the Contract Documents. The requirements of this section are primarily related to performance of the Work beyond furnishing of manufactured products. The term “Quality Control” includes inspection, sampling and testing, and associated requirements.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Record Drawings and Submittals

1.3 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. Work shall conform to Federal, State and local building codes, electrical codes, fire codes, mechanical codes and plumbing codes, and to Occupational Safety and Health Act (OSHA) Regulations. Nothing in Contract Documents shall be interpreted as permission or direction to violate any governing code or ordinance.

1.4 INSPECTION AT PLACE OF MANUFACTURE

- A. Unless otherwise indicated, all products, material and equipment may be subject to inspection by the Engineer at the place of manufacture.
- B. The presence of the Engineer at the place of manufacture, however, shall not relieve the Contractor of the responsibility for furnishing products, material, and equipment which comply with all the requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the Engineer.

1.5 CONTRACTOR SUBMITTALS

- A. Certificates of compliance shall be submitted at Owner's request.
- B. Transcripts of results of acceptance to verify quality of manufactured products shall be submitted at Owner's request.

1.6 SAMPLING AND TESTING

- A. Unless otherwise indicated, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered; however, the Owner reserves the right to use any generally-accepted system of sampling and testing, which in the opinion of the Engineer will insure the Owner that the quality of the workmanship is in full accordance with the Contract Documents.
- B. Any waiver by the Owner of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of
- C.

SECTION 01400 – QUALITY CONTROL

- D. substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial Work, shall not be construed as a waiver of any requirements of the Contract Documents.
- E. Notwithstanding the existence of such a waiver, the Engineer reserves the right to make independent investigations and tests, and failure of any portion of the Work to meet any of the requirements of the Contract Documents, shall be reasonable cause for the Engineer to require removal or correction and reconstruction of any such Work in accordance with the General Provisions. In addition, any costs for retests shall be borne by the Contractor.

1.7 INSPECTION AND TESTING LABORATORY SERVICES

- A. Inspection and testing laboratory service shall comply with the following:
- B. Owner may appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.
- C. The Contractor shall hire an independent firm who will perform inspections, testing, and other services specified in individual specifications and as required by the Engineer unless otherwise noted. The Contractor shall pay for all testing and specialty inspections and for any retesting of tests that are paid for by the Owner described elsewhere.
- D. Reports will be submitted to the Owner and Engineer by the independent firm in duplicate, indicating observations and results of tests indicating compliance or non-compliance with the Contract Documents.
- E. The Contractor shall cooperate with the Owner and/or independent firm and furnish samples of material, design mix, equipment, tools, storage, and assistance as requested.
- F. The Contractor shall notify the Owner's Representative 24 hours prior to the expected time for operations requiring inspection and laboratory testing services.
- G. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. The Contractor shall bear all costs from such retesting at no additional cost to the Owner.
- H. For samples and tests required for Contractor's use, the Contractor shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the Contractor's use shall be included in the Contract Price.

1.8 CONTRACTOR'S QUALITY CONTROL

- A. Arrange work to be readily accessible and easy to operate and maintain where detail drawings are not included in Contract Documents, supplementary drawings

SECTION 01400 – QUALITY CONTROL

or shop drawings and submittals.

- B. Combinations of manufactured equipment shall be fully compatible and work safely and successfully as a unit. Furnish necessary mountings, couplings and appurtenances with each unit.
- C. Relocations or adjustment of existing facilities noted in Contract Documents shall be done as needed. If existing items are lost or damaged during construction, replace with new items of equal or better quality.
- D. Make field measurements needed to fabricate and install Work before ordering or beginning work. Make minor changes in alignments and dimensions as needed to remedy or avoid utilities and structural conflicts.

1.9 PROJECT CONDITIONS

- A. Items furnished shall be capable of fulfilling their intended purpose in the environment in which they are installed. Allow for local temperature extremes, climactic conditions and corrosive environments where necessary to ensure proper functioning of furnished products.
- B. The Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the Work due to its failure to comply with this requirement.
- C. Points of connections to any existing pipelines must be accurately located by the Contractor. Information such as vertical elevations, pipe outside diameters, joints, materials of construction, shape, and pipe conditions must be obtained prior to beginning work in the affected area and this information shall be transmitted to the Engineer. The Engineer shall make any necessary adjustments to the drawings to reflect the actual field conditions. No additional payments will be made to the Contractor for any required adjustments in the drawings at the points of connection to existing pipelines. No payment will be allowed for special transition couplings or jointing materials required for connections to existing pipelines.

1.10 UNIT PRICES

- A. Payment for Contractor-provided testing required in Contract Documents will be included in the price bid for items of work for which Contractor-provided testing is specified.

PART 2 PART 2 – MATERIALS (NOT USED)

PART 3 PART 3 – EXECUTION

3.1 INSPECTION

- A. Notify Engineer of time and place of shop tests five(5) working days before they begin. Complete manufacturing operations, checks, adjustments and tests before factory inspection.

SECTION 01400 – QUALITY CONTROL

- B. The Engineer will inspect products after delivery and throughout construction process. Products will be subject to rejection at any time on account of failure to meet Contract Documents even though samples may have been accepted as satisfactory at place of manufacture.
- C. The Contractor shall inspect related and appurtenant Work and shall report in writing to the Engineer any conditions, which will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor at its sole cost and expense.
- D. Before backfilling, request inspection by the Engineer to verify proper installation of buried work.
- E. Before finishing, request inspection by the Engineer to verify that no surfaces to receive product have defects or errors which could result in poor or potentially defective application or cause latent defects in workmanship.

3.2 INSTALLATION/APPLICATION/ERECTION

- A. Install products according to manufacturer's installation and warranty requirements. Install products to tolerances recommended by manufacturer. Unless otherwise shown, install equipment true and level using precision gauges and levels.
- B. Refer variances between manufacturer's installation instructions and Contract Documents to the Engineer.
- C. Construct walls plumb, straight, level, square and true. Welds, unless otherwise shown, shall be continuous, watertight, and conforming to Structural Welding Code of American Welding Society. Welds shall be free of sharp points or edges.
- D. Pipe work, valves, fittings, tanks and appurtenances shall have no leaks at design pressures.
- E. Exposed surfaces shall be finished in appearance. Grind smooth exposed welds. Round or chamfer corners of exposed structural shapes for personal protection.
- F. Prime and paint exposed surfaces of ferrous products, piping, and conduit except for stainless steel or galvanized or sherardized surfaces or unless otherwise shown. Clean painted surfaces and touch up bare or marred spots with finish to match factory finish.

3.3 FIELD QUALITY CONTROL

- A. Maintain complete set of Contract Documents at jobsite field office or superintendent's truck at all times.
- B. Frequency of sampling and testing shall be as shown, and shall be performed at such other times as necessary to document contract compliance.

SECTION 01400 – QUALITY CONTROL

- C. Notify the Engineer and regulating authorities three (3) working days before field tests.
- D. Perform field tests in presence of the Engineer who will record results.
- E. Repair damage to work that is not cause for rejection.
- F. Contractor shall bear the responsibility for repairing, correcting or replacing work failing tests or inspection. Repeat tests until results satisfy Specifications. Repair damages resulting from tests.

****END OF SECTION****

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SECTION 01545 – PROTECTION OF THE WORK AND PROPERTY

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage as specified herein.
- B. In order to prevent damage, injury or loss, Contractor's actions shall include but not be limited to, the following:
- C. Store apparatus, materials, supplies, and equipment in an orderly safe manner that will not unduly interfere with the progress of the Work or the Work of any other contractor or utility service company.
- D. Provide suitable storage facilities for all materials, which are subject to injury by exposure to weather, theft, breakage, or otherwise.
- E. Place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the Work.
- F. Clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the Work shall present a safe, orderly and workmanlike appearance.
- G. Provide barricades and guard rails around openings, for scaffolding, for temporary stairs and ramps, around excavations, elevated walkways and other hazardous areas.
- H. Take work progress photos and submit monthly to the Engineer in digital format.
- I. The Contractor shall not, except after written consent from proper parties, enter or occupy privately-owned land with men, tools, materials or equipment, except on easements provided herein.
- J. The Contractor shall assume full responsibility for the preservation of all public and private property or facility on or adjacent to the site. If any direct or indirect damage is done by or on account of any act, omission, neglect or misconduct in the execution of the Work by the Contractor, it shall be restored by the Contractor, at his expense, to a condition equal to that existing before the damage was done.

1.2 PROTECTION OF EXISTING STRUCTURES

- A. Underground Structures:
 - 1. Underground structures are defined to include, but not be limited to, all sewer, water, gas, and other piping, and manholes, chambers, electrical conduits, tunnels and other existing subsurface work located within or adjacent to the limits of the Work.
 - 2. All underground structures known to Engineer are shown. This information

SECTION 01545 – PROTECTION OF THE WORK AND PROPERTY

is shown for the assistance of Contractor in accordance with the best information available, but is not guaranteed to be correct or complete.

3. The Contractor shall explore ahead of his trenching and excavation Work and shall uncover all obstructing underground structures sufficiently to determine their location, type, material, and condition to prevent damage to them and to prevent interruption to the services which such structures provide. This exploration shall be completed sufficiently ahead of construction activities to allow for design revisions by the Engineer. If Contractor damages an underground structure, he shall restore it to original condition at his expense.
4. Necessary changes in the location of the Work may be made by Engineer, to avoid unanticipated underground structures.
5. If permanent relocation of an underground structure or other subsurface facility is required and is not otherwise provided for in the Contract Documents, Engineer will direct Contractor in writing to perform the Work, which shall be paid for under the provisions of the Contract.
6. The Contractor shall call USA Dig Alert at 1-800-227-2600 a minimum of forty-eight (48) hours prior to any excavation.

B. Surface Structures:

Surface structures are defined as all existing buildings, structures and other facilities above the ground surface. Included with such structures are their foundations or any extension below the surface. Surface structures include, but are not limited to, buildings, walls, roads, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks and all other facilities that are visible above the ground surface.

C. Protection of Underground and Surface Structures:

1. The Contractor shall sustain in their places and protect from direct or indirect injury all underground and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure. Before proceeding with the Work of sustaining and supporting such structure, Contractor shall satisfy the Engineer that the methods and procedures to be used have been approved by the party owning same.
2. The Contractor shall assume all risks attending the presence or proximity of all underground and surface structures within or adjacent to the limits of the Work. Contractor shall be responsible for all damage and expense for direct or indirect injury caused by his Work to any structure. Contractor shall repair immediately all damage caused by his Work, to the satisfaction of the owner of the damaged structure.
3. All other existing surface facilities, including but not limited to, guard rails, posts, guard cables, signs, poles, markers, and curbs which are temporarily

SECTION 01545 – PROTECTION OF THE WORK AND PROPERTY

removed to facilitate installation of the Work shall be replaced and restored to their original condition at Contractor's expense.

1.3 PROTECTION OF INSTALLED PRODUCTS AND EXISTING EQUIPMENT

- A. Provide protection of installed products to prevent damage from subsequent operations. Remove protection facilities when no longer needed, prior to completion of Work.
- B. The Contractor shall coordinate Lock-Out Tag Out (LOTO) with District Staff to ensure appropriate means and methods of isolating and protecting personnel and equipment.
- C. A Site Outage Plan and Schedule shall be included in the Field Testing Plan defined in Section 17490, including: description of work, equipment to be de-energized, breakers to be opened and list of LOTO tagging

1.4 PROTECTION OF SURVEY OR ROADWAY MARKERS

- A. The Contractor shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced for easy and accurate restoration. It shall be the Contractor's responsibility to notify the proper representatives of the Owner of the time and location that Work will be done. Such notification shall be sufficiently in advance of construction so that there will be no delay due to waiting for survey points to be satisfactorily referenced for restoration. All survey markers or points disturbed will be accurately restored by the Contractor at the Contractor's expense after all work has been completed.

1.5 PROTECTION OF TREES AND LANDSCAPING

- A. The Contractor shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs of other existing landscaping, including those lying within or beyond street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the Engineer and the jurisdictional agency or Owner. All existing trees and landscaping which are damaged during the construction shall be trimmed or replaced by the Contractor or a certified landscape maintenance company under permit from the jurisdictional Owner and to the satisfaction of said agency and/or the Owner. All costs shall be borne by the Contractor.

PART 2 PART 2 – MATERIALS (NOT USED)

PART 3 PART 3 – EXECUTION

3.1 PROCEDURES FOR PROTECTING EXISTING UTILITIES

- A. Protect in Place: Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified.

SECTION 01545 – PROTECTION OF THE WORK AND PROPERTY

- B. Cut and Plug Ends: Cut abandoned utility lines and plug ends with an 8-inch wall of brick and mortar or concrete plug. Dispose of the cut pipe as unsuitable material.
- C. Remove and Reconstruct: Where necessary or as required by the Engineer, remove the utility and, after passage, reconstruct it with new materials. Provide temporary service for the disconnected utility.

3.2 COMPACTION

- A. Utilities Protected in Place: Backfill and compact under and around the utility so that no voids are left. Where utilities are concrete encased, use the alternative construction method (sand slurry) for backfill around the utility.
- B. Alternative Construction – Sand Slurry: Sand slurry consisting of one sack (94 pounds) of Portland cement per cubic yard of sand and sufficient moisture for workability may be required for backfill to aid in reducing compaction difficulties. Submit specific methods and procedures for review by the Engineer prior to construction.

3.3 ADJACENT UTILITIES

- A. Protect existing utilities from any disturbances and repair the lines and associated appurtenances if they are damaged in any way. All costs incurred for protection of utilities or any costs incurred due to the presence of the lines, whether or not they lie within the new construction, shall be borne in full by the Contractor.

****END OF SECTION****

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SECTION 01600 – MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Contractor shall make all arrangements for transportation, delivery and handling of equipment and materials required for prosecution and completion of the Work.
- B. Shipments of materials to Contractor or Subcontractors shall be delivered to the site only during regular working hours. Shipments shall be addressed and consigned to the proper party giving name of Project, street number and city. Shipments shall not be delivered to Owner except where otherwise directed.
- C. If necessary to move stored materials and equipment during construction, Contractor shall move or cause to be moved materials and equipment without any additional compensation.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01400 – Quality Control

1.3 PRODUCTS

- A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

1.4 DELIVERY

- A. Arrange deliveries of products in accord with construction schedules and in ample time to facilitate inspection prior to installation.
- B. Coordinate deliveries to avoid conflict with Work and conditions at site and to accommodate the following:
 - 1. Work of Owner.
 - 2. Limitations of storage space.
 - 3. Availability of equipment and personnel for handling products.
 - 4. Owner's use of premises.
- C. Do not have products delivered to project site until related Shop Drawings have been approved by the Engineer.
- D. Do not have products delivered to site until required storage facilities have been provided.
- E. Have products delivered to site in manufacturer's original, unopened, labeled containers. Keep Engineer informed of delivery of all equipment to be incorporated in the Work.
- F. Partial deliveries of component parts of equipment shall be clearly marked to

SECTION 01600 – MATERIALS AND EQUIPMENT

identify the equipment, to permit easy accumulation of parts and to facilitate assembly.

1. Immediately on delivery, inspect shipment to assure:
2. Product complies with requirements of Contract Documents and reviewed submittals.
3. Quantities are correct.
4. Containers and packages are intact, labels are legible.
5. Products are properly protected and undamaged.

1.5 PRODUCT STORAGE

- A. Store and protect materials in accordance with manufacturer's recommendations and requirements of the Contract Documents.
- B. Manufacturer's product containers shall not be opened until time of installation.
- C. Contractor shall make all arrangements and provisions necessary for the storage of materials and equipment. All excavated materials, construction equipment, and materials and equipment to be incorporated into the work shall be placed so as not to injure any part of the work or existing facilities, and so that free access can be maintained at all times to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly and compactly stored in locations that will cause a minimum of inconvenience to the Owner, other contractors, public travel, adjoining owners, tenants and occupants. Arrange storage in a manner to provide easy access for inspection.
- D. Any requested storage requested by the Contractor at District facilities shall be approved by the Owner.
- E. Materials and equipment shall be stored to facilitate inspection and to ensure preservation of the quality and fitness of the work, including proper protection against damage by freezing and moisture.
- F. Arrange storage to provide access for inspection and inventory control.
- G. Periodically inspect to ensure products are undamaged, and are maintained under required conditions.
- H. Maintain an inventory of materials stored to facilitate inspection and estimate progress payments for materials delivered but not yet installed.
- I. Store products in accordance with manufacturer's written instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's written instructions.
- J. Protect products against moisture, temperature extremes, dust, debris, tampering,

SECTION 01600 – MATERIALS AND EQUIPMENT

vandalism, ultraviolet radiation, or damage from improper handling, storage or exposure. Protect exposed metals from rust and corrosion even though they will be sandblasted or otherwise cleaned before painting.

- K. Products subject to damage by moisture, freezing, UV exposure, or other effects of the elements shall be stored inside weatherproof storage areas equipped with suitable temperature and moisture controls.
- L. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- M. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- N. If necessary to relocate stored materials and equipment prior to or during construction, Contractor shall move materials and equipment without any additional compensation.

1.6 PRODUCT HANDLING

- A. Provide equipment and personnel necessary to handle products, including those provided by Owner, by methods to prevent soiling or damage to products or packaging.
- B. Provide additional protection during handling as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.
- C. Handle products by methods to prevent bending or overstressing.
- D. Lift heavy components only at designated lifting points.
- E. Materials and equipment shall at all times be handled in a safe manner and as recommended by manufacturer or supplier so that no damage will occur to them. Do not drop, roll or skid products off delivery vehicles. Hand carry or use suitable materials handling equipment.

1.7 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

SECTION 01600 – MATERIALS AND EQUIPMENT

1.8 SUBSTITUTIONS

- A. Unless otherwise authorized in writing by the Engineer, the substantiation of offers of equivalency must be submitted within sixty (60) calendar days after Notice To Proceed. The Contractor's attention is further directed to the requirement that its failure to submit data substantiating a request for a substitution of an "equivalent" item within said 60-day period after the execution of the Agreement, shall be deemed to mean that the Contractor intends to furnish one of the specific brand-named products named in the specification, and the Contractor does hereby waive all rights to offer or use substitute products in each such case. Wherever a proposed substitute product has not been submitted within said 60-day period, or wherever the submission of a proposed substitute product fails to meet the requirements of the specifications and an acceptable resubmittal is not received by the Engineer within said 60-day period, the Contractor shall furnish only one of the products originally named in the Contract Documents.
- B. Items being submitted as an equivalent substitution shall be clearly identified as such in the proposed product list required to be submitted as specified in Section 01300.
- C. Substantiating data submittals for items being offered as an equivalent substitution shall conform in all respects to the requirements of Section 01300.
- D. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
- E. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- F. A request constitutes a representation that the Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Will provide the same warranty for the Substitution as for the specified Product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.
- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- H. Substitution Submittal Procedure:

SECTION 01600 – MATERIALS AND EQUIPMENT

1. Submit six copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
 3. The Engineer shall have sole discretion and will notify Contractor in writing of decision to accept or reject request.
- I. Substitutions will not be considered for equipment, material or methods not designated as allowing "Approved Equal" or "Or Equal" unless said equipment or material is no longer available.

****END OF SECTION****

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SECTION 01660 – SYSTEMS START-UP AND TESTING

PART 1 GENERAL

1.1 DESCRIPTION

- A. Starting Systems.
- B. Demonstration and instructions.
- C. Testing.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Record Drawings and Submittals
- B. Section 01400 – Quality Control
- C. Section 01700 – Project Closeout

1.3 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Engineer and Owner two(2) week's prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative and Contractor's personnel in accordance with manufacturer's instructions.
- G. The equipment, where specified in individual specification Sections, require the manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 01300 that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate operations and maintenance of Products to Owner's personnel two weeks prior to date of final inspection.
- B. Demonstration of the Project equipment and instruction shall be by a qualified manufacturer's representative who is knowledgeable about the Project.
- C. Utilize operation and maintenance manuals as basis for instruction. Review

SECTION 01660 – SYSTEMS START-UP AND TESTING

contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

- D. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

1.5 TESTING

- A. When any Work, equipment or materials is determined to be unsatisfactory, faulty or defective, or does not conform to the requirements of the Contract Documents the costs incurred by the Owner for additional testing shall be borne by the Contractor.
- B. Reports will be submitted to the Engineer indicating observations and results of tests and indicating compliance or noncompliance with the requirements of the Contract Documents.

****END OF SECTION****

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SECTION 01700 – PROJECT CLOSEOUT

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall thoroughly clean the project site upon completion of Work.
- B. The Contractor shall conduct Performance Tests for each element of the Work as described in the individual sections. Where no performance test is specified, the Contractor shall demonstrate satisfactory performance for a period of one week prior to final acceptance.
- C. The Contractor shall establish dates for equipment testing and acceptance periods. The times shall be within the Contract time.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Record Drawings and Submittals
- B. Section 01730 – Operation and Maintenance Data

1.3 TECHNICAL MANUAL SUBMITTALS

- A. The Contractor shall provide Technical Manuals in accordance with the Contract Documents at project close out.

1.4 FINAL SUBMITTALS

- A. The Contractor shall complete all the requirements of Section 01300. The Contractor, prior to requesting final payment, shall obtain and submit the following items to the Engineer:
- B. Written guarantees, where required.
- C. Operating manuals and instructions (three(3) sets of all documents per Facility Group), including:
 - 1. Water Treatment (DCMWTP)
 - 2. Distribution (PS's, PRS's and Reservoirs)
 - 3. Wastewater (4SWR and SPS's)
- D. Finalized copies of all:
 - 1. PLC programs and Release Notes
 - 2. OIT programs and Release Notes,
 - 3. HMI source files used for configuration, database and graphics imports, including Release Notes.
- E. Maintenance stock items; spare parts, special tools.

SECTION 01700 – PROJECT CLOSEOUT

- F. Completed record drawings, including electronic PDF and updated CAD Files.
- G. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

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SECTION 01730 – OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Contractor shall provide operation and maintenance data in the form of instructional manuals for use by the Owner's personnel for:
 - 1. All equipment and systems.
- B. Operation and Maintenance Data Manuals shall be submitted with last pay request.
- C. Definitions:
 - 1. Operation and Maintenance Data:
 - a. The term "operation and maintenance data" includes all product related information and documents which are required for preparation of the operation and maintenance manual. It also includes all data, which must accompany said manual as directed by current regulations of any participating government agency.
 - b. Required operation and maintenance data includes, but is not limited to, the following:
 - 1) Complete, detailed written operating instructions for each product or piece of equipment including: equipment function; operating characteristics; limiting conditions; operating instructions for startup, normal and emergency conditions; regulation and control; and shutdown.
 - 2) Complete, detailed written preventative maintenance instructions as defined below.
 - 3) Recommended spare parts lists and local sources of supply for parts.
 - 4) Written explanations of all safety considerations relating to operation and maintenance procedures.
 - 5) Name, address and phone number of manufacturer, manufacturer's local service representative, and Subcontractor or installer.
 - 6) Copy of all approved Shop Drawings and copy of warranty bond and service contract as applicable.
 - 2. Preventive Maintenance Instructions:
 - a. The term "preventive maintenance instructions" includes all information and instructions required to keep a product or piece of equipment properly lubricated, adjusted and maintained so that the item functions economically throughout its full design life.
 - b. Preventive maintenance instructions include, but are not limited to, the following:

SECTION 01730 – OPERATION AND MAINTENANCE DATA

- 1) A written explanation with illustrations for each preventive maintenance task.
- 2) Recommended schedule for execution of preventive maintenance tasks.
- 3) Lubrication charts.
- 4) Table of alternative lubricants.
- 5) Trouble shooting instructions.
- 6) List of required maintenance tools and equipment.

D. Submittals:

1. General: For each phase (1a, 1b, 2a, 2b), the Contractor shall submit the operations and maintenance data to the Engineer within 30 calendar days after approval of the final Shop Drawing, and ahead of startup for the designated phase.
2. Number of Copies: Operations and Maintenance Documents shall be submitted in the following Manner:
 - a. DRAFT Operation and Maintenance Documents in digital format
 - b. Three(3) hard-copy sets of all FINAL Operations and Maintenance documents organized per Facility Group, including:
 - 1) Water Treatment (DCMWTP)
 - 2) Distribution (PS's, PRS's and Reservoirs)
 - 3) Wastewater (4SWR and SPS's)
 - c. FINAL Operation and Maintenance Documents in electronic format
3. Letter of Transmittal: Provide a letter of transmittal with each submittal and include the following in the letter:
 - a. Date of submittal.
 - b. Contract title and number.
 - c. Contractor's name and address.
 - d. A list of the attachments and the Specification Sections to which they relate.
 - e. Reference to or explanation of related submittals already made or to be made at a future date.
4. Format Requirements:
 - a. The Contractor shall use 8-1/2 inch by 11-inch paper of high rag content and quality. Larger drawings or illustrations are acceptable if neatly folded to the specified size in a manner, which will permit easy unfolding without removal from the binder. Provide reinforced

SECTION 01730 – OPERATION AND MAINTENANCE DATA

punched binder tab. Or provide fly-leaf for each product.

- b. All text must be legible type-written or machine printed originals or high quality copies of same.
- c. Each page shall have a binding margin of approximately 1-1/2 inches and be punched for placement in a three ring looseleaf or triple post binder. Provide binders not less than one inch or more than 2-1/2 inches thick. Identify each binder on the spine and outside front cover with the following:
 - 1) Title "OPERATING AND MAINTENANCE INSTRUCTIONS".
 - 2) Title of Project.
 - 3) Identity of building, structure or area as applicable.
 - 4) Identity of general subject matter covered.
- d. The Contractor shall use dividers and typewritten indexed tabs between major categories of information such as operating instructions, preventive maintenance instructions, or other. When necessary, place each major category in a separate binder.
- e. The Contractor shall provide a table of contents for each binder.
- f. The Contractor shall identify products by their functional names in the table of contents and at least once in each chapter or Section. Thereafter, abbreviations and acronyms may be used if their meaning is explained in a table in the back of each binder. Use of model or catalog numbers or letters for identification is not acceptable.

****END OF SECTION****

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SECTION 16010 – ELECTRICAL BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic requirements for electrical systems.

1.2 SCOPE

- A. Division 16 requirements specified herein are only applicable to modifications and additions occurring as a result of installation related to the Olivenhain Municipal Water District (OMWD) Programmable Logic Controller (PLC) Replacement Project. All modifications shall be in accordance with existing site standards and classifications.
- B. Any electrical modifications occurring as a result of installation related to the Olivenhain Municipal Water District (OMWD) Programmable Logic Controller (PLC) Replacement Project, shall be:
 - 1. In accordance with existing site standards and classifications, and
 - 2. Documented in the project AS-BUILT documentation and drawings submitted by the Contractor.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - General Requirements.
- B. Section 16120 - Wire and Cable - 600 Volt and Below.
- C. Section 16130 - Raceways and Boxes.

1.4 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. Aluminum Association (AA).
- B. American Iron and Steel Institute (AISI).
- C. ASTM International (ASTM):
 - 1. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ETL Testing Laboratories (ETL).
- E. Institute of Electrical and Electronics Engineers/American National Standards Institute (IEEE/ANSI):

SECTION 16010 – ELECTRICAL BASIC REQUIREMENTS

- F. C2, National Electrical Safety Code (NESC).
- G. National Electrical Manufacturers Association (NEMA):
 - 1. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
- H. National Fire Protection Association (NFPA):
 - 1. 70, National Electrical Code (NEC).
- I. Underwriters Laboratories, Inc. (UL).
- J. Where Underwriters Laboratories, Inc. (UL) test procedures have been established for the product type, use UL or ETL Testing Laboratories (ETL) approved electrical equipment and provide with the UL or ETL label.

1.5 SUBMITTALS

- A. Shop Drawings:
 - 1. See Division 1 for requirements for the mechanics and administration of submittal process.
 - 2. See Division 1 and individual specification sections for submittal requirements for products defined as equipment.
 - 3. General Requirements:
 - a. Provide manufacturer's technical information on products to be used, including product descriptive bulletin.
 - b. Include data sheets that include manufacturer's name and product model number.
 - 1) Clearly identify all optional accessories.
 - 4. Acknowledgement that products are UL or ETL listed or are constructed utilizing UL or ETL recognized components.
 - 5. Manufacturer's delivery, storage, handling and installation instructions.
 - 6. Product installation details.
 - 7. See individual specification sections for any additional requirements.
- B. Operation and Maintenance Manuals:
 - 1. See Division 1 for requirements for:
 - a. The mechanics and administration of the submittal process.

SECTION 16010 – ELECTRICAL BASIC REQUIREMENTS

- b. The content process of Operation and Maintenance Manuals.
- C. When a Specification Section includes products specified in another Specification Section, each Section shall have the required Shop Drawing transmittal form per Division 1 and all Sections shall be submitted simultaneously.

1.6 DEFINITIONS

- A. For the purposes of providing materials and installing electrical work the following definitions shall be used.
 - 1. Outdoor Area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
 - 2. Architecturally Finished Interior Area: Offices, laboratories, conference rooms, restrooms, corridors and other similar occupied spaces.
 - 3. Non-Architecturally Finished Interior Area: Pump, mechanical, electrical rooms and other similar process type rooms.
 - 4. Highly Corrosive and Corrosive Area: Areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.
 - 5. Hazardous Areas: Class I, II or III areas as defined in NFPA 70 (NEC) and NFPA 820.
 - 6. Shop Fabricated: Manufactured or assembled equipment for which a UL test procedure has not been established.

1.7 DELIVERY, STORAGE AND HANDLING

- A. See Division 1.
- B. Protect nameplates on electrical equipment to prevent defacing.

1.8 AREA DESIGNATIONS

- A. Designation of an area will determine the NEMA rating of the electrical equipment enclosures, types of conduits and installation methods to be used in that area.
 - 1. Outdoor Areas:
 - a. Wet.
 - b. Also, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.
 - 2. Indoor Areas:

SECTION 16010 – ELECTRICAL BASIC REQUIREMENTS

- a. Dry.
- b. Also, wet, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Refer to specific Division 16 sections and specific material paragraphs below.
- B. Provide all components of a similar type by one (1) manufacturer.

2.2 MATERIALS

- A. Electrical Equipment Support Pedestals and/or Racks:
 - 1. Approved Manufacturers:
 - a. Modular Strut:
 - 1) Unistrut Building Systems.
 - 2) B-Line.
 - 3) OCAL.
 - 2. Material Requirements:
 - a. Modular Strut:
 - 1) Stainless steel: AISI Type 316.
 - 2) PVC coated galvanized steel: ASTM A123 or ASTM A153 and 20 mil PVC coating.
 - b. Mounting Hardware:
 - 1) Stainless steel.
 - 2) OCAL.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install and wire all equipment, including pre-purchased equipment, and perform all tests necessary to assure conformance to the Drawings and Specifications and ensure that equipment is ready and safe for energization.
- B. Install equipment in accordance with the requirements of:
 - 1. NFPA 70 (NEC).

SECTION 16010 – ELECTRICAL BASIC REQUIREMENTS

2. IEEE/ANSI C2.
 3. The manufacturer's instructions.
- C. In general, conduit routing is not shown on the Drawings.
1. The Contractor is responsible for routing all conduits including those shown on one-line and control block diagrams and home runs shown on floor plans.
 2. Conduit routings and stub-up locations that are shown are approximate; exact routing to be as required for equipment furnished and field conditions.
- D. When complete branch circuiting is not shown on the Drawings:
1. A homerun indicating panelboard name and circuit number will be shown and the circuit number will be shown adjacent to the additional devices (e.g., light fixture and receptacles) on the same circuit.
 2. The Contractor is to furnish and install all conduit and conductors required for proper operation of the circuit.
 3. The indicated home run conduit and conductor size shall be used for the entire branch circuit.
 4. See Section 16120 for combining multiple branch circuits in a common conduit.
- E. Do not use equipment that exceed dimensions or reduce clearances indicated on the Drawings or as required by the NFPA 70 (NEC).
- F. Install equipment plumb, square and true with construction features and securely fastened.
- G. Install electrical equipment, including pull and junction boxes, minimum of 6-inches from process, gas, air and water piping and equipment.
- H. Install equipment so it is readily accessible for operation and maintenance, is not blocked or concealed and does not interfere with normal operating and maintenance requirements of other equipment.
- I. Device Mounting Schedule:
1. Unless indicated otherwise on the Drawings, mounting heights are as indicated below:
 - a. Light switch (to center): 48 IN.
 - b. Receptacle in architecturally finished areas (to center): 18 IN.
 - c. Receptacle on exterior wall of building (to center): 18 IN.

SECTION 16010 – ELECTRICAL BASIC REQUIREMENTS

- d. Receptacle in non-architecturally finished areas (to center): 48 IN.
 - e. Telephone outlet in architecturally finished areas (to center): 18 IN.
 - f. Telephone outlet for wall-mounted phone (to center): 54 IN.
 - g. Safety switch (to center of operating handle): 54 IN.
 - h. Separately mounted motor starter (to center of operating handle): 54 IN.
 - i. Pushbutton or selector switch control station (to center): 48 IN.
 - j. Panelboard (to top): 72 IN.
- J. Avoid interference of electrical equipment operation and maintenance with structural members, building features and equipment of other trades.
1. When it is necessary to adjust the intended location of electrical equipment, unless specifically dimensioned or detailed, the Contractor may make adjustments in equipment locations in accordance with the following without obtaining the Engineer's approval:
- a. 1 FT at grade, floor and roof level in any direction in the horizontal plane.
 - b. 1 FT for equipment other than lighting at ceiling level in any direction in the horizontal plane.
 - c. 1 FT for lighting fixtures at ceiling level in any direction in the horizontal plane.
 - d. 1 FT on walls in a horizontal direction within the vertical plane.
 - e. Changes in equipment location exceeding those defined above require the Engineer's approval.
- K. Provide electrical equipment support system per the following area designations:
1. All Areas:
- a. 316 Stainless steel system consisting of stainless steel channels and fittings, nuts and hardware.
- L. Provide all necessary anchoring devices and supports rated for the equipment load based on dimensions and weights verified from approved submittals, or as recommended by the manufacturer.
1. Do not cut, or weld to, building structural members.

SECTION 16010 – ELECTRICAL BASIC REQUIREMENTS

2. Do not mount safety switches or other equipment to equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.
- M. Provide corrosion resistant spacers to maintain 1/4 IN separation between metallic equipment and/or metallic equipment supports and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as Basins, Clarifiers, Digesters, Reservoirs, etc.
- N. Do not place equipment fabricated from aluminum in direct contact with earth or concrete.
- O. Screen or seal all openings into equipment mounted outdoors to prevent the entrance of rodents and insects.
- P. Do not use materials that may cause the walls or roof of a building to discolor or rust.
- Q. Identify electrical equipment and components.

3.2 FIELD QUALITY CONTROL

- A. Verify exact rough-in location and dimensions for connection to electrified equipment, provided by others.
 1. See Division 1 for openings and penetrations in structures.
- B. Replace equipment and systems found inoperative or defective and re-test.
- C. Cleaning:
 1. See Division 1.
- D. The protective coating integrity of support structures and equipment enclosures shall be maintained.
 1. Repair field damaged galvanized components utilizing a zinc rich paint.
 2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
 3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the component.
 4. Repair surfaces which will be inaccessible after installation prior to installation.
 5. See Section 16130 for requirements for conduits and associated accessories.
- E. Replace nameplates damaged during installation.

SECTION 16010 – ELECTRICAL BASIC REQUIREMENTS

3.3 DEMONSTRATION

- A. Demonstrate equipment in accordance with Division 1.

3.4 PROTECTIVE DEVICE COORDINATION

- A. Provide system coordination of the protective devices furnished on this project. The protective device on the line side closest to the fault or abnormal conditions shall isolate the problem portion of the system and minimize damage in that portion. The rest of the system shall be maintained in normal service. The coordination shall be in conformance with the recommendations of latest IEEE Standard 242.
- B. Submit the analysis that shall include impedance and short circuit calculations, list of any assumptions made in the analysis, the recommended settings of the protective devices, and the system time/current characteristic curves. The submittal shall be made so as to allow time for review and resubmittal, if necessary, before the implementation of final settings and adjustments.

****END OF SECTION****

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SECTION 16060 – GROUNDING

PART 1 PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Material and installation requirements for grounding system(s).

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - General Requirements.
- B. Section 16010 - Electrical: Basic Requirements.
- C. Section 16120 - Wire and Cable - 600 Volt and Below.
- D. Section 16130 - Raceways and Boxes.

1.3 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. Standard Specification for Highway Bridges.
- B. ASTM International (ASTM):
 - 1. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- C. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. 837, Qualifying Permanent Connections Used in Substation Grounding.
- D. National Fire Protection Association (NFPA):
 - 1. 70, National Electrical Code (NEC).
- E. Underwriters Laboratories, Inc. (UL):
 - 1. 467, Standard for Safety Electrical Grounding and Bonding Equipment.
- F. Assure ground continuity is continuous throughout the entire Project.

1.4 SUBMITTALS

- A. Shop Drawings
 - 1. Product Technical Data
 - a. Provide submittal data for all products specified in PART 2 of this Specification except:

SECTION 16060 – GROUNDING

- 1) Grounding clamps, terminals and connectors.
- 2) Exothermic welding system.

2. See Section 16010 for additional requirements.

1.5 WORK PAYMENT

- A. Payment for the Work in this section shall be included as part of the lump-sum or unit-price bid amount for which such Work is appurtenant thereto, including all Work and materials specified herein and as may be required to complete this portion of the Work.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Ground Rods and Bars and Grounding Clamps, Connectors and Terminals:
 - a. Burndy.
 - b. Harger Lightning Protection.
 - c. Heary Brothers.
 - d. Joslyn.
 - e. Robbins Lightning Protection.
 - f. Thomas & Betts (Blackburn).
 - g. Thompson.
 - h. Or equal.
 2. Exothermic Weld Connections:
 - a. Erico Products Inc., Cadweld.
 - b. Harger Lightning Protection.
 - c. Thermoweld.
 - d. Or equal.
 3. Prefabricated Composite Test Stations:
 - a. Quazite Composolite.

SECTION 16060 – GROUNDING

- b. Armorcast Products Company.
- c. Or equal.

2.2 COMPONENTS

- A. Wire and Cable:
 - 1. Bare Conductors: Soft drawn stranded copper meeting ASTM B8.
 - 2. Insulated Conductors: Color coded green, per Section 16120.
- B. Conduit: As specified in Section 16130.
- C. Ground Bars:
 - 1. Solid Copper:
 - a. 1/4 inch thick.
 - b. 2 or 4 inch wide.
 - c. 24 inch long minimum in main service entrance electrical rooms, 12 inch long elsewhere.
 - 2. Predrilled grounding lug mounting holes.
 - 3. Stainless steel or galvanized steel mounting brackets.
 - 4. Insulated standoffs.
- D. Ground Rods:
 - 1. 3/4 inch x 10 FT, or as indicated on the Drawings.
 - 2. Copperclad:
 - a. Heavy uniform coating of electrolytic copper molecularly bonded to a rigid steel core.
 - b. Corrosion resistant bond between the copper and steel.
 - c. Hard drawn for a scar-resistant surface.
- E. Exothermic Weld Connections:
 - 1. Copper oxide reduction by aluminum process.
 - 2. Molds properly sized for each application.

SECTION 16060 – GROUNDING

F. Prefabricated Composite Material Test Stations:

1. Fiberglass reinforced polymer concrete.
2. Body and cover shall sustain a minimum vertical load test of 22,000 LBS over a 10 inch square or be H-20 rated per AASHTO.
3. Size: 12 inch round or 12 inch square.
4. Open bottom.
5. Stackable design as required for specified depth.
6. Engrave cover with the word "GROUND".

PART 3 PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install products in accordance with manufacturer's instructions.
2. Size grounding conductors and bonding jumpers in accordance with NFPA 70 Article 250, except where larger sizes are indicated on the Drawings.
3. Remove paint, rust, or other nonconducting material from contact surfaces before making ground connections.
4. Where ground conductors pass through floor slabs or building walls provide non-metallic sleeves.
5. Do not splice grounding conductors except at ground rods.
6. Install ground rods and grounding conductors in undisturbed, firm soil.
 - a. Provide excavation required for installation of ground rods and ground conductors.
 - b. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
 - c. Unless otherwise specified, connect conductors to ground rods with exothermic weld.
 - d. Provide sufficient slack in grounding conductor to prevent conductor breakage during backfill or due to ground movement.
 - e. Backfill excavation completely, thoroughly tamping to provide good contact between backfill materials and ground rods and conductors.
7. Do not use exothermic welding if it will damage the structure the grounding

SECTION 16060 – GROUNDING

conductor is being welded to.

B. Grounding Electrode System:

1. Provide a grounding electrode system in accordance with NFPA 70 Article 250 and as indicated on the Drawings.
2. Grounding Conductor Terminations:
 - a. Ground bars mounted on wall, use compression type terminal and bolt it to the ground bar with two bolts.
 - b. Ground bars in electrical equipment, use compression type terminal and bolt it to the ground bar.
 - c. Grounding Conductor: Bare conductor, size as indicated on the Drawings.

C. Raceway Bonding/Grounding:

1. All metallic conduit shall be installed so that it is electrically continuous.
2. All conduits to contain a grounding conductor with insulation identical to the phase conductors, unless otherwise indicated on the Drawings.
3. NFPA 70 required grounding bushings shall be of the insulating type.
4. Provide Myers hubs for conduits that terminate in devices or panels that are not threaded.
5. Bond all conduit, at entrance and exit of equipment, to the equipment ground bus or lug.
6. Provide bonding jumpers if conduits are installed in concentric knockouts.
7. Make all metallic raceway fittings and grounding clamps tight to ensure equipment grounding system will operate continuously at ground potential to provide low impedance current path for proper operation of overcurrent devices during possible ground fault conditions.

D. Equipment Grounding:

1. All utilization equipment shall be grounded with an equipment ground conductor.

SECTION 16060 – GROUNDING

3.2 FIELD QUALITY CONTROL

- A. Leave grounding system uncovered until observed by Engineer or Owner Representative.

****END OF SECTION****

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SECTION 16120 – WIRE AND CABLE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Building wire.
 - b. Power cable.
 - c. Control cable.
 - d. Instrumentation cable.
 - e. Wire connectors.
 - f. Insulating tape.
 - g. Pulling lubricant.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - General Requirements.
- B. Section 16010 - Electrical: Basic Requirements.

1.3 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. National Electrical Manufacturers Association (NEMA):
 - 1. ICS 4, Industrial Control and Systems: Terminal Blocks.
- B. National Electrical Manufacturers Association/Insulated Cable Engineers Association (NEMA/ICEA):
 - 1. WC 57/S-73-532, Standard for Control Cables.
- C. National Fire Protection Association (NFPA):
 - 1. 70, National Electrical Code (NEC).
- D. Underwriters Laboratories, Inc. (UL):
 - 1. 44, Standard for Safety Thermoset-Insulated Wires and Cables.
 - 2. 83, Standard for Safety Thermoplastic-Insulated Wires and Cables.
 - 3. 467, Standard for Safety Grounding and Bonding Equipment.
 - 4. 486A, Standard for Safety Wire Connectors and Soldering Lugs for use

SECTION 16120 – WIRE AND CABLE

with Copper Conductors.

5. 486C, Standard for Safety Splicing Wire Connections.
6. 510, Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
7. 1581, Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords.
8. 2250, Standard for Safety Instrumentation Tray Cable.

1.4 SUBMITTALS

A. Shop Drawings:

1. Product technical data:
 - a. Provide submittal data for all products specified in Part 2 of this specification except:
 - 1) Wire connectors.
 - 2) Insulating tape.
 - 3) Cable lubricant.
 - b. See Section 16010 for additional requirements.

1.5 DEFINITIONS

- A. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire. All cable shall be 600 volt rated.
- B. Instrumentation Cable:
 1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.
 2. The following are specific types of instrumentation cables:
 - a. Analog signal cable:
 - 1) Used for the transmission of low current (e.g., 4-20mA DC) or low voltage (e.g., 0-10 Vdc) signals, using No. 16 AWG and smaller conductors.
 - 2) Commonly used types are defined in the following:
 - a) TSP: Twisted shielded pair. #18 AWG minimum size.
 - b) TST: Twisted shielded triad. #18 AWG minimum size.

SECTION 16120 – WIRE AND CABLE

- b. Digital signal cable: Used for the transmission of digital signals between computers, PLC's, RTU's, etc.
- c. Building Wire: Single conductor, insulated, with or without outer jacket depending upon type.

1.6 DELIVERY, STORAGE AND HANDLING

- A. See Section 16010.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Building wire, power and control cable and multiplex cable:
 - a. American Insulated Wire Corporation.
 - b. General Cable.
 - c. Southwire Company.
 - 2. Instrumentation cable:
 - a. Analog cable:
 - 1) Alpha Wire Corporation.
 - 2) American Insulated Wire Corporation.
 - 3) Belden CDT Inc.
 - 3. Wire connectors:
 - a. Burndy Corporation.
 - b. Buchanan.
 - c. Thomas and Betts.
 - 4. Insulating and color coding tape:
 - a. 3M Co.
 - b. Plymouth Bishop Tapes.
 - c. Red Seal Electric Co.
- B. Submit request for substitution in accordance with Division 1.

SECTION 16120 – WIRE AND CABLE

2.2 MANUFACTURED UNITS

A. Building Wire:

1. Conductor shall be copper with 600 V rated insulation.
2. Conductors shall be stranded, except for conductors used in lighting and receptacle circuits which may be stranded or solid.
3. Surface mark with manufacturers name or trademark, conductor size, insulation type and UL label.
4. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 for type XHHW-2 insulation.

B. Power Cable:

1. Conductor shall be copper with 600 V rated insulation.
2. Surface mark with manufacturers name or trademark, conductor size, insulation type and UL label.
3. Conform to NEMA/ICEA WC 70/S-95-658 and UL 83 and UL 1277 for type XHHW-2 insulation with an overall PVC jacket.
4. Number of conductors as required, including a bare ground conductor.
5. Individual conductor color coding:
 - a. ICEA Method 4.
 - b. See Part 3 of this specification for additional requirements.
6. Conform to NFPA 70 Type TC {and IEEE/ANSI 1202 or CSA FT-4}.

C. Control Cable:

1. Conductor shall be copper with 600 V rated insulation.
2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
3. Conform to NEMA/ICEA WC 57/S-73-532 and UL 83 and UL 1277 for type THHN/THWN insulation with an overall PVC jacket.
4. Number of conductors as required, provided with insulated ground conductor of the same AWG size.
5. Individual conductor color coding:

SECTION 16120 – WIRE AND CABLE

- a. NEMA/ICEA Method 1, Table E-2.
 - b. See Part 3 of this Specification for additional requirements.
- 6. Conform to NFPA 70 Type TC.
- D. Electrical Equipment Control Wire:
 - 1. Conductor shall be copper with 600 V rated insulation.
 - 2. Conductors shall be stranded
 - 3. Surface mark with manufacturers name or trademark, conductor size, insulation type and UL label.
 - 4. Conform to UL 44 for Type SIS insulation.
 - 5. Conform to UL 83 for Type MTW insulation.
- E. Instrumentation Cable:
 - 1. Surface mark with manufacturers name or trademark, conductor size, insulation type and UL label.
 - 2. Analog cable:
 - a. Tinned copper conductors, #18 AWG minimum.
 - b. 600 V PVC insulation with PVC jacket.
 - c. Individually and overall shields. Twisted with 100 percent foil shield coverage with drain wire.
 - d. Six (6) twists per foot minimum.
 - e. Individual conductor color coding: ICEA Method 1, Table K-2.
 - f. Conform to UL 2250, UL 1581 and NFPA 70 Type ITC.
 - 3. Digital cable:
 - a. As recommended by equipment (e.g., PLC, RTU) manufacturer.
 - b. Conform to UL 910 and NFPA 70 Type ITC.
- F. Wire Connectors:
 - 1. Twist/screw on type:
 - a. Insulated pressure or spring type solderless connector.

SECTION 16120 – WIRE AND CABLE

- b. 600 V rated.
 - c. Ground conductors: Conform to UL 486C and/or UL 467 when required by local codes.
 - d. Phase and neutral conductors: Conform to UL 486C.
- 2. Compression and mechanical screw type:
 - a. 600 V rated.
 - b. Ground conductors: Conform to UL 467.
 - c. Phase and neutral conductors: Conform to UL 486A.
- 3. Terminal block type:
 - a. High density, screw-post barrier-type with white center marker strip.
 - b. 600 V and ampere rating as required, for power circuits.
 - c. 600 V, 20 ampere rated for control circuits.
 - d. 300 V, 15 ampere rated for instrumentation circuits.
 - e. Conform to NEMA ICS 4 and UL 486A.
- G. Insulating and Color Coding Tape:
 - 1. Pressure sensitive vinyl.
 - 2. Premium grade.
 - 3. Heat, cold, moisture, and sunlight resistant.
 - 4. Thickness, depending on use conditions: 7, 8.5, or 10 mil.
 - 5. For cold weather or outdoor location, tape must also be all-weather.
 - 6. Color:
 - a. Insulating tape: Black.
 - b. Color coding tape: Fade-resistant color as specified herein.
 - 7. Comply with UL 510.
- H. Pulling Lubricant: Cable manufacturer's standard containing no petroleum or other products which will deteriorate insulation.

PART 3 PART 3 - EXECUTION

SECTION 16120 – WIRE AND CABLE

3.1 INSTALLATION

A. Permitted Usage of Insulation Types:

1. Type XHHW-2:
 - a. Building wire and power and control cable in architectural and non-architectural finished areas.
 - b. Building wire and power and control cable in conduit below grade.
2. Type SIS and MTW:
 - a. For the wiring of control equipment within control panels and field wiring of control equipment within switchgear, switchboards, motor control centers.

B. Conductor Size Limitations:

1. Feeder and branch power conductors shall not be smaller than No. 12 AWG unless otherwise indicated on the Drawings.
2. Control conductors shall not be smaller than No. 14 AWG unless otherwise indicated on the Drawings.
3. Instrumentation conductors shall not be smaller than No. 18 AWG unless otherwise indicated on the Drawings.

C. Color Code All Wiring as Follows:

1. Building wire:

	240 V, 208 V, 240/120 V, 208/120 V	480 V, 480/277 V
Phase 1	Black	Brown
Phase 2	Red*	Orange
Phase 3	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green
<i>* Orange when it is a high leg of a 120/240 V Delta system.</i>		

- a. Conductors No. 6 AWG and smaller: Insulated phase, neutral and ground conductors shall be identified by a continuous colored outer finish along its entire length.
- b. Conductors larger than No. 6 AWG:

SECTION 16120 – WIRE AND CABLE

- 1) Insulated phase and neutral conductors shall be identified by one (1) of the following methods:
 - a) Continuous colored outer finish along its entire length.
 - b) 3 IN of colored tape applied at the termination.
 - 2) Insulated grounding conductor shall be identified by the following method:
 - a) Continuous green outer finish along its entire length.
 - 3) The color coding shall be applied at all accessible locations, including but not limited to: Junction and pull boxes, wireways, manholes and handholes.
2. Power cables ICEA Method 4 with:
- a. Phase and neutral conductors identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
 - b. Ground conductor: Green insulation the entire length.
3. Control cables NEMA/ICEA Method 1, Table E-2:
- a. When used in power applications the colored insulated conductors used as phase and neutral conductors may have to be re-identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
- D. Install all wiring in raceway unless otherwise indicated on the Drawings.
- E. Feeder, branch, control and instrumentation circuits shall not be combined in a raceway, cable tray, junction or pull box, except as permitted in the following:
1. Where specifically indicated on the Drawings.
 2. Where field conditions dictate and written permission is obtained from the Engineer.
 3. Control circuits shall be isolated from feeder and branch power and instrumentation circuits but combining of control circuits is permitted.
 - a. The combinations shall comply with the following:
 - 1) 12 Vdc, 24 Vdc and 48 Vdc may be combined.
 - 2) 125 Vdc shall be isolated from all other AC and DC circuits.
 - 3) AC control circuits shall be isolated from all DC circuits.

SECTION 16120 – WIRE AND CABLE

4. Instrumentation circuits shall be isolated from feeder and branch power and control circuits but combining of instrumentation circuits is permitted. Except for manufacture instrument cables, each instrument shall have their own raceways. For example, cable from instrument sensor to its associated transmitter.
 - a. The combinations shall comply with the following:
 - 1) Analog signal circuits may be combined.
 - 2) Digital signal circuits may be combined but isolated from analog signal circuits.
5. Multiple branch circuits for lighting, receptacle and other 120 Vac circuits are allowed to be combined into a common raceway.
 - a. Contractor is responsible for making the required adjustments in conductor and raceway size, in accordance with all requirements of the NEC, including but not limited to:
 - 1) Up sizing conductor size for required ampacity de-ratings for the number of current carrying conductors in the raceway.
 - 2) The neutral conductor may be shared on sequential circuits (e.g., circuit numbers 1, 3, 5).
 - 3) Up sizing raceway size for the size and quantity of conductors.
- F. Ground the drain wire of shielded instrumentation cables at one (1) end only.
 1. The preferred grounding location is at the load (e.g., control panel), not at the source (e.g., field mounted instrument).
- G. Splices and terminations for the following circuit types shall be made in the indicated enclosure type using the indicated method.
 1. Feeder and branch power circuits:
 - a. Device outlet boxes:
 - 1) Twist/screw on type connectors.
 - b. Junction and pull boxes and wireways:
 - 1) Twist/screw on type connectors for use on No. 8 and smaller wire.
 - 2) Compression, mechanical screw or terminal block or terminal strip type connectors for use on No. 6 AWG and larger wire.
 - c. Motor terminal boxes:
 - 1) Compression lugs taped first with 3M Cambric tape, or equal, followed by rubber splicing tape, followed by vinyl

SECTION 16120 – WIRE AND CABLE

electric tape, or by means approved by the motor manufacturer.

d. Manholes or handholes:

- 1) Twist/screw on type connectors pre-filled with epoxy for use on No. 8 AWG and smaller wire.
- 2) Watertight compression or mechanical screw type connectors for use on No. 6 AWG and larger wire. All splices shall be submersible.

2. Control Circuits:

- a. Junction and pull boxes: Terminal block type connector.
- b. Manholes or handholes: Twist/screw on type connectors pre-filled with epoxy.
- c. Control panels and motor control centers: Terminal block or strips provided within the equipment or field installed within the equipment by the Contractor.

3. Instrumentation circuits can be spliced where field conditions dictate and written permission is obtained from the Engineer.

- a. Maintain electrical continuity of the shield when splicing twisted shielded conductors.
- b. Junction and pull boxes: Terminal block type connector.
- c. Control panels and motor control centers: Terminal block or strip provided within the equipment or field installed within the equipment by the Contractor.

4. Non-insulated compression and mechanical screw type connectors shall be insulated with tape or hot or cold shrink type insulation to the insulation level of the conductors.

H. Insulating Tape Usage:

1. For insulating connections of No. 8 AWG wire and smaller: 7 mil vinyl tape.
2. For insulating splices and taps of No. 6 AWG wire or larger: 10 mil vinyl tape.
3. For insulating connections made in cold weather or in outdoor locations: 8.5 mil, all weather vinyl tape.

I. Color Coding Tape Usage: For color coding of conductors.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing:

SECTION 16120 – WIRE AND CABLE

1. All Wire and Cable Modifications to be verified by Engineer or Owner Representative.

****END OF SECTION****

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SECTION 16130 – RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Conduits.
 - b. Conduit fittings.
 - c. Conduit supports.
 - d. Wireways.
 - e. Outlet boxes.
 - f. Pull and junction boxes.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - General Requirements.
- B. Section 16010 - Basic Electrical Requirements.
- C. Section 16140 - Wiring Devices.

1.3 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. American Iron and Steel Institute (AISI).
- B. ASTM International (ASTM):
 - 1. D2564, Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- C. National Electrical Manufacturers Association (NEMA):
 - 1. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. RN 1, Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 3. TC 3, PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- D. National Fire Protection Association (NFPA):
 - 1. 70, National Electrical Code (NEC).
- E. Underwriters Laboratories, Inc. (UL):

SECTION 16130 – RACEWAYS AND BOXES

1. 1, Standard for Safety Flexible Metal Conduit.
2. 6, Standard for Safety Rigid Metal Conduit.
3. 50, Standard for Safety Enclosures for Electrical Equipment.
4. 360, Standard for Safety Liquid-Tight Flexible Steel Conduit.
5. 467, Standard for Safety Grounding and Bonding Equipment.
6. 514A, Standard for Safety Metallic Outlet Boxes.
7. 514B, Standard for Safety Fittings for Cable and Conduit.
8. 651, Standard for Safety Schedule 40 and 80 Rigid PVC Conduit.
9. 870, Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings.
10. 886, Standard for Safety Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

1.4 SUBMITTALS

- A. Shop Drawings:
 1. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification except:
 - 1) Conduit fittings.
 - 2) Support systems.
 - b. See Section 16010 for additional requirements.
 2. Fabrication and/or layout drawings:
 - a. Identify dimensional size of pull and junction boxes to be used.

1.5 DELIVERY, STORAGE AND HANDLING

- A. See Section 16010.

PART 2 PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. PVC coated rigid metallic conduits and repair kits:

SECTION 16130 – RACEWAYS AND BOXES

- a. Occidental Coating Company.
- b. Rob-Roy Ind.
- c. OCAL
- 2. Rigid non-metallic conduit:
 - a. Carlon.
 - b. Cantex.
- 3. Flexible conduit:
 - a. AFC Cable Systems.
 - b. Anamet, Inc.
 - c. Electri-Flex.
- 4. Wireway:
 - a. Hoffman Engineering Company.
- 5. Conduit fittings and accessories:
 - a. OCAL.
- 6. Support systems:
 - a. Unistrut Building Systems (316 stainless steel).
 - b. OCAL.
- 7. Outlet, pull and junction boxes:
 - a. OCAL.

2.2 RIGID METALLIC CONDUITS

- A. PVC-Coated Rigid Steel Conduit (PVC-RGS):
 - 1. Nominal 40 mil Polyvinyl Chloride Exterior Coating:
 - a. Coating: Bonded to hot-dipped galvanized rigid steel conduit conforming to NEMA/ANSI C80.1.
 - b. The bond between the PVC coating and the conduit surface: Greater than the tensile strength of the coating.
 - 2. Nominal 2 mil, minimum, urethane interior coating.

SECTION 16130 – RACEWAYS AND BOXES

3. Urethane coating on threads.
4. Conduit: Epoxy prime coated prior to application of PVC and urethane coatings.
5. Female Ends:
 - a. Have a plastic sleeve extending a minimum of 1 pipe diameter or 2 IN, whichever is less beyond the opening.
 - b. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used with it.
6. Standards: NEMA/ANSI C80.1, UL 6, NEMA RN 1.

2.3 RIGID NON-METALLIC CONDUIT

- A. Schedules 80 (PVC-80), or Schedule 40 (PVC-40) at the direction of the Engineer:
 1. Polyvinyl-chloride (PVC) plastic compound which includes inert modifiers to improve weatherability and heat distribution.
 2. Rated for direct sunlight exposure.
 3. Fire retardant and low smoke emission.
 4. Shall be suitable for use with 90 DegC wire and shall be marked "maximum 90 Deg C".
 5. Standards: NEMA TC 2, UL 651.

2.4 FLEXIBLE CONDUIT

- A. PVC-Coated Flexible Galvanized Steel (liquid-tight) Conduit (FLEX-LT):
 1. Core formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked. $\frac{3}{4}$ -inch minimum size.
 2. Extruded PVC outer jacket positively locked to the steel core.
 3. Liquid and vaportight.
 4. Standard: UL 360.

2.5 WIREWAY

- A. Watertight (NEMA 4X rated) Wireway:
 1. 14 GA Type 316 stainless steel bodies and covers without knockouts and 10 GA stainless steel flanges.
 2. Cover: Fully gasketed and held in place with captive clamp type latches.

SECTION 16130 – RACEWAYS AND BOXES

3. Flanges: Fully gasketed and bolted.

2.6 CONDUIT FITTINGS AND ACCESSORIES

A. Fittings for Use with PVC-RGS:

1. General:
 - a. In hazardous locations listed for use in Class I, Division 2, Groups C and D locations.
2. Hubs: Threaded, insulated and gasketed metallic for raintight connection. 316 Stainless steel or PVC coated.
3. Unions: Threaded PVC coated, galvanized steel or zinc plated malleable iron.
4. Conduit bodies (ells and tees):
 - a. Body: PVC coated with threaded hubs.
 - b. Standard and mogul size.
 - c. Cover:
 - 1) PVC coated, clip-on type with 316 stainless steel screws.
5. Conduit bodies (round):
 - a. Body: PVC coated with threaded hubs.
 - b. Cover: Threaded screw on type, PVC coated.
6. Sealing fittings:
 - a. Body: PVC coated.
 - b. Standard and mogul size.
 - c. With or without drain and breather.
 - d. Fiber and sealing compound: UL listed for use with the sealing fitting.

B. Fittings for Use with FLEX-LT:

1. Connector:
 - a. Straight or angle type.
 - b. PVC coated, insulated and gasketed.
 - c. Composed of locknut, grounding ferrule and gland compression

SECTION 16130 – RACEWAYS AND BOXES

nut.

d. Liquid tight.

2. Standards: UL 467, UL 514B.

C. Fittings for Use with Rigid Non-Metallic PVC Conduit:

1. Coupling, adapters and conduit bodies:

a. Same material, thickness, and construction as the conduits with which they are used.

b. Homogeneous plastic free from visible cracks, holes or foreign inclusions.

c. Bore smooth and free of blisters, nicks or other imperfections which could damage the conductor.

2. Solvent cement for welding fittings shall be supplied by the same manufacturer as the conduit and fittings.

3. Standards: ASTM D2564, NEMA TC 3, UL 651, UL 514B.

D. Weather and Corrosion Protection Tape:

1. PVC based tape, 10 mils thick.

2. Protection against moisture, acids, alkalis, salts and sewage and suitable for direct bury.

3. Used with appropriate pipe primer.

2.7 ALL RACEWAY AND FITTINGS

A. Mark Products:

1. Identify the nominal trade size on the product.

2. Stamp with the name or trademark of the manufacturer.

2.8 OUTLET BOXES

A. Cast Outlet Boxes:

1. Threaded hubs and grounding screw. Minimum requirement of 3 hub boxes.

2. Styles:

a. or “FD”

b. “Bell”

SECTION 16130 – RACEWAYS AND BOXES

- c. Single or multiple gang and tandem
 - d. “EDS” or for hazardous locations
- 3. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.
- 4. Standards: UL 514A, UL 886.
- B. See Section 16140 for wiring devices, wallplates and coverplates.

2.9 PULL AND JUNCTION BOXES

- A. NEMA 4X Rated (metallic):
 - Body and Cover: 14 GA Type 316 stainless steel
 - Seam continuously welded and ground smooth
 - No knockouts
 - External mounting flanges
 - Hinged door and 316 stainless steel screws and clamps
 - Door with oil-resistant gasket
- B. NEMA 7 and 9 Rated:
 - 1. Cast gray iron alloy or copper-free aluminum with manufacturers standard finish.
 - 2. Drilled and tapped openings or tapered threaded hub.
 - 3. Cover bolted-down with 316 stainless steel bolts or threaded cover with neoprene gasket.
 - 4. External mounting flanges.
 - 5. Grounding lug.
 - 6. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.
- C. Miscellaneous Accessories:
 - 1. Rigid handles for covers larger than 9 SF or heavier than 25 LBS.
 - 2. Split covers when heavier than 25 LBS.
 - 3. Weldnuts for mounting optional panels and terminal kits.
 - 4. Terminal blocks: Screw-post barrier-type, rated 600 volt and 20 ampere minimum.
- D. Standards: NEMA 250, UL 50.

2.10 SUPPORT SYSTEMS

SECTION 16130 – RACEWAYS AND BOXES

- A. Multi-conduit Surface or Trapeze Type Support and Pull or Junction Box Supports:
 - 1. Material requirements:
 - a. Stainless steel: AISI Type 316.
- B. Single Conduit and Outlet Box Support Fasteners:
 - 1. Material requirements:
 - a. 316 Stainless steel.
 - b. PVC coat malleable iron or steel: 20 mil PVC coating.

PART 3 EXECUTION

3.1 RACEWAY INSTALLATION – GENERAL

- A. Shall be in accordance with the requirements of:
 - 1. NFPA 70.
 - 2. Manufacturer instructions.
- B. Size of Raceways:
 - 1. Raceway sizes are shown on the Drawings, if not shown on the Drawings, then size in accordance with NFPA 70.
 - 2. Unless specifically indicated otherwise, the minimum raceway size shall be:
 - a. Conduit: 3/4 IN (exposed) and 1 IN (buried).
 - b. Wireway: 2-1/2 IN x 2-1/2 IN.
- C. Field Bending and Cutting of Conduits:
 - 1. Utilize tools and equipment recommended by the manufacturer of the conduit, designed for the purpose and the conduit material to make all field bends and cuts.
 - 2. Do not reduce the internal diameter of the conduit when making conduit bends.
 - 3. Prepare tools and equipment to prevent damage to the PVC coating.
 - 4. Degrease threads after threading and apply a zinc rich paint.
 - 5. Debur interior and exterior after cutting.
- D. Male threads of conduit systems shall be coated with an electrically conductive

SECTION 16130 – RACEWAYS AND BOXES

anti-seize compound.

- E. The protective coating integrity of conduits, fittings, outlet, pull and junction boxes and accessories shall be maintained.
 - 1. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
 - 2. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the conduit; or a self-adhesive, highly conformable, cross-linked silicone composition strip, followed by a protective coating of vinyl tape.
 - a. Total nominal thickness: 40 mil.
 - 3. Repair surfaces which will be inaccessible after installation prior to installation.
- F. Remove moisture and debris from conduit before wire is pulled into place.
 - 1. Pull mandrel with diameter nominally 1/4 IN smaller than the interior of the conduit, to remove obstructions. Conduits shall be replaced where mandrel will not pull through.
 - 2. Swab conduit by pulling a clean, tight-fitting rag through the conduit.
 - 3. Tightly plug ends of conduit with tapered wood plugs or plastic inserts until wire is pulled.
- G. Only mule tape with footage marking shall be used to pull wire and cable in conduit systems.
- H. Where portions of a raceway are subject to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway shall be sealed to prevent circulation of warm air to colder section of the raceway.
- I. Fill openings in walls, floors, and ceilings and finish flush with surface.
 - 1. See Division 1.

3.2 RACEWAY ROUTING

- A. Raceways shall be routed in the field unless otherwise indicated.
 - 1. Conduit and fittings shall be installed, as required, for a complete system that has a neat appearance and is in compliance with all applicable codes.
 - 2. Run in straight lines parallel to or at right angles to building lines.
 - 3. Do not route conduits:

SECTION 16130 – RACEWAYS AND BOXES

- a. Through areas of high ambient temperature or radiant heat.
- b. In suspended concrete slabs.
4. Conduit shall not interfere with, or prevent access to, piping, valves, ductwork, or other equipment for operation, maintenance and repair.
5. Provide pull boxes or conduit bodies as needed so that there is a maximum of 270 degrees of bends in the conduit run or in long straight runs to limit pulling tensions.
- B. Maintain minimum spacing between parallel conduit and piping runs in accordance with the following when the runs are greater than 30 FT:
 1. Between instrumentation and telecommunication: 1 IN.
 2. Between instrumentation and 125 V, 48 V and 24 Vdc, 2 IN.
 3. Between instrumentation and 600 V and less AC power or control: 6 IN.
 4. Between instrumentation and greater than 600 Vac power: 12 IN.
 5. Between telecommunication and 125 V, 48 V and 24 Vdc, 2 IN.
 6. Between telecommunication and 600 V and less AC power or control: 12 IN.
 7. Between telecommunication and greater than 600 Vac power: 12 IN.
 8. Between 125 V, 48 V and 24 Vdc and 600 V and less AC power or control: 2 IN.
 9. Between 125 V, 48 V and 24 Vdc and greater than 600 Vac power: 2 IN.
 10. Between 600 V and less AC and greater than 600 Vac: 2 IN.
 11. Between process, gas, air and water pipes: 12 IN.
- C. Conduits shall be installed to eliminate moisture pockets.
 1. Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.
- D. Provide all required openings in walls, floors, and ceilings for conduit penetration.
 1. See Division 1.

3.3 RACEWAY APPLICATIONS

- A. Permitted Raceway Types per Wire or Cable Types:
 1. Power wire or cables: All raceway types.

SECTION 16130 – RACEWAYS AND BOXES

2. Control wire or cables: All raceway types.
 3. Instrumentation cables: Metallic raceway except non-metallic may be used underground.
 4. Motor leads from a VFD: RGS, RAC or shielded VFD cables in all other raceways.
 5. Telecommunication cables: All raceway types.
- B. Permitted Raceway Types Per Area Designations:
1. All exposed areas:
 - a. PVC-RGS.
- C. Permitted Raceway Types Per Routing Locations:
1. Match existing. All other shall be PVC-RGS unless approved by the Owner or Engineer.
- D. FLEX-LT conduits shall be install as the final conduit connection to light fixtures, dry type transformers, motors, electrically operated valves, instrumentation primary elements, and other electrical equipment that is liable to vibrate.
1. The maximum length shall not exceed:
 - a. 3 FT to motors.
 - b. 3 FT to all other equipment.

3.4 CONDUIT FITTINGS AND ACCESSORIES

- A. Conduit Seals:
1. Installed in conduit systems located in hazardous areas as required by the NFPA 70.
- B. Rigid non-metallic conduit and fittings shall be joined utilizing solvent cement.
1. Immediately after installation of conduit and fitting, the fitting or conduit shall be rotated 1/4 turn to provide uniform contact.
- C. Install Expansion Fittings:
1. Where conduits are exposed to the sun and conduit run is greater than 200 FT.
 2. Elsewhere as identified on the Drawings.
- D. Install Expansion/Deflection Fittings:

SECTION 16130 – RACEWAYS AND BOXES

1. Where conduits enter a structure.
 - a. Except electrical manholes and handholes.
 - b. Except where the ductbank is tied to the structure with rebar.
 2. Where conduits span structural expansions joints.
 3. Elsewhere as identified on the Drawings.
- E. Threaded connections shall be made wrench-tight.
- F. Conduit joints shall be watertight:
1. Where subjected to possible submersion.
 2. In areas classified as wet.
 3. Underground.
- G. Terminate Conduits:
1. In NEMA 4 and 4X rated enclosures:
 - a. Watertight, insulated and gasketed hub and locknut.
 2. In NEMA 7 and 9 rated enclosures:
 - a. Into an integral threaded hub.
 3. When stubbed up through the floor into floor mount equipment:
 - a. With an insulated grounding bushing on metallic conduits.
 - b. With end bells on non-metallic conduits.

3.5 CONDUIT SUPPORT

- A. Permitted multi-conduit surface or trapeze type support system per area designations and conduit types:
1. All areas:
 - a. Match existing. All other shall be 316 Stainless Steel unless approved by the Owner or Engineer.
- B. Permitted single conduit support fasteners per area designations and conduit types:
1. All areas:
 - a. Match existing. All other shall be 316 Stainless Steel unless

SECTION 16130 – RACEWAYS AND BOXES

approved by the Owner or Engineer.

C. Conduit Support General Requirements:

1. Maximum spacing between conduit supports per NFPA 70.
2. Support conduit from the building structure. A Structural Engineer shall be consulted at the direction of the District or designated Responsible In Charge Engineer.
3. Do not support conduit from process, gas, air or water piping; or from other conduits.
4. Provide hangers and brackets to limit the maximum uniform load on a single support to 25 LBS or to the maximum uniform load recommended by the manufacturer if the support is rated less than 25 LBS.
 - a. Do not exceed maximum concentrated load recommended by the manufacturer on any support.
 - b. Conduit hangers: Continuous threaded rods combined with struts or conduit clamps: Do not use perforated strap hangers and iron bailing wire.
5. Conduit support system fasteners:
 - a. Use sleeve-type expansion anchors as fasteners in masonry wall construction.
 - b. Do not use concrete nails and powder-driven fasteners.

3.6 OUTLET, PULL AND JUNCTION BOX INSTALLATION

A. General:

1. Install products in accordance with manufacturer's instructions.
2. See Section 16010 and the Drawings for area classifications.
3. Size boxes to accommodate quantity of conductors enclosed and quantity of conduits connected to the box.

B. Outlet Boxes:

1. Permitted uses of cast outlet boxes:
 - a. Housing of wiring devices surface mounted in non-architecturally finished dry, wet corrosive, highly corrosive and hazardous areas.
 - b. Pull and junction box surface mounted in non-architecturally finished dry, wet corrosive and highly corrosive areas.

SECTION 16130 – RACEWAYS AND BOXES

2. Mount device outlet boxes where indicated on the Drawings and at heights as scheduled in Section 16010.
3. Set device outlet boxes plumb and vertical to the floor.
4. When an outlet box is connected to a PVC coated conduit, the box shall also be PVC coated.

C. Pull and Junction Boxes:

1. Install pull or junction boxes in conduit runs where indicated or required to facilitate pulling of wires or making connections.
 - a. Make covers of boxes accessible.
2. Permitted uses of NEMA 4X metallic enclosure shall be at the approval of the Owner or Engineer.
3. Pull or junction box surface mounted in areas designated as wet and/or corrosive.
4. Permitted uses of NEMA 7 enclosure:
 - a. Pull or junction box surface mounted in areas designated as Class I hazardous.
 - 1) Provide PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.

****END OF SECTION****

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SECTION 16140 – WIRING DEVICES

PART 1 PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Light switches.
 - b. Receptacles.
 - c. Device wallplates and coverplates.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - General Requirements.
- B. Section 16010 – Electrical Basic Requirements.
- C. Section 16130 - Raceways and Boxes.

1.3 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. National Electrical Manufacturers Association (NEMA):
 - 1. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. WD 1, General Color Requirements for Wiring Devices.
 - 3. WD 6, Wiring Devices - Dimensional Requirements.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. 20, Standard for Safety General Use Snap Switches.
 - 2. 498, Standard for Safety Attachment Plugs and Receptacles.
 - 3. 514A, Standard for Safety Metallic Outlet Boxes.
 - 4. 894, Standard for Safety Switches for Use in Hazardous (Classified) Locations.
 - 5. 943, Standard for Safety Ground-Fault Circuit-Interrupters.
 - 6. 1010, Standard for Safety Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations.

1.4 SUBMITTALS

SECTION 16140 – WIRING DEVICES

A. Shop Drawings:

1. See Section 01300 for requirement 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.
 - b. See Division 1 for additional requirements.

PART 2 PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Light switches and receptacles:
 - a. Bryant.
 - b. Cooper Wiring Devices.
 - c. Hubbell.
 - d. Leviton.
 - e. Pass & Seymour.
 - f. Crouse-Hinds.
 - g. Appleton Electric Co.
 - h. Killark.
 2. Submit request for substitution in accordance with Division 1.

2.2 LIGHT SWITCHES

- A. General requirements unless modified in specific requirements paragraph of switches per designated areas or types:
1. Toggle type, quiet action, Industrial Specification Grade.
 2. Self grounding with grounding terminal.
 3. Back and side wired.
 4. Solid silver cadmium oxide contacts.

SECTION 16140 – WIRING DEVICES

5. Rugged urea housing and one-piece switch arm.
 6. Rated 20 A, 120/277 Vac.
 7. Switch handle color: Ivory.
 8. Types as indicated on the Drawings:
 - a. Single pole.
 - b. Double pole.
 - c. 3-way.
 - d. 4-way.
 9. Standards: UL 20, UL 514A, NEMA WD 6.
- B. Architecturally Finished Areas:
1. Wallplate:
 - a. Ivory colored high impact thermoplastic or nylon.
 - b. Single or multiple gang as required.
- C. Dry Non-architecturally Finished Areas:
1. Coverplate:
 - a. Zinc plated malleable iron or galvanized steel.
 - b. Single or multiple gang as required.
- D. Wet Non-architecturally Finished Areas:
1. Coverplate:
 - a. Gasketed zinc plated malleable iron or aluminum with stainless steel screws utilizing rocker, front mounted toggle or pull type switch.
 - b. Single or multiple gang as required.
- E. Corrosive Areas:
1. Corrosion resistant nickel plated metal parts.
 2. Coverplate:
 - a. Gasketed zinc plated malleable iron or copper free aluminum with stainless steel screws utilizing rocker, front mounted toggle or pull

SECTION 16140 – WIRING DEVICES

type switch.

b. Single or multiple gang as required.

F. Highly Corrosive Areas:

1. Corrosion resistant nickel plated metal parts.

2. Coverplate:

a. PVC-RGS conduit system:

- 1) PVC coated zinc plated malleable iron or copper free aluminum with stainless steel screws utilizing rocker, front mounted toggle or pull type switch.
- 2) Single or multiple gang as required.

b. PVC conduit system:

- 1) Gray colored high impact thermoplastic.
- 2) Single or multiple gang as required.

G. Hazardous Areas

1. Rated for Class I, Division 1 and 2, Groups B, C, and D and Class II, Division 1 and 2 areas, Groups E, F, and G.

2. Switch enclosed in separate sealing chamber.

a. Sealing chamber has prewired factory sealed pigtail leads.

3. Coverplate:

a. Zinc plated malleable iron or copper free aluminum with stainless steel screws utilizing rocker or front mounted toggle type switch.

b. Single or multiple gang as required.

4. Standards: UL 894.

2.3 RECEPTACLES

A. General requirements unless modified in specific requirements paragraph of receptacles per designated areas:

1. Straight blade, Industrial Specification Grade.

2. Brass triple wipe line contacts.

3. One-piece grounding system with double wipe brass grounding contacts and self grounding strap.

SECTION 16140 – WIRING DEVICES

4. Back and side wired.
 5. Rated 20 A, 125 Vac.
 6. High impact nylon body.
 7. Receptacle body color:
 - a. Normal power: Ivory.
 8. Types as indicated on the Drawings:
 - a. Normal: Self grounding with grounding terminal.
 - b. Ground fault circuit interrupter: Feed-through type with test and reset buttons.
 9. Duplex or simplex as indicated on the Drawings.
 10. Configuration: NEMA 5-20R.
 11. Standards: UL 498, UL 514A, UL 943, NEMA WD 1, NEMA WD 6.
- B. Architecturally Finished Areas:
1. Wallplate: Ivory colored high impact thermoplastic or nylon.
- C. Dry Non-architecturally Finished Areas:
1. Coverplate:
 - a. Zinc plated malleable iron or galvanized steel.
 - b. Single or multiple gang as required.
- D. Wet Non-architecturally Finished Areas:
1. Coverplate: Weatherproof (NEMA 3R) while in use, gasketed, copper-free aluminum, 2.5 IN minimum cover depth.
- E. Exterior Locations:
1. Coverplate: Weatherproof (NEMA 3R) while in use, gasketed, copper-free aluminum, 2.5 IN minimum cover depth.
- F. Corrosive Areas:
1. Corrosion resistant nickel plated metal parts.
 2. Receptacle body color: Yellow.
 3. Coverplate:

SECTION 16140 – WIRING DEVICES

- a. Zinc plated malleable iron or galvanized steel.
 - b. Single or multiple gang as required.
- G. Highly Corrosive Areas:
 - 1. Corrosion resistant nickel plated metal parts.
 - 2. Receptacle body color: Yellow.
 - 3. Coverplate:
 - a. PVC-RGS conduit system:
 - 1) PVC coated zinc plated malleable iron or copper free aluminum.
 - 2) Single or multiple gang as required.
 - b. PVC conduit system:
 - 1) Gray colored high impact thermoplastic.
 - 2) Single or multiple gang as required.
- H. Hazardous Areas:
 - 1. Rated for Class I, Division 1 and 2, Groups B, C, and D; and Class II, Division 1 and 2, Groups F and G.
 - 2. Factory-sealed receptacle/switch/coverplate.
 - a. Zinc plated malleable iron or copper free aluminum with stainless steel screws and gasketed spring-loaded cover.
 - 3. "Dead-front" construction requiring plug to be inserted and rotated to activate receptacle.
 - a. Ordinary non-hazardous plug shall not activate the receptacle.
 - 4. Standard: UL 1010.
- I. Special Purpose Receptacles:
 - 1. NEMA configuration as indicated on the Drawings.
 - 2. Coverplate: See requirements per area designations herein.

PART 3 PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.

SECTION 16140 – WIRING DEVICES

- B. Mount devices where indicated on the Drawings and as scheduled in Section 16010.
- C. See Section 16130 for device outlet box requirements.
- D. Where more than one (1) receptacle is installed in a room, they shall be symmetrically arranged.
- E. Provide blank plates for empty outlets.

****END OF SECTION****

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SECTION 16195 – ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers

1.2 SCOPE

- A. Labeling, Wiring and Conduit Tagging defined herein are only applicable to modifications and additions occurring as a result of installation related to the Olivenhain Municipal Water District (OMWD) Programmable Logic Controller (PLC) Replacement Project..

1.3 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background. Provide 316 stainless steel screws for mounting (adhesives not allowed). Seton Identifications Products or approved equal.
- B. Locations:
 - 1. Each electrical distribution and control equipment enclosure.
- C. Letter Size:
 - 1. Use 1/8 inch letters for identifying individual equipment and loads.
 - 2. Use 1/4 inch letters for identifying grouped equipment and loads.

SECTION 16195 – ELECTRICAL IDENTIFICATION

- D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, and control device stations.

2.2 WIRE MARKERS

- A. Description: Heat Shrinkable Slip-on PVC sleeve type as manufactured by Brady or approved equal.
- B. Locations: Each conductor at terminal boards and at each termination.
- C. Wire Labeling Standard: The intent of this standard is to provide for a wire marking system that clearly identifies the termination point at either end of any given conductor. Implementing this system would facilitate quicker troubleshooting due to the immediate recognition of a wires origination and destination without the need of contract drawings.
 - 1. Method: The most powerful controller would take precedence as the first termination point called out on the label. The second half of the label would be the termination point at the other end. The wire label would remain the same at both ends of the wire. For example:
 - a. If a wire ran from the RTU, Terminal Block number 4, Terminal(typical) 25 to the Motor Control Center, Pump 1 bucket, Field Terminal Block, Point 3, the tag would read; RTU-TB4-25/MCC-P1-FTB-3.
 - b. A wire that runs from the Motor Control Center, Pump 1 bucket, Field Terminal Block, Point 22 to the common of High Pressure Switch PSH-101, would read; MCC-P1-FTB-22/PSH-101-C.
 - c. An analog signal conductor from the positive connection of Pressure Transmitter PIT-111 to the RTU, Terminal Block number 6, Point 6, would read; PIT-111-+/- RTU-TB6-6
 - d. A circuit conductor originating from panel “LP” circuit breaker number 5 and feeding exhaust fan EF1 would read, LP-5/EF1.
 - e. Any conductor going to a relay would include the actual relay base pin number. For example, a conductor from the RTU Terminal Block 2 point 12 to relay CR1 pin 7 would read, RTU-TB2-12/CR1- 7.
 - f. Motor feeders are not required to be marked with anything other than phase colors.

2.3 CONDUIT TAGS

- A. Conduit tags shall be provided for exposed conduits stub ups and shall be 316 stainless steel and labeled per the Drawing conduit schedule. Provide Seaton or equal.

SECTION 16195 – ELECTRICAL IDENTIFICATION

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment surface using 316 stainless steel machine screws. Sheet metal screws shall not be used. Adhesives are not allowed.
- C. Wire numbers shall be precisely located on each conductor, 3/8" from end of insulation. Where solderless type terminals are used, the number shall be applied to the wire not the terminal insulator.

****END OF SECTION****

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SECTION 17000 – INSTRUMENTATION AND CONTROLS

PART 1 GENERAL

1.1 INITIALISMS, ACRONYMS AND DEFINITIONS

A. INITIALISMS AND ANCRONYMS:

- | | | |
|-----|--------|---|
| 1. | 4SWRF | 4S Ranch Water Reclamation Facility |
| 2. | DCMWTP | David C McCollom Water Treatment Plant |
| 3. | EC | Electrical Contractor |
| 4. | ERT | Energy Recovery Turbine |
| 5. | HMI | Human Machine Interface |
| 6. | I&C | Instrumentation & Controls |
| 7. | IO | Input and Outputs |
| 8. | OEM | Original Equipment Manufacture |
| 9. | O&M | Operations and Maintenance |
| 10. | OIT | Operator Interface |
| 11. | OMWD | Olivenhain Municipal Water District |
| 12. | P&ID | Process and Instrumentation Diagram |
| 13. | PID | Proportional Integral Derivative (PID) Controller |
| 14. | PLC | Programmable Logic Controller |
| 15. | PRS | Pressure Reducing Station |
| 16. | PS | Pump Station |
| 17. | RFI | Request For Information |
| 18. | RIO | Remote IO |
| 19. | SCADA | Supervisory Control and Data Acquisition |
| 20. | SPS | Sewer Pump Station |
| 21. | SI | Systems Integrator |
| 22. | UFT | Un-Witnessed Factory Test |
| 23. | WFT | Witnessed Factory Test |

SECTION 17000 – INSTRUMENTATION AND CONTROLS

24. VFD Variable Frequency Drives

B. DEFINITIONS:

1. **1746 SLC:** SLC 1747 control systems (comprised of 1747 Controllers and 1746 IO) are legacy components and equipment being upgraded under the OMWD PLC Replacement Project.
2. **5069 CompactLogix:** CompactLogix 5380 control systems (comprised of 5069 Controllers and 5069 IO) are DIN rail-mounted systems that are the typical migration path for legacy and SLC and MicroLogix IO systems.
3. **1756 ControlLogix:** ControlLogix 1756 control systems (comprised of 1756 Controllers and 1756 IO) are Chassis mounted systems that are capable of addressing a large amount of IO points.
4. **1766 MicroLogix:** MicroLogix 1766 control systems (comprised of 1766 Controllers and 1762 IO) are legacy components and equipment being upgraded under the OMWD PLC Replacement Project.
5. **Control System:** An assemblage of interrelated PLC, IO, Network, HMI and OIT's equipment and programming associated with a system, sub-system and/or facility.
6. **The District:** In reference to the Owner – Olivenhain Municipal Water District.
7. **The Engineer:** The Engineer of Record responsible for the professional inspection and approval of the system design and construction within his or her other area of technical specialty.
8. **The Project:** The "PLC Replacement Project" at Olivenhain Municipal Water District.
9. **The Distributor:** Authorized Allen-Bradley Rockwell Automation Distributor and Supplier of equipment.
10. **HMI:** In reference to the three(3) separate Ignition SCADA HMI Applications with integrated SQL Historians used for monitoring and control 4SWRF and Waste Water Sites, DCMWTP, and collective Remote Distribution Sites (Reservoirs, Pump Stations and PRS's).
11. **Facility Groups:** Inclusive of the Owners three(3) main facility types:
 - a. Water Treatment (DCMWTP),
 - b. Distribution (PS's, PRS's, and Reservoirs)
 - c. Wastewater (4SWRF and SPS's)

SECTION 17000 – INSTRUMENTATION AND CONTROLS

12. **Factory Testing Hardware and Software:** Testing of the assembled PLC upgrade system and components conducted at the Contractors Facilities. Includes Unwitnessed and Witness Testing.
13. **OEM:** Organization that makes specialized systems or sub-systems from component and parts.
14. **Project Phases:** The defined Project Phases for execution of the PLC Replacement Project. Phase 1a and 1b – Upgrade of Wastewater Water and Distribution Remote Sites (respectively). Phase 2a and 2b – Upgrade of DCMWTP and 4SWRF (respectively).
15. **Shop Drawings:** Shop Drawings include drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the Contract.
16. **Wiring Diagram:** Electrical schematics of the PLC Control Panel used to outline each field device, as well as the connection between the devices found within an electrical panel.
17. **Notice to Proceed:** Authorizes the prime contractor to proceed with work in the agreement.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - General Requirements - ALL
- B. Division 16 - Electrical Requirements - ALL

1.3 REFERENCE SPECIFICATIONS, CODE AND STANDARDS

- A. The installation and fabrication of all items within the scope of this section of the specifications shall be accomplished according to the requirements of the regulatory agencies as specified in Electrical Section 16000 and the referenced standards listed including UL, IEEE, ICEA, and NEMA.
- B. The primary reference standards for this section of the specifications shall be ISA-Instrument Society of America.
- C. Without limiting the generality of other requirements of these specifications, all work specified herein shall conform to or exceed the applicable requirements of the referenced documents to the extent that the requirements therein are not in conflict with the provisions of this section; provided, that where such documents have been adopted as a code or public ordinance by the public agency having jurisdiction, such code or ordinance shall take precedence.
- D. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:
 1. ISA-RP60.6 Nameplates, Labels, and Tags for Control Centers

SECTION 17000 – INSTRUMENTATION AND CONTROLS

2. ISA-RP12.6 Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations
3. ISA-S5.1 Instrument Symbols and Identification
4. ISA-S5.4 Instrument Loop Diagrams
5. ISA-S20 Specification Forms for Process Measurement and Control Instrumentation; Primary Elements and Control Valves.

1.4 RESPONSIBILITIES

- A. Due to the complexities associated with the interfacing of numerous control system devices and upgrading facilities with limited downtime availability, the System Integrator (SI) shall be the Contractor for the Project.
- B. The SYSTEMS INTEGRATOR (SI) shall be responsible for:
 1. Management and installation of the entire electrical and control system required for this project shall be by an SI meeting the qualifications defined herein.
 2. This includes, but is not limited to, all work necessary to select, furnish, construct, supervise installation, configure, calibrate, test, and place into operation all PLC replacement equipment, HMI, programmable controllers, control panels, communications, monitoring equipment and accessories.
 3. SI must be competent in performance, supervision and coordination of work required and performed by OEM equipment manufacturers, suppliers and the Electrical Contractor.
 4. Custom electrical panels, controls, and instrumentation shall be furnished by Systems Integrator.
- C. The ELECTRICAL CONTRACTOR (EC) shall be responsible for:
 1. Installation of the electrical materials, wiring and equipment required for this project shall be the EC meeting qualifications as defined herein. The EC shall be capable of looking at electrical equipment submittals, prior to installation, comparing hookup requirements to the drawings, and noting any deficiencies.
 2. Selecting, furnishing, and installing all commodity electrical materials (conduit, wire, supports, fittings, duct banks, etc.) that are generally not “custom” or uniquely manufactured for this project.
 3. Electrical Contractor activities may be Sub-Contracted by the SI.
 4. If Electrical activities are performed by the SI, the SI must:
 - a. Have a current C10 Electrical Contractor’s License issued by the State of California Department of Consumer Affairs, and

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- b. Meet all of the qualifications defined for the EC herein.

1.5 SCOPE OF WORK

- A. The two(2) Logix Series migration paths (from Legacy Chassis) are defined as follows for the Project.
 - 1. CompactLogix 5380 control systems (comprised of 5069 Controllers and 5069 IO) are DIN rail-mounted systems that are the typical migration path for legacy and SLC and MicroLogix IO systems. For the purposes of consistency, the “CompactLogix system” shall be referenced as 5069 throughout the remainder of this document and comprise the majority of the legacy chassis conversions.
 - 2. ControlLogix 1756 control systems (comprised of 1756 Controllers and 1756 IO) are Chassis mounted systems that are capable of addressing a large amount of IO points. ControlLogix 1756 upgrades have been selected in specific cases for OMWD conversions.
- B. Provide two(2) phase execution for replacement and upgrade a total of 42 “end of life” Allen Bradley 1746 SLC and three(3) associated Remote IO Chassis, as well two(2) 1766 MicroLogix PLC’s in accordance with Appendix 17000-A as follows:
 - 1. Phase 1 – Remote Sites
 - a. Delivery of Phase 1 shall be in accordance with Section 01115 Construction Sequence.
 - b. Phase 1a - Upgrade and replacement of 1746 SLC PLC with 5069 CompactLogix at other Remote Wastewater handling sites throughout the District, including:

(4S-103)	- Avenida Apice SPS
(4S-105)	- Cerro Del Sol 1 SPS #1
(4S-106)	- Cerro Del Sol 2 SPS #2
(4S-107)	- Camino Sin Puente SPS #1
(4S-108)	- Camino Sin Puente SPS #2
(4S-109)	- Camino Sin Puente SPS #3
(4S-110)	- Camino Sin Puente SPS #4
(4S-111)	- Del Dios SPS
(4S-113)	- Fire Station SPS
(4S-114)	- Midpoint SPS
(4S-115)	- Neighborhood 3 SPS
(4S-120)	- Santaluz SPS
(4S-121)	- Avenida Orilla SPS
 - c. Phase 1b - Upgrade and replacement of 1746 SLC PLC with 5069 CompactLogix at other Remote Water Distribution sites throughout the District, including:

(D-001)	- 520 PRS / Flow Control
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SECTION 17000 – INSTRUMENTATION AND CONTROLS

- (D-002) - 4S-1 Reservoir - (inclusive of full backpanel replacement)
- (D-003) - Connemara PS
- (D-004) - Cielo PS
- (D-005) - Crosby 3 and 4 PRS
- (D-007) - Gano Reservoir
- (D-008) - Gaty Reservoir
- (D-009) - Oak South #1 PRS
- (D-010) - Miler Reservoir / Hydro
- (D-011) - Oak South #3
- (D-012) - Peay Reservoir / Flow Control)
- (D-013) - Santa Fe Valley PS
- (D-014) - Unit M Flow Control
- (D-015) - Unit Z Pump Station
- (D-016) - Via De Las Flores PRS
- (D-017) - Village Park Recycled PS
- (D-018) - Zorro Reservoir

- (M-206) - Upgrade and replacement of One(1) Ammonia Feed Facility PLC from 1746 SLC to 1756 ControlLogix

2. Phase 2 – DCMWTP Treatment and 4SWRF Reclamation Facilities

- a. Delivery of Phase 2 shall be in accordance with Section 01115 Construction Sequence.
- b. Phase 2a - 4S Water Reclamation Facility (4SWRF)
 - 1) Upgrade and replacement of 1746 SLC PLC's with 5069 CompactLogix, including:
 - (4S-101) - Headworks Odor Control
 - (4S-102) - Solids Processing Odor Control
 - (4S-104) - Blower Control
 - (4S-116) - PLC-2A
 - (4S-117) - PLC-2B
 - (4S-118) - Reclaimed Water Pump Station
 - (4S-119) - Pond System Reservoir/ Pump Station
 - 2) Upgrade and replacement of 1746 SLC PLC with 1756 ControlLogix, including:
 - (4S-112) - Filters PLC
- c. Phase 2b - David C McCollom Water Treatment Plant (DCMWTP)
 - 1) (M-204 and M-205) - Upgrade and replacement of 1746 SLC ICP2 & 3 and integrate as ethernet Remote IO to CC-MBR Remote as 1756 ControlLogix

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- 2) (M-201 thru M-203) - Sub-contract upgrade and replacement of ERT 1746 SLC PLC's and Remote IO's to OEM Canyon Hydro.
- C. In order to reduce duration of cut-overs and minimize construction costs, ancillary equipment associated with the PLC Chassis (i.e. physical control panels, back panel, power supplies, network switches, terminal blocks, fusing, etc) will be preserved wherever possible.
- D. The District's maximum permissible outage window to complete the Shutdown, Installation and Testing of each site is defined in Section 17000-A, and must be adhered to by the Contractor.
- E. All 5069 Compact and 1756 ControlLogix Upgrades performed by the Contractor shall be performed to Studio 5000 Logix Designer V35, or latest designated by the District.
- F. Four(4) categories of PLC upgrades and conversion have been identified for the Phase 1 and 2 implementation programs as summarized in Appendix 17000-A "PLC Conversion Type". PLC conversions shall be applied as follows:
 1. TYPE 1 - COMPACTLOGIX RE-TERMINATION
 - a. Consisting of specified OMWD reservoirs, sewage pump stations, potable water pump stations and pressure reducing sites the SI shall upgrade these from SLC to CompactLogix.
 - b. The EC shall manually re-terminate the wiring that currently lands on the legacy SLC 1746 IO wiring blocks directly to new CompactLogix 5069 terminal blocks/wiring arms.
 - c. Interposing Relays shall be supplied and installed by the Contractor for all new 5069-OB16 modules. Relays shall be Allen-Bradley type 700-HLT1U1. Suitable contact rating for load shall be confirmed by the Contractor, with alternates approved as need by the Engineer.
 - d. A Provisional Bills of Materials is included in Appendix 17000-B.2 "Consolidated BOM" for TYPE 1 conversions. The Bills of Materials are for reference use only by the Contractor, and do not necessarily reflect exact quantities. The Contractor is responsible to verify all configurations, part numbers and quantities. All components and devices shall be furnished and installed as required to provide a complete operable, ready for use and reliable system for accomplishing the functions and meeting the performance set forth herein.
 2. TYPE 2 - COMPACTLOGIX ENTRELEC HARNESS
 - a. These PLC upgrades pertain to specific panels PLC 2A and 2B at the 4SWRF. These panels perform critical control functions at the

SECTION 17000 – INSTRUMENTATION AND CONTROLS

4SWRF, with minimal downtime permitted to convert from the legacy SLC processors. There is also abundant wiring associated with these PLC's. The existing field wiring utilizes specialized Entrelec harnessing and Terminal Bases.

- b. The EC shall connect from the existing proprietary Entrelec Field Terminal Blocks with newly installed Entrelec (also known as Interfast Connectors) Universal pigtail harnesses and have them pre-wired to the new 5069 swing arms to allow for reconnection to new a CompactLogix 5069 IO Chassis configuration with minimum downtime.
- c. TE Connectivity can be contacted from purchasing details and supply of Entrelec Universal pigtail harnesses (also known as Interfast Connectors). The following quantity of connectors shall be required for PLC 2A and 2B at 4SWRF:
 - 1) 5069-IA16 Recommended Entrelec Connector
 - a) Part # - LAF300/UNI/OMN20/418/UL
 - b) See Appendix 17000-B.1, SHEET I-101 for Pin-Out Connections
 - 2) 5069-OA16 Recommended Entrelec Connector
 - a) Part # - LAF300/UNI/OMN20/418/UL
 - b) See Appendix 17000-B.1, SHEET I-102 for Pin-Out Connections
 - 3) 5069-IF8 Recommended Entrelec Connector
 - a) Part # - LAF300/UNI/SUBD25/422/UL
 - b) See Appendix 17000-B.1, SHEET I-103 for Pin-Out Connections
 - 4) 5069-OF4 Recommended Entrelec Connector
 - a) Part # - LAF300/UNI/SUBD9/420/UL
 - b) See Appendix 17000-B.1, SHEET I-104 for Pin-Out Connections

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- d. The contact details for Entrelec support from TE Connectivity are as follows:
 - 1) Email: cc-entrelec-n-amer@te.com
 - 2) Ph: 1-800-526-5076 Prompt #2, then Prompt #4
- e. A Provisional Bills of Materials is included in Appendix 17000-B.2 “Consolidated BOM” for TYPE 2 conversions. The Bills of Materials are for reference use only by the Contractor, and do not necessarily reflect exact quantities. The Contractor is responsible to verify all configurations, part numbers and quantities. All components and devices shall be furnished and installed as required to provide a complete operable, ready for use and reliable system for accomplishing the functions and meeting the performance set forth herein.

3. TYPE 3 - CONTROLLOGIX RE-TERMINATION

- a. These PLC upgrades pertain to the DCMWTP, Ammonia Injection Facility and the Filter Control Panel at 4SWRF.
- b. These racks have been selected for conversion to the 1756 ControlLogix to accommodate upgrade to 1756-OX8 Modules, which are a specialized relay contact module that are not available on the 5069 CompactLogix Series.
- c. Additionally, the DCMWTP has an existing ControlLogix Master PLC’s (CC-MBR redundant-pair), with the intention to tie-in ICP-2 and ICP-3 as Ethernet based Remote IO to the ControlLogix Master PLC’s.
- d. The Energy Recovery Turbine (ERT) Control Panel at DCMWTP has a specialized OEM PLC program associated with it, with the plan to upgrade it TYPE 3 - 1756 ControlLogix via sole-source contract to Canyon Hydro.
- e. A Provisional Bills of Materials is included in Appendix 17000-B.2 “Consolidated BOM” for TYPE 3 conversions. The Bills of Materials are for reference use only by the Contractor, and do not necessarily reflect exact quantities. The Contractor is responsible to verify all configurations, part numbers and quantities. All components and devices shall be furnished and installed as required to provide a complete operable, ready for use and reliable system for accomplishing the functions and meeting the performance set forth herein.
- f. The EC shall manually re-terminate the wiring that currently lands on the legacy SLC 1746 IO wiring blocks directly to new 1756 ControlLogix terminal blocks/wiring arms.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

4. TYPE 4 - MICROLOGIX TO COMPACTLOGIX
 - a. These upgrades include converting the existing two(2) 1766 MicroLogix PLC's for the Scrubber/Odor Control Panels at 4SWRF to CompactLogix.
 - b. A Provisional Bills of Materials is included in Appendix 17000-B.2 "Consolidated BOM" for TYPE 4 conversions. The Bills of Materials are for reference use only by the Contractor, and do not necessarily reflect exact quantities. The Contractor is responsible to verify all configurations, part numbers and quantities. All components and devices shall be furnished and installed as required to provide a complete operable, ready for use and reliable system for accomplishing the functions and meeting the performance set forth herein.
 - c. The EC shall manually re-terminate the wiring that currently lands on the legacy MicroLogix 1766 IO wiring blocks directly to new CompactLogix 5069 CompactLogix terminal blocks/wiring arms.
- E. For TYPE upgrades defined in 1.5 D, the following classification of IO system conversions have been defined:
 1. 1746 SLC IO to 5069 CompactLogix DIN Rail Mounted IO (TYPE 1 and 2)
 2. 1746 SLC IO to 1756 ControlLogix Chassis Mounted IO (TYPE 3)
 3. 1766 MicroLogix IO to 5069 CompactLogix IO DIN Rail Mounted IO (TYPE 4)
- F. For TYPE 1 and 2 upgrades defined in 1.5 D, conversion of 1746 SLC to 5069 CompactLogix IO upgrades shall be provided in accordance with Appendix 17000-D by the Contractor.
- G. For TYPE 3 upgrades defined in 1.5 D, conversion of 1746 SLC to 1756 ControlLogix IO shall be provided in accordance with Appendix 17000-E by the Contractor.
- H. For TYPE 4 upgrades defined in 1.5 D, conversion of 1766 MicroLogix to 5069 CompactLogix IO shall be provided in accordance with Appendix 17000-F by the Contractor.
- I. Mitigation and Special Conditions for handling IO conversion from Legacy 1746 SLC IO to CompactLogix and ControlLogix are noted in Appendix 17000-G.1 and G.2.
- J. Local and Remote IO connections from the legacy 1746 SLC environment shall be provided at sites identified in accordance with Appendix 17000-H.1 by the Contractor.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- K. ControlLogix Remote IO connections from the legacy 1746 SLC environment shall be provided at DCMWTP by the contractor, in accordance with Appendix 17000-H.2 for ICP2 and ICP3.
- L. Upgrade of Rockwell Automation OIT Panels shall be performed by the SI in accordance with Appendix 17000-C. Where OIT Panels are removed from service, the following requirements shall be met:
 - 1. All power and network wiring associated with the original OIT shall be removed.
 - 2. A blanking panel shall be provided and installed by the Contractor to cover the original OIT cut-out, including painting and gasketing in order to maintain the original environmental protection and integrity of the control panel.
- M. The following Serial Network upgrades shall be performed by the SI:
 - 1. At Miller Reservoir (D-010), upgrade the existing ProSoft 3150 MCM Module to 5069-Serial for direct Modbus RS-485 communications with a MultiTek M842 Power Meter. The 5069-Serial is native to the CompactLogix 5069 process and will allow remapping of the necessary Modbus registers to be read from the Power Meter
 - 2. At DCMWTP, the RS-485 serial interface from ERT-1 (Unit 1) & ERT-2 (Unit-2) MultiTek DMM's to the Red Lion OIT RS-485 Serial port shall be upgraded by the ERT OEM - Canyon Hydro, under sole source supply agreement to the Contractor.
- N. For TYPE 1, 2 and 4 Upgrades, CPU, Module and IO loop power for 5069 CompactLogix upgrades shall be provided in accordance with Appendix 17000-I.1 for MOD, SA and LA Power to the CompactLogix equipment.
- O. For TYPE 3 Upgrades, Control and IO Loop Power shall be provided in accordance with Appendix 17000-I.2
- P. Ethernet Remote IO Communications upgrades will be provided in accordance with Appendix 17000-J
- Q. Appendix 17000-K Existing Field Survey Data Report is provided for Contractor reference. This is a detailed and extensive report of existing facility equipment, including:
 - 1. Existing Field Survey Data Report (December 2022)
 - 2. Existing Facilities I/O List
 - 3. As-Built PDF Drawing Documentation

Conformance to original form, fit and function of replacement equipment shall remain the responsibility of the Contractor. This includes verification of exact

SECTION 17000 – INSTRUMENTATION AND CONTROLS

mounting dimensions, power supply requirements, type of IO points, networking compatibility, wiring and signal compatibility, IO module configuration and layout.

- R. The Contractor shall thoroughly examine the given equipment configuration and conditions in the Appendix 17000-K - Field Survey Data Report before submitting their bid proposal to perform any work. This shall include comparing any site conditions, drawings and details noted within the report, against those given within the Specifications and Plans. No allowance shall be made for any additional costs incurred by the Contractor due to his failure to examine each site or report any discrepancies to the Engineer.
- S. D-002 4S-1 Reservoir does not have any existing drawings or AS-BUILT documentation. As such, a new replacement back panel insert, inclusive of PLC, IO, wiring, terminal blocks and power supply, and utility duplex outlet shall be provided. Further panel details and pictures of the existing panel configuration are provided in Appendix 17000-K – Section 1, D-0002_4S-1 Reservoir.xls.
- T. General Scope of Work requirements shall include the following:
1. Phase 1 is to be completed within 365 Calendar Days from Notice To Proceed and include all remote water distribution and wastewater handling sites.
 2. Phase 2 is to be completed within 730 Calendar Days from Notice To Proceed and include all 4SWRF and DCMWTP.
 3. Modify and upgrade existing PLC Control Panels as follows:
 - a. In each of the existing control panels the Contractor shall complete the following steps prior to modifications/demolition:
 - 1) All existing field conductors are to remain and be reused. Existing control panels, control devices, and terminal blocks are to remain where indicated on the drawings.
 - 2) Identify all field control, signal and power conductors in existing control panels. Document the wire label, wire color, terminal strip and terminal block number for each termination.
 - 3) Where control devices are to remain, identify all control, signal and power conductors in existing control panels. Document the wire label, wire color, terminal strip and terminal block number for each termination. Remove existing PLC's, IO and associated chassis from Control Panels and provide to Owner Representative upon completion of field testing. Due care shall be taken by the Contractor with handling and removal equipment, such that asset recovery credits may be obtained by the Owner.
 - b. Provide and install new PLC components and equipment as follows:

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- 1) Provide mounting supports and other access as detailed as recommended by the OEM.
 - 2) Modify power supply to new PLC and IO equipment as required per Appendix 17000-I.1 and I.2.
 - 3) Install the necessary 5069 DIN rail mounted controller and IO system for TYPE 1,2 and 4 conversions. Install the 1756 Chassis and Components for TYPE 3 conversions.
 - 4) Modify and install Local and Remote IO connections per Appendix 17000-H.1 and H.2
 - 5) Install new OIT equipment per Appendix 17000-C.
 - 6) Trace and document any conductors that are not shown on the Wiring Diagrams. Any existing inputs or outputs that were not accounted for on the Wiring Diagrams shall be redlined and submitted with the new PLC Control Panel submittal for final approval
 - 7) Maintain facility radio and fiber communications for telemetry to central SCADA HMI facilities where needed.
4. Coordinate timely modification and demolition of the existing control system components, while adhering to the schedule of work for transition and upgrade of the new control system within the District's existing system.
 5. Provide installation services, including ready for use control systems hardware, software and equipment as specified in this Division and shown on the Contract Drawings. Note: This document describes the function and operation of the system and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as required to provide a complete operable, ready for use and reliable system for accomplishing the functions and meeting the performance set forth herein.
 6. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals, and services to provide a complete and operational electrical, instrumentation and control system as specified and as shown on the Contract Drawings.
 7. Procure, fabricate, assemble, wire, configure and test the instrumentation, network and control system based on the requirements of Division 17.
 8. Organize meetings and workshops between District staff, representatives and the SI as required to understand the existing control system details as specified.
- U. The Systems Integrators (SI) scope of work shall include the following:
1. Design, procure, configure, factory test, install, commission and support a PLC system that shall integrate all process controls required to provide for a complete and operational system. The PLC system shall be designed in accordance with the Owners Technical Guidance and Standards for HMI, OIT and PLC systems.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

2. Provide all PLC, HMI and OIT program conversion and updates, including control programs, database configuration, graphic screens, communications links, historical archiving, and other programming tasks as specified in these Specifications.
3. Coordinate all program updates with the Engineer to ensure that the HMI and OIT development, PLC programs, communications links, databases and other SCADA HMI elements match the existing District standards and program conventions. The District's existing PLC, HMI, and OIT programs will be made available to the SI after award of the Contract and a Non-disclosure Agreement has been signed and executed by the Contractor staff working on the project.
4. Remove unused logic and documentation from existing PLC programs (e.g. I/O signals that were originally used and have been subsequently identified as SPARE). All work on existing PLC, HMI and OIT systems including removal of existing logic or graphics, shall be performed under direct supervision of the District and Engineer.
5. Upgrade the existing network hardware, software and programming logic for integration of the new PLC, OIT and network equipment into the existing systems SCADA HMI and PLC network topologies as shown on the Contract Drawings and Provisional Bill of Materials in Appendix 17000-B.1 and B.2.
6. Perform detailed field and documentation investigations required for development of system control software, hardware, HMI, OIT and control and operating strategies.
7. Investigate all IO connected to existing processes and facilities to determine what will be re-wired and modified, demolished or abandoned by this Work.
8. After completion and approval of each phase of the startup, testing, and commissioning process, the SI shall provide final versions of the as-built panel hardware documentation, software and signed test procedures to the district. All abandoned wiring occurring as a result of the OMWD PLC Replacement project shall be labelled and saved off at both ends (including to/from location identification), and recorded accordingly on applicable AS-BUILT documentation.
9. Modify PLC, HMI and OIT programs to provide control system and network diagnostic information, including network, controller, and IO fault alarms.
10. Perform all necessary and interim PLC, HMI and OIT programming and configuration to support the sequencing of PLC upgrades as determined by the Contractor per the Specifications as well as in accordance with the Special Technical Provisions defined in Section 01170. All control system setpoints, initialization variables, operating states (auto, manual, etc.), alarm configuration (enabled/disabled, setpoints, etc.) and any other settable and adjustable control system configuration and tuning

SECTION 17000 – INSTRUMENTATION AND CONTROLS

parameters shall be preserved during each phase of the sequencing and upgrade process. Parameters shall be ported to the new PLC and HMI program environments by means of automatic scripting and conversion process. Manual re-entry of setpoints and parameters is not permitted post conversion.

11. The SI shall maintain both new and existing SCADA HMI, OIT and PLC program versions throughout the Project construction and commissioning phases, with minimized impact to operations staff. This includes all aspects of process logic, database, graphics, historian, alarming, trending and reporting. Separate versions of programs shall be developed and maintained as necessary to support the project schedule and sequencing defined in Section 01115.
12. Where PLC development and SCADA HMI workstations are required for use by the Contractor for testing purposes, those workstations shall be specifically designated and clearly identified by the Contractor and shall not be available for general operator use.
13. The SI shall update each of the HMI monitoring and control systems that are part of the existing Ignition HMI application. This work includes:
 - a. Configuration of IO drivers to communicate with Allen-Bradley CompactLogix and ControlLogix Ethernet/IP devices.
 - b. Update and import of modified PLC address points into the Ignition database. The following are the approximate number of Ignition tag database elements associated with PLC's each of the following HMI systems:
 - 1) DCMWTP – 9,000 Tag Database Elements
 - 2) 4SWRF – 13,000 Tag Database Elements
 - 3) Remote Distribution Sites – 6,000 Tag Database Element
 - c. Update and import of HMI and OIT graphical displays and functions affected by the PLC Upgrade and Replacement. This includes, but is not limited to, PLC and IO diagnostic displays.
14. The SI shall update and replace each of the designated remaining PanelView Plus OIT systems. This work includes:
 - a. Update of the existing PanelView OIT FactoryTalk View applications to the latest version of FactoryTalk View designated by the District.
 - b. Configuration of IO drivers to communicate with Allen-Bradley CompactLogix and ControlLogix Ethernet/IP devices.
 - c. Update and import of modified PLC address points into the respective FactoryTalk View databases.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- d. Modification and import of graphical displays as needed to support upgrade to the latest version of FactoryTalk View. This shall include scaling of graphics to higher resolution as needed for new PanelView Plus configuration.
- 15. Simulate, test, startup, and commission the control system at interim stages during construction as required by Specifications as well as in accordance with the Special Technical Provisions defined Section 01170. All work shall be planned, coordinated and tested by the Contractor to the fullest extent possible, to minimize downtime impact for PLC conversions and upgrades.
- 16. Train District Staff on the Operation and Maintenance on all facets of the upgraded PLC control system, HMI, OIT, equipment and software programming. The following on-site training sessions shall be provisioned by in the SI:
 - a. PLC Training - Four(4) sessions, Eight(8) hours per session.
 - b. HMI Training - Two(2) sessions, Eight(8) hours per sessions
 - c. OIT Training - One(1) session, Two(2) hours
- 17. Control system configuration by the SI shall include the following:
 - a. PID verification and tuning.
 - b. Logical sequencing and timing of equipment control, etc.
 - c. Monitoring and alarming.
 - d. HMI and OIT software development including real-time database, report generation, graphic screens.
 - e. HMI application development, alarming set point modification, data archiving, etc.
 - f. No real-time process control shall be implemented at the HMIs.
 - g. All PLC programming shall be in Ladder-Logic. Any exceptions shall be at the approval of the Engineer.
 - h. Collect, store and maintain any historical operating information for present and future reporting and maintenance uses while upgrades are performed.
 - i. Assist operating personnel by noting and communicating off-normal operating conditions and equipment failures at remote sites.
- 18. The SI shall not deviate from or modify any numbering scheme or existing process control strategy without Engineer's approval.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

19. The SI shall furnish and maintain their own development applications licenses as needed to convert, migrate and configure the latest version of PLC, HMI and OIT's required for the Project. The District shall provide separate development and test computer workstations, servers and associated licenses, as needed for permanent maintenance, support and runtime operation of the upgraded Control System.
20. Perform all other work where noted "by SI."

V. System Migration and Cutover:

1. The existing Olivenhain SCADA HMI system includes three (3) separate Ignition SCADA Servers, Workstations and PLC systems as shown on the Drawings.
2. The SI shall provide SCADA HMI, OIT and PLC programming configuration that includes the following:
 - a. All existing PLC programs shall be rewritten and migrated to provide a common set of PLC programs developed under the Studio 5000 logic software for new and existing programs. Sequence and strategy for transition shall be as detailed in this Section. All existing program transition, installation, testing, startup, and commissioning shall be coordinated with and approved by the District.
 - b. Existing process systems that are to be revised as permanent functions as part of this Project, as required by the Drawings and Specifications.
 - c. Prior to process system modifications or additions, existing systems shall remain part of the existing SCADA HMI system. Once modifications are made, graphic displays created by the SI to depict the modifications shall become "active". After completion of functional testing, and approval by the Engineer, all existing and new View Workstations shall be updated with the associated new display and data for that system shall be monitored and controlled by the new SCADA HMI servers and OIT's.
 - d. Interim and temporary equipment that are installed as part of this Project connected to new or existing control panels. This work includes modified and new IO points added to existing or new IO panels as shown in Appendix 17000-K. Prior to process system modifications or additions, existing systems shall remain part of the existing SCADA HMI system. Once modifications are made, graphic displays created by the SI to depict the modifications shall become "active". After completion of functional testing, and approval by the Engineer, all existing and new View Workstations shall be updated with the associated new display and data for the interim and temporary at system shall be monitored and controlled by the new SCADA HMI servers.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

3. Existing District networks are presently operating within the District as shown on the Drawings in Appendix 17000-B.1. These networks will be protected throughout construction and shall remain operational at all times, and include the following:
 - a. Plant network at DCMWTP
 - b. Plant network at 4SWRF
 - c. Remote sites via OMWD's Radio Telemetry and Fiber Networks
4. The existing plant SCADA SCADA HMI Servers shall be maintained by District staff during construction until all existing systems are transitioned to the new SCADA system.
5. System Freeze dates shall be incorporated into Phase 1 and 2 project schedules for individual Facilities, PLC's and associated sub-systems. The latest version of PLC, OIT and HMI programs shall be transferred to the SI on the Freeze Dates. Any online programming or system modifications shall be tracked by the District and reported to the SI by the Engineer

1.6 CONTRACT DOCUMENTS

- A. The Drawings and Specifications herein are intended to be descriptive of the type of control system upgrades to be provided with sufficient detail to construct. Minor omission of detail shall not relieve a qualified contractor from the obligation to provide a complete operational system if it can be determined that the particular detail is usual and customary for similar system.
- B. Appendix 17000-B.1 Contract Drawings are comprised of diagrammatic layouts and indicate general arrangement of systems and equipment for example only.
 1. Exact locations and layouts of electrical products shall be defined during submittal, assembly, or field fit during construction. Field measurements take precedence over dimensioned drawings. Drawing intent is to show initial size, capacity, approximate location, orientation, and general relationship of equipment in area shown but may not show exact detail or arrangement.
 2. In no case, is NEC, UL, or other applicable governing standards to be overridden.
 3. As-built AutoCAD and PDF documentation sets for finalized equipment installations are to be provided by the Contractor for all facilities listed in Appendix 17000-A.
- C. No changes from the Contract Documents or Specifications shall be made without written approval of the Engineer. Should there be need to need to deviate from the Contract Documents, written details and reasons for all changes shall be submitted to the Engineer for review.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

1.7 SUBMITTALS

A. General

1. Submittals shall be provided per Section 01300 Record Drawings and Submittals.
2. Fabrication of an item and software development shall be commenced only after the Engineer has reviewed the pertinent submittals and declared to the Contractor either "NO EXCEPTIONS TAKEN" or MAKE CORRECTIONS NOTED."
3. Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.
4. All Contractor shop drawings submittals shall be carefully reviewed by an authorized representative of the Contractor, prior to submission to the Engineer. The Engineer's review of Contractor shop drawings submittals shall not relieve the Contractor of the entire responsibility for the correctness of details and dimensions. The Contractor shall assume all responsibility and risk for any misfits due to any errors in Contractor submittals. The Contractor shall be responsible for the dimensions and the design of adequate connections and details.
5. All submittals and documentation for Control Panel Upgrades and Upgrade shall be grouped by site. Each submittal and Bill of Materials shall reference and provide details according to the "Description", "Facility Name/Type", "ID" and "Function" provided in Appendix 17000-A.
6. A separate technical brochure or bulletin shall be included for each instrument, and equipment item, system, and other element.
7. The Contractor shall modify the original site Control Panel and Wiring Diagrams to the project, which will constitute as the basis for "Shop Drawings" to the project.
8. Original AutoCAD control panel drawings exist for some (but not all) facilities and control panels, as identified in Appendix 17000-A. AutoCAD submittals shall be provided by the Contractor for all PLC Control Panel Upgrades as follows:
 - a. Where original AutoCAD drawing files do exist, they shall be updated to the latest version of AutoCAD, modified to include redline updates and modifications for the PLC Replacement Project. All changes shall be identified with a clearly identifiable cloud bubble and reference note on the original AutoCAD file.
 - b. Where original AutoCAD drawing files do not exist, new AutoCAD source files shall be furnished by the Contractor to reflect control panel configuration and wiring. PDF to AutoCAD conversions will

SECTION 17000 – INSTRUMENTATION AND CONTROLS

not be accepted. Only sheets affected by the PLC upgrades shall be re-produced in AutoCAD. All changes and redlines from the original interpreted's PDF shall be identified with a clearly identifiable cloud bubble and reference note on the original AutoCAD file.

9. Wiring diagrams or control circuits shall be submitted and show complete details on the circuit interconnectivity of all devices within each Control Panel.
10. Diagrams shall consist of component layout drawings to scale, showing numbered terminals on components together with the unique number of the wire to be connected to each terminal. Wiring diagrams shall show terminal assignments from all primary measurement devices, such as flow meters, and to all final control devices, such as pumps, valves and local control panels.
11. Complete control panel layouts, showing:
 - a. Physical arrangements which define and quantify the physical groupings of, PLC components, annunciators, hand stations, recorders, indicators, pilot lights and all other instrumentation devices associated with control panel sections, auxiliary panels, subpanels and racks.
 - b. All cutout locations fully dimensioned.
 - c. All outside panel dimensions shall be shown.
 - d. Back panel equipment layout and terminal point locations for all panel and back-of-panel piping and wiring connections.
 - e. Terminations shall be coded with identifiers for wiring and piping connections for all electric, hydraulic and pneumatic terminations.
12. New AutoCAD network drawings shall be updated and provided for as follows:
 - a. Remote Sites - Appendix 17000-B.1, SHEET I-004
 - b. 4SWRF - Appendix 17000-B.1, SHEET I-003
 - c. DCMWTP - Appendix 17000-B.1, SHEET I-005
13. Each specific submittal shall be submitted and favorably reviewed by the Engineer and the District prior to any work being performed on subsequent submittals.

B. Submittal Requirements

1. Submittals shall be electronic format, including the following:

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- a. Permanent Recorded PDF Copy – fully bookmarked with links to each of the sections identified in the documents table of contents.
 - b. AutoCAD Originals (Upon Final Acceptance). All drawings developed for the PLC Control Panels shall be generated utilizing a commercial CAD system and shall be delivered electronically in a DWG format, as completely compatible with/readable by the latest AutoCAD software package.
 - c. Word Document Originals (Upon Final Acceptance).
 - d. Excel Originals (Upon Final Acceptance).
 - e. All other original sources of documented information.
2. Phase specific submittals shall be submitted for review as determined by the Contractor to coordinate properly with the overall construction sequence including review and comments cycles by the Engineer.
3. The submittal drawings' title block shall include, as a minimum, the SI's registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing and documentation.
4. Submittals shall be coordinated and provided by the Contractor, under four(4) separate phase groupings, including:
 - a. Phase 1a - 4S Remote Sites,
 - b. Phase 1b – Distribution Remote Sites,
 - c. Phase 2a - DCMWTP, and
 - d. Phase 2b - 4SWRF.
5. The Contractor shall group, coordinate and provide the following submittals for each of the phase groupings:
 - 1) Project Plan and Schedule
 - 2) Meetings and Coordination Workshop Agendas
 - 3) Control Panel and Wiring Diagram Submittal
 - 4) PLC Programming Submittal
 - a) PLC Programs & Release Notes
 - 5) HMI and OIT Programming Submittal
 - a) HMI and OIT Programs & Release Notes
 - 6) PLC Control Logic Simulator System (4SWRF Only)
 - 7) Factory and Field Testing Plan
 - 8) Training Plan
 - 9) Spares, Expendables and Test Equipment
 - 10) Operations and Maintenance Manual

SECTION 17000 – INSTRUMENTATION AND CONTROLS

6. Drawing and documentation modifications that are identified during Factory Testing shall be corrected and available for reference during field installation, testing and commissioning tasks.

C. Project Plan Submittal

1. The Project Plan shall, at a minimum, contain an overview of the following project work and approach, including:
 - a. System architecture drawings for: DCMWTP, 4SWRF and Typical Remote Site Configuration.
 - b. Equipment procurement, fabrication and testing
 - c. PLC, HMI and OIT Software Conversion
 - d. Decommissioning, installation, replacement, coordination, commissioning and interim operations
 - e. Project Schedule
 - f. Training
2. Prepare separate project schedules using Microsoft Project for Project Phases 1 and 2 – Gantt Chart Format. At a minimum the following details shall be included:
 - a. Major tasks outlines, task start and end dates, milestones, predecessors and critical path.
 - b. Dates for all subsequent project submittals defined within the Specifications, including provision for a minimum of two complete District review cycles. Each Engineer review cycle is anticipated to take thirty(30) calendar days.
 - c. Responses to RFI's are anticipated to take fourteen(14) days.
 - d. Proposed dates for all specified Project Coordination Workshops.
 - e. Hardware purchasing, fabrication, and assembly.
 - f. Software purchasing and configuration.
 - g. Development of PLC control logic simulator system for 4SWRF per Section 17490.
 - h. Shipment of all control system equipment.
 - i. Installation of all field instrumentation and control system equipment including timing and sequence for implementation.
 - j. Development and Testing: Schedule for all testing including at a

SECTION 17000 – INSTRUMENTATION AND CONTROLS

minimum the testing sequence as specified per Section 17490.

- k. Dates for system cutover, startup, commissioning for each major element of the process control system. At a minimum, include the schedule for each PLC and OIT upgrade, along with HMI servers/workstations modifications provided under this Contract.
- l. Startup and commissioning period for each control system PLC as identified in Appendix 17000-A, the Contract Documents and each major construction phase as detailed per the Specifications and in accordance with the Special Technical Provisions defined in Section 01170.
- m. Schedule for all training including submittal and approval of O&M manuals, factory training, and site training.

D. Meetings and Coordination Workshops Agendas Submittals

- 1. A Project Kick-Off Meeting shall be initiated by the Contractor within twenty-one(21) calendar days from Notice to Proceed.
- 2. Four (4) groups of workshops shall be provisioned for by the Contractor, including:
 - a. Phase 1a - 4S Remote Sites, including separate workshops for:
 - 1) Hardware Design & PLC/HMI/OIT Programing
(within thirty(45)-calendar days from Notice to Proceed)
 - 2) Installation and Commissioning
(within ninety(90)-calendar days from Notice to Proceed)
 - b. Phase 1b - Distribution Remote Sites, including separate workshops for:
 - 1) Hardware Design & PLC/HMI/OIT Programming
(within 135-calendar days from Notice to Proceed)
 - 2) Installation and Commissioning
(within 150-calendar days from Notice to Proceed)
 - c. Phase 2a - 4SWRF, including separate workshops:
 - 1) Hardware Design
(within 180-calendar days Notice to Proceed)
 - 2) PLC, HMI, OIT Programming & PLC Simulator
(within 210-calendar days Notice to Proceed)

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- 3) Installation and Commissioning
(within 240-calendar days Notice to Proceed)
 - d. Phase 2b - DCMWTP, including separate workshops for:
 - 1) Hardware Design
(within 330 calendar days from Notice to Proceed)
 - 2) PLC, HMI, OIT Programming
(within 360 calendar days from Notice to Proceed)
 - 3) Installation and Commissioning
(within 390 calendar days from Notice to Proceed)
 3. Agendas shall be submitted for the Coordination Workshops as specified in these Specifications. Submit proposed Control System Coordination Workshop Agendas a minimum of four weeks prior to the scheduled workshop dates for review and comment by Engineer and modification by the SI as required. Each Workshop shall be limited to three(3) hours.
 4. Detailed minutes shall be recorded by the SI at each of the individual workshops and meetings, and circulated to the Engineer for approval, within Seven(7) calendar days from completion of the workshop.
- E. Control Panel and Wiring Diagram Submittal
1. Prepare and submit separate submittal packages for Project Phases 1 and 2.
 2. Bill of Materials
 - a. Provisional Bills of Materials are provided for each control panel upgrade and facility in Appendix 17000-B.2 Contract Documents. The Bills of Materials are for reference use only by the Contractor, and do not necessarily reflect exact quantities. The Contractor is responsible to verify all configurations, part numbers and quantities. All components and devices shall be furnished and installed as required to provide a complete operable, ready for use and reliable system for accomplishing the functions and meeting the performance set forth herein.
 - b. A complete and detailed Bill of Material list shall be submitted for each field mounted device or assembly as well as cabinet assemblies and subassemblies. Bills of Material shall include all items within an enclosure. An incomplete submittal shall be rejected and no further evaluation performed until a complete and detailed bill of material is submitted.
 3. Where PLC upgrades are provided to control panel installations, submit separate submittal packages for all modified drawing sheets. Samples of

SECTION 17000 – INSTRUMENTATION AND CONTROLS

modified wiring diagram and control panel submittals acceptable to the Owner and Engineer, are provided in Appendix 17000-B.1 Contract Drawings.

- a. Layout, format, and labeling used on the wiring diagrams shall match format and level of detail shown on the Drawings, generally in conformance with the level of detail presented in the sample wiring diagrams therein. Diagrams shall include project panel and component specific name and number placeholders, protection devices, wire and cable identification labeling, power supply connections, specific circuit and panel specified requirements, etc. for a fully documented interconnected wiring system.
 - b. Process controller wiring to interface boards for fieldbus, networking, or other special systems wiring shall be numbered with rack number, slot number, and termination number as applicable.
 - c. Incorporate panel/module power wiring and power supplies. Include all fuse and protection devices including ratings.
 - d. Updated drawing sets with modified PLC Panel Configurations and Bill of Materials must be submitted and approved by the Engineer prior to Construction and Field Testing.
 - e. Where updated drawing sets are modified in the field during the Construction and Installation process, redline markups shall be left within control panels during Construction and Field Testing until such time that final As-Built are delivered and left in place by the Contractor.
4. Submit evidence that all control panels shall be modified in conformance with UL 508. Additionally, specific UL 508 seal application is required for:
 - a. D-002, 4S-1 Reservoir Back Panel ReplacementAll costs associated with obtaining the UL seal and any inspections shall be borne by the Contractor and included in the Project Bid Price.
 5. Control Panel Submittals shall be inclusive of the following PLC upgrade types specified within Division 17. This includes the following SLC and MicroLogix upgrade and conversion types identified in Appendix 17000-B.1 and B.2:
 - a. TYPE 1 Compact Re-Terminations & Conversions
 - b. TYPE 2 CompactLogix Entelec Harnessing & Conversions
 - c. TYPE 3 ControlLogix Re-Termination & Conversions
 - d. TYPE 4 MicroLogix Conversions

SECTION 17000 – INSTRUMENTATION AND CONTROLS

6. The SI shall furnish equipment that is the product of one manufacturer to the maximum practical extent. Where this is not practical, all equipment of a given type shall be the product of one manufacturer.
7. Load Calculations:
 - a. The Contractor shall be responsible to ensure that all upgraded components of the PLC Control Panels do not exceed the limits of existing Power Supply ratings.
 - b. Additional power supplies, power distribution, terminal blocks, wiring, fusing and conversion modules shall be supplied as required to provide newly installed equipment with the required equipment operational voltage and current. Power supplies and power distribution shall be sized to provide 125 percent of the maximum current requirements.
 - c. Panel power requirements shall state required voltages, currents, and phases.
 - d. Load calculations shall be provided to calculate the required standby power for battery backed loads for a duration of 4 hours.
 - e. Load calculations shall be provided to verify load currents for all power supplies.
8. Submit network diagrams for new and modified Serial and Ethernet systems.
 - a. The network diagrams shall contain the physical wiring layout showing trunk lines, drop lines, junction boxes, terminals, scanning device, terminating resistors, and all network connections.
 - b. Indicate media transitions from copper to fiber, fiber to copper, wireless to wired, etc. Identify all equipment and physical location of each (enclosure, panel, etc.)
 - c. The network diagrams shall indicate type, physical location, network address, port type and configuration, etc. of each switch and router provided.
 - d. Submit network switch, router and any other applicable network convertor module configuration files.
 - e. Where applicable, submit separate network diagrams and configuration files for system operation under Phases 1 and 2 conversions.

F. PLC Programming Submittals

1. Prepare and submit separate submittal packages for Project Phases 1 and

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- 2.
2. The PLC Software Design Specification shall define how the SI will, convert, configure and program the new software applications for each of the converted PLC programs. The PLC Software Design Specification shall be submitted and favorably reviewed by the Engineer and the District prior to any work being performed on subsequent submittals.
3. The SI shall develop the PLC Software Design Specification using the existing SLC 500 PLC programs provided by the District after contract award, and established as the basis for the conversion.
4. Specific details shall be provided for handling conversion of:
 - a. PLC Ladder Format and Program Organization
 - b. Conversions Errors and Warnings
 - c. Symbol Addressing and Tag Naming
 - d. Message Instructions
 - e. Copy Instructions
 - f. Timer Instructions
 - g. Indirect Addressing
 - h. Control and IO Configuration and Status
 - i. PID Instructions
 - j. Analog IO Configuration
 - k. IO Data Buffering and Debouncing
 - l. Initialization variables, operator setpoints, states and other memory variables memory variables that must be preserved during conversion.
5. The following programming criteria shall apply for upgraded and modifications of PLC programs from 1746 SLC and 1766 MicroLogix to Studio 5000 programming environment:
 - a. All routine names shall be descriptive.
 - b. Each program rung shall be commented upon completion program conversion, even if it is not the programmer's original code.
 - c. Rung comments shall be included a detailed description of the logic. Logic actions shall be understandable by non-programmers

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- d. Rungs or logic that is modified from the original to converted PLC programs shall include the following information:
 - 1) Reason for modification
 - 2) Rung comments as specified herein
 - 3) Date of modification
 - 4) Name of programmer who performed the modification
 - 5) Name of the programmer's company
 - 6) Company contact information
- e. The PLC program description of each physical I/O point shall match the field tag and description as reflected on the updated Control Panel Drawings.
- 6. Compliance with the PLC software migration strategy and technical guidance under Appendix 17000-L shall be demonstrated in the submittal.
- 7. Throughput and update rates between the Plant SCADA HMI Servers, OIT's and PLC's shall be maintained as equal or better to existing system performance by applying (as needed by the SI):
 - a. Optimized PLC Array Tags
 - b. Keeping Tag Names Short
 - c. Increasing CPU Time Slice (not to exceed 40%)
 - d. Applying Alias Tags
- 8. All completed work for conversion of PLC programs shall be submitted by the SI and favorably reviewed by the Engineer and the District prior to any Factory and Field Testing.
- 9. The Contractor shall maintain and submit detailed Release Notes for any modifications to the PLC Programs following completion to the Factory Testing. The Release Notes shall indicate the date of change, description and location of the changes. The Release Notes shall be submitted to the Engineer prior to commencement of Field Testing.
- G. HMI and OIT Programming Submittals
 - 1. Prepare and submit separate submittal packages for Project Phases 1 and 2.
 - 2. The HMI and OIT Software Design Specification shall define how the SI will, convert, configure and program the new software applications for each of the converted HMI and OIT programs. The HMI and OIT Software Design Specification shall be submitted and favorably reviewed by the Engineer and the District prior to any work being performed on subsequent submittals.
 - 3. The SI shall develop the HMI and OIT Software Design Specification using

SECTION 17000 – INSTRUMENTATION AND CONTROLS

the existing Ignition and FactoryView programs (respectively), as the established basis for the conversion.

4. Specific details shall be provided for handling conversion and update of:
 - a. OPC Topics and Item Names.
 - b. Communications drivers and PLC communications paths.
 - c. PLC communications topics and update rates, along with identifying any foreseeable performance bottlenecks.
 - d. Database import/export technique, OPC Item Names and approach to ensuring that integrity of the Memory Mapping is not lost during conversion.
 - e. IO and Diagnostic Displays.
 - f. Historical datalogging and preserving integrity and access to previous historical data records post upgrade.
 - g. Initialization variables, operator setpoints, states and other memory variables that must be preserved during conversion.
5. Compliance with the OIT and HMI software migration strategy and technical guidance under Appendix 17000-L shall be demonstrated in the submittal.
6. All completed work for conversion of HMI and OIT program conversions shall be submitted by the SI and favorably reviewed by the Engineer and the District prior to any Factory and Field Testing.
7. The Contractor shall maintain and submit detailed Release Notes for any modifications to the HMI and OIT Programs following completion to the Factory Testing. The Release Notes shall indicate the date of change, description and location of the changes. The Release Notes shall be submitted to the Engineer prior to commencement of Field Testing.

H. PLC Control Logic Simulation System

1. Prepare and submit PLC Control Logic Simulator Submittal Design package for 4SWRF only per Appendix 17000-A.
2. Submit hardware and programming details for a standalone control logic simulator as specified in Section 17490.
3. Submit simulation programming strategy and overview that defines specifically how:
 - a. IO data will be mapped and switched for each individual PLC between simulation and real process IO.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- b. Simulation and programming logic for every associated plant process and loop, including equipment and instrumentation (pumps, valves, PID's, transmitters, switches, etc).

I. Factory and Field Testing Submittal

- 1. Prepare and submit separate submittal packages for Project Phases 1 and 2.
- 2. The Contractor shall provide comprehensive-testing procedures, forms and reports complete. Testing submittals shall address the testing and commissioning requirements of Section 17490. The testing and commissioning binder shall include:
 - a. Table of Contents
 - b. List of Testing Material, Test Equipment and Measurement Devices.
 - c. Summary of Test Procedures
 - d. Loop/Component Inspections Forms
 - e. Qualifications of Testing Personnel
- 3. For Field Testing, a separate Plant Outage and Planning Schedule shall be submitted at least fourteen(14) days prior to commencement of testing for each site, including: equipment to be de-energized, breakers to be opened and Lock-Out Tag-Out required,

J. Training Plan

- 1. Prepare and submit separate submittal packages for Project Phases 1 and 2.
- 2. The training plan shall include:
 - a. Course outline.
 - b. Recommended audience.
 - c. Schedule.
 - d. Instructor Bio's.

K. Operations and Maintenance Manuals

- 1. Submittals for Operations and Maintenance Manuals shall be by Facility Group:
 - a. Distribution Sites (PS's, PRS,'s Reservoirs)

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- b. Wastewater (SPS's and 4SWRF)
- c. Water Treatment (DCMWTP)
- 2. The Contractor shall submit technical operation and maintenance information for each item of mechanical, electrical and instrumentation equipment in an organized manner in the Owner's Manual. It shall be written so that it can be used and understood by the District's operation and maintenance staff.
- 3. Owner's Manual shall be in both hard copy and electronic as stated in within this Specification and Section 01300, subdivided first by specification section number; second, by equipment item; and last, by "Part." "Parts" shall conform to the following (as applicable):
 - a. Part 1 — Equipment Summary:
 - Procedures: Manufacturer-recommended procedures
 - b. Part 2 — Operational Procedures:
 - 1) Summary: A summary table shall indicate the equipment name, equipment number, and process area in which the equipment is installed.
 - Installation
 - Adjustment
 - Location of controls, special tools, equipment required, or related instrumentation needed for operation
 - Operation procedures
 - Load changes
 - Calibration
 - Shutdown
 - Troubleshooting
 - Disassembly
 - Reassembly
 - Realignment
 - Testing to determine performance efficiency
 - Tabulation of proper settings for all pressure relief valves, low and high-pressure switches, and other protection devices
 - List of all electrical relay settings including alarm and contact settings
 - c. Part 3 — Preventive Maintenance Procedures:
 - 1) Procedures: Preventive maintenance procedures shall include all manufacturer-recommended procedures to be performed on a periodic basis, both by removing and

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- replacing the equipment or component, and by leaving the equipment in place.
- 2) Schedules: Recommended frequency of preventive maintenance procedures shall be included. Lubrication schedules, including lubricant SAE grade, type, and temperature ranges, shall be covered.
- d. Part 4 - Parts List:
- 1) Parts List: A complete parts list shall be furnished, including a generic description and manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included.
 - 2) Drawings: Cross-sectional or exploded view drawings shall accompany the parts list that have been updated to reflect any factory test and/or field modifications
- e. Part 5 – Updated Shop Drawings As-Built Wiring Diagrams:
- 1) Diagrams: Part 5 shall include As-Built complete internal and connection wiring diagrams for modified and control panel electrical equipment items.
 - 2) Drawings: This part shall include approved shop or fabrication drawings.
- f. Part 6- HMI Display and Database Updates
- 1) Displays: Include screen captures of all modified and updated displays, with explanation of changes
 - 2) Database: Include capture of all modified HMI Tag Database updates and modifications
 - 3) Include any other HMI related programming changes, configuration or modifications
- g. Part 7 – OIT Display and Database Updates
- 1) Displays: Include screen captures of all modified and updated displays, with explanation of changes
 - 2) Database: Include capture of all modified OIT Tag Database updates and modifications
 - 3) Include any other OIT related programming changes, configuration or modifications
- h. Part 8 - Safety:
- 1) Procedures: This part describes the safety precautions to be taken when operating and maintaining the equipment or working near it.
- i. Part 9 - Documentation:

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- 1) All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.
 - 2) Updated and Finalized copies of IO List for All Control Panels
 - 3) Updated and finalized copies of all OIT and SCADA to PLC Memory Maps
4. Submit electronic readable PDF file format of the proposed O&M manuals for review by the Engineer. Submittals shall be delivered in a timely manner to the Engineer to allow for review period, corrections and re-submissions as necessary, including the following:
- a. O&M submittals shall be published 1st electronically and 2nd on hard copy stock.
 - b. Electronic submittals shall be transmitted with the hard copy submittals and be viewable using a PDF reader
 - c. Electronic submittals shall be assembled in accordance with the specifications for hard copy submittals with table of contents, bookmarks, tabs, subtabs, etc. utilizing the electronic bookmarks feature available in the PDF assembler.
5. Provide three(3) sets of hard copy O&M manuals per Facility Group, and by the specifications defined in this section.
6. Delivery of approved hard-copy O&M manuals shall be made to the Owner's designated facility prior to Field Testing.
7. At the end of the project, hard copy and soft copy electronic PDF files, shall be updated to As-Built conditions. Additionally, original Word Document and AutoCAD drawings shall be provided to the Owner.
8. Incomplete or unacceptable Owner's Manuals shall constitute sufficient justification to withhold adequate amount, proportional in value, from any monies due the Contractor.

1.8 QUALIFICATIONS

A. SYSTEMS INTEGRATOR

1. The SI shall have on staff a Project Engineer with three(3) years prior experience on water and wastewater projects. This Project Engineer shall coordinate the technical aspects of this project and prepare the submittals and drawings. The Project Engineer shall attend all coordination meetings when specifically requested by the Engineer
2. Shall be competent in and familiar with management and subcontracting of

SECTION 17000 – INSTRUMENTATION AND CONTROLS

specialty electrical and instrumentation supply and engineering work as requires of a Systems Integrator as described herein.

3. The SI shall meet the following minimum qualifications:
 - a. Perform at least 60% of the work defined within the Specifications and Contract.
 - b. Has a current C10 Electrical Contractor's License issued by the State of California Department of Consumer Affairs.
 - c. Employs a professional Control Systems Engineer or Electrical Engineer registered in the State of California to supervise The Project.
 - d. Employs personnel who have successfully completed manufacturers' training courses on the specific PLC's, computers, and software associated with this Project.
 - e. Be a current Certified Member of the following System Integrator programs, with active status for at least the past year:
 - 1) Allen-Bradley – Systems Integrator Partner Program (minimum Silver or Gold Status)
 - 2) Inductive Automaton - Certified (minimum Core Certified)
 - f. Has performed work of similar or greater complexity on at least five previous water industry projects.
 - g. Has been actively engaged in the type of work specified in this Specification Section, in the water and wastewater industry, for a minimum of the past five(5) years.
 - 1) At least three(3) projects shall be listed, including associated references with the Contractors tender package.
 - h. Has been actively engaged in industrial process control programming and system integration for a minimum of ten years.
 - i. Has been actively engaged in HMI configuration and system integration for a minimum of five years.
 - j. Has not been removed from a project during the past five years due to performance or failure to meet project milestone delivery requirements.
 - k. Maintains a permanent, fully staffed and equipped service facility within four(4) hours travel time of the Project Sites defined in Appendix A, with full time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified

SECTION 17000 – INSTRUMENTATION AND CONTROLS

in these Specifications.

- I. Shall be capable of responding to on-site problems within four(4) hours of notice.

B. ELECTRICAL CONTRACTOR

1. The Electrical Contractor (EC) shall meet the following minimum Qualifications:
 - a. The EC shall have on staff a Project Manager with three(3) years prior experience on water and wastewater projects. The Project Manager shall coordinate and attend all meetings as specified herein.
 - b. Has a current C10 Electrical Contractor's License issued by the State of California Department of Consumer Affairs.
 - c. EC shall be regularly engaged in similar industrial power and controls electrical contracting for the Water and Wastewater Industry.
 - d. EC shall have successfully performed work of similar or greater complexity (as measured in contract value on industrial power and controls projects) on at least three (3) previous projects.
 - e. EC shall carry all insurances as defined and required by the special provisions and as required by law.
 - f. EC shall be competent in methods and materials execution and selection associated in the type of electrical and instrumentation work specified in this Division.
 - 1) EC shall be familiar with and understand codes and requirements from NFPA70, NFPA110, and all other governing national or local codes as required for work scope as described in the drawings and specifications.
 - 2) EC shall know and understand common terms and abbreviations used in this Industry. Not all terms and abbreviations will be defined in the drawings and specifications.
 - g. EC shall comply with State law which requires that all personnel installing electrical components are certified by the State of California as "Electrician" or "Electrician Trainee." Apprentices may install electrical components only under direct supervision of a certified Electrician.
 - h. EC shall have sufficient qualified personnel to staff the project and meet the construction schedule as defined by the Contract requirements or as approved during the submittal process.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

C. ORIGINAL EQUIPMENT MANUFACTURER

1. The Energy Recovery Turbine (ERT) Control Panels at DCMWTP have specialized Original Equipment Manufacturer (OEM) installed with customized control algorithms, programs, Modbus RTU communications and Red Hat OIT. The PLC Control Panels comprise the ERT Sub-System identified as M-201, 203 and 203 in Appendix 17000-A of the Specification. Design, upgrade and integration of the ERT Sub-System and its associated Control Panels, software programing, simulation, installation, testing and commissioning shall be sole-sourced by the Contractor to the OEM "Canyon Hydro". The OEM's System Engineer may be contacted at Canyon Hydro – michael.maloney@canyonhydro.com for further assistance.
2. Provision of a Control Logic and Process Simulation System for Factory Testing of the ERT System Upgrade at DCMWTP shall be at the discretion and recommendation of the OEM – Canyon Hydro, in order to facilitate successful execution of the upgrade.

D. DISTRIBUTOR

1. The Contractors authorized distributor and wholesaler of the Allen-Bradley PLC replacement supply equipment shall be based within 50 mile radius of the OMWD head office location at 1966 Olivenhain Rd, Encinitas, CA 92024.

E. QUALIFICATIONS AND PROJECT STAFFING

1. The Contractor shall provide responses to all qualification requirements listed above in sufficient detail to show the specified minimum qualification requirements are met. Submit resumes of proposed project manager and project engineer, PLC and HMI software programmers, firm qualifications, relevant project descriptions, office locations, and other required data.
2. Dedicated project levels staffing shall be maintained by the Contractor throughout the contract duration and resources shall not be re-allocated without District approval. At a minimum, resumes shall be provided for the following project personnel:
 - a. One(1) Project Manager
 - b. One(1) Full-time Project Engineer
 - c. Two(2) Full-time PLC Programmers
 - d. One(1) Full-time HMI/OIT Programmer
3. Sufficient Field Technicians shall be provided for field installation, commissioning and to support overall project schedules.
4. Submit firm qualifications, certifications, relevant project descriptions, office

SECTION 17000 – INSTRUMENTATION AND CONTROLS

locations, and other required data. Preprinted brochures alone without specifically addressing the specified qualification requirements will not be acceptable or adequate for judging the firm to be qualified

5. The Contractor and Integrator shall each provide at least five(5) water and wastewater project references from within the last five(5) years.

1.9 SPARE PARTS

- A. Critical Spares shall be defined as any upgraded hardware piece or component, critical to maintenance, operations and support of the PLC upgrade program. This shall include, but not be limited to each type of used within the Project:
 1. PLC Power Supplies
 2. PLC Controller
 3. PLC IO Modules and associated Terminal Block Connector
 4. PLC Remote IO and Network Module
 5. Connectors and Harnesses
- B. The Contractor shall identify and include in the Owner's Manual a list of Critical Spare parts as per the specification requirements.
- C. Two(2) of each Critical Spares item identified in the Critical Spare Parts List shall be provided by the Contractor before commencement of installation. Supplied spares to be at the same firmware revision level as all other system components that are in use.

1.10 GUARANTEE

- A. The Contractor shall guarantee the performance and the hardware of all the Control Panel equipment as specified herein, for a period of one(1) year following the date of completion and formal acceptance of the Work as specified under the General Conditions of these Specifications. Services shall begin within 24 hours for critical items and within three(3) calendar days for non-critical items after notification by the District.
- B. Equipment, software, and materials which do not achieve design requirements after installation shall be replaced or modified by the System Integrator to attain compliance, at no additional cost to the District. Following replacement or modification, the Contractor shall retest the system and perform any additional procedures needed to place the complete system in satisfactory operation and attain design compliance approval from the Engineer.
- C. All parts, material (excluding consumables), labor, travel, subsistence, or other expenses incurred in providing all the services and service visits during the one-year warrantee period shall be borne by the Contractor under the guarantee.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

PART 2 PRODUCTS

2.1 MATERIALS AND STANDARD SPECIFICATIONS

- A. Provide instruments, equipment and materials suitable for service conditions and meeting standard specifications such as ANSI, ASTM, ISA, and SAMA. The intent of this Specification is to insure instruments and equipment are of a uniform quality and manufacture throughout the plant. All instruments in the plant of the same type shall be made by the same manufacturer.

2.2 NAME TAGS

- A. All instrumentation and equipment items or systems shall be identified by name tags. Field equipment shall be tagged with the assigned instrumentation tag number listed in the Instrument Schedule.
- B. Name tags shall be stainless steel with engraved or stamped black characters of 3/16 inch minimum height. Tags shall be attached to equipment with a tag holder and stainless steel band with a worm screw clamping device. Use 20-gauge stainless steel wire where banding is impractical. For field panels or large equipment cases use stainless steel screws; however, such permanent attachment shall not be on an ordinarily replaceable part.

2.3 FIELD-MOUNTED EQUIPMENT

- A. All instrument and control equipment mounted outside of protective structures shall be equipped with suitable surge arresting devices to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharges or nearby electrical devices. Protective devices used on 120 Vac inputs to field mounted equipment shall be secondary valve surge protectors conforming to the requirements of ANSI C62.1.
- B. All Field Mounted Equipment requirements specified herein are only applicable to modifications and additions of instrumentation occurring as a result of installation related to the Olivenhain Municipal Water District (OMWD) Programmable Logic Controller (PLC) Replacement Project

2.4 EQUIPMENT OPERATING CONDITIONS

- A. All equipment shall be rated for normal operating performance with varying operating conditions over the following minimum ranges.
 - 1. Operation and Maintenance (O&M) Manuals shall be prepared respective to the Work of this Instrumentation Section. Preliminary and final O&M Manuals shall be submitted for Engineer approval.
 - 2. Field Instruments:
 - a. Outdoor Areas:

SECTION 17000 – INSTRUMENTATION AND CONTROLS

- 1) Ambient Temperature: +15°F to +120°F Ambient Relative Humidity: 5% to 100%
 - 2) Weather: Rain, and ice
- b. Indoor Unheated Areas:
- 1) Ambient Temperature: +30°F to +110°F
 - 2) Ambient Relative Humidity: 10% to 95%, non-condensing
- c. Indoor Environmentally Controlled Areas: Ambient Temperature: +60°F to +104°F
- 1) Ambient Relative Humidity: 10% to 90%, non-condensing

2.5 EQUIPMENT LOCATIONS

- A. Provide equipment and materials suitable for the types of locations in which they are located as defined under Division 17. All equipment specified for field mounting shall be weatherproof and splash proof as a minimum.

2.6 FASTENERS

- A. Fasteners for securing equipment to walls, floors and the like shall be 316 stainless steel. When fastening to existing walls, floors, and the like, provide capsule anchors, not expansion shields. Size capsule anchors to meet load requirements. Minimum size capsule anchor bolt is 3/8 inch.

2.7 ELECTRONIC MEDIA

- A. All submittals shall be exchanged via designated electronic sharefile site, approved by the District per Section 01300.

PART 3 EXECUTION

3.1 GENERAL

- A. Execution shall be performed in accordance with the Specifications and Section 17490.

SECTION 17000 – INSTRUMENTATION AND CONTROLS

APPENDICES

APPENDIX A	SITE DEFINITION AND IDENTIFIERS (17000-A)
APPENDIX B.1	CONTRACT DRAWINGS (17000-B.1)
APPENDIX B.2	PROVISIONAL BILL OF MATERIALS (17000-B.2)
APPENDIX C	OPERATOR INTERFACE UPGRADES (17000-C)
APPENDIX D	1746 SLC TO 5069 COMPACTLOGIX I/O CONVERSION (17000-D)
APPENDIX E	1746 SLC TO 1756 CONTROLLOGIX I/O CONVERSION (17000-E)
APPENDIX F	1766 MICROLOGIX TO 5069 COMPACTLOGIX (17000-F)
APPENDIX G.1	5069 IO CONVERSION SPECIAL CONDITIONS (17000-G.1)
APPENDIX G.2	1756 IO CONVERSION SPECIAL CONDITIONS (17000-G.2)
APPENDIX H.1	1746 to 5069 LOCAL AND REMOTE IO UPGRADES (17000-H.1)
APPENDIX H.2	1746 to 1756 LOCAL AND REMOTE IO UPGRADES (17000-H.2)
APPENDIX I.1	5069 PLC POWER SYSTEM UPGRADES (17000-I.1)
APPENDIX I.2	1756 PLC POWER SYSTEM UPGRADES (17000-I.2)
APPENDIX J	ETHERNET REMOTE IO UPGRADES (17000-J)
APPENDIX K	FIELD SURVEY DATA REPORT AND IO LIST (17000-K) - SEE SEPERATE ATTACHMENT
APPENDIX L	PLC PROGRAM MIGRATION (17000-L)

**** END OF SECTION ****

APPENDIX 17000-A SITE DEFINITION AND IDENTIFIERS

SITE DEFINITION AND IDENTIFIERS

Description	Facility Group	Phase	PLC Conversion Type	ID	Function	Address (California, USA) Project Sites	Process Simulator Required for UFT/WFT	Original AutoCAD Exist	Allowable Site Shutdown - Startup Window For Install (Hours)
Energy Recovery Turb. Remote IO #1	DCMWTP (Treatment)	2b	3	M-201	ERT-1 (RIO)	19090 Via Ambiente, Escondido	Per OEM Canyon Hydro	NO	Per Plant Shutdown Schedule
Energy Recovery Turb. Remote IO #2	DCMWTP (Treatment)	2b	3	M-202	ERT-2 (RIO)	19090 Via Ambiente, Escondido	Per OEM Canyon Hydro	NO	Per Plant Shutdown Schedule
Energy Recovery Turb. Control	DCMWTP (Treatment)	2b	3	M-203	ERT Control	19090 Via Ambiente, Escondido	Per OEM Canyon Hydro	NO	Per Plant Shutdown Schedule
Inst. & Control Panel #2	DCMWTP (Treatment)	2b	3	M-204	ICP-2	19090 Via Ambiente, Escondido	NO	NO	Per Plant Shutdown Schedule
Inst. & Control Panel #3	DCMWTP (Treatment)	2b	3	M-205	ICP-3	19090 Via Ambiente, Escondido	NO	NO	Per Plant Shutdown Schedule
Ammonia Feed Facility	DCMWTP (Treatment)	1b	3	M-206	AFIF	8250 Paseo Esplanada B, Escondido	NO	YES	Per Plant Shutdown Schedule
HW SCRUBBER PLC	4SWRF Plant (Wastewater)	2a	4	4S-101	Headworks Odor Control	16595 Dove Canyon Rd, San Diego	YES	NO	24
SDW SCRUBBER PLC	4SWRF Plant (Wastewater)	2a	4	4S-102	Solids Processing Odor Control	16595 Dove Canyon Rd, San Diego	YES	NO	24
BLOWER PLC	4SWRF Plant (Wastewater)	2a	1	4S-104	Blower Control PLC	16595 Dove Canyon Rd, San Diego	YES	YES	24
FILTERS PLC	4SWRF Plant (Wastewater)	2a	3	4S-112	US Water Filters PLC	16595 Dove Canyon Rd, San Diego	YES	NO	4
PLC 2A	4SWRF Plant (Wastewater)	2a	2	4S-116	Main Plant Control & Monitoring	16595 Dove Canyon Rd, San Diego	YES	YES	4
PLC 2B	4SWRF Plant (Wastewater)	2a	2	4S-117	Main Plant Control & Monitoring	16595 Dove Canyon Rd, San Diego	YES	YES	4
PLC 3	4SWRF Plant (Wastewater)	2a	1	4S-118	Reclaimed Water Pump Station	16595 Dove Canyon Rd, San Diego	YES	YES	6
PLC4	4SWRF Plant (Wastewater)	2a	1	4S-119	Pond Systems Res/Pump Station	16595 Dove Canyon Rd, San Diego	YES	YES	12
520	Distribution	1b	1	D-001	PRS & Flow Control	8400 B Artesian Rd, San Diego	NO	NO	24

Description	Facility Group	Phase	PLC Conversion Type	ID	Function	Address (California, USA) Project Sites	Process Simulator Required for UFT/WFT	Original AutoCAD Exist	Allowable Site Shutdown - Startup Window For Install (Hours)
4S-1	Distribution	1b	1	D-002	Reservoir	16893 B Camino San Bernado, San Diego	NO	NO	24
Connemara	Distribution	1b	1	D-003	PS	19389 Avenida Apice, Rancho Santa Fe	NO	NO	6
Cielo Pump Station	Distribution	1b	1	D-004	PS	7813 Camino Sin Puente, Rancho Santa Fe	NO	YES	12
Crosby 3 and 4	Distribution	1b	1	D-005	PRS	16971 C Bing Crosby Blvd, Rancho Santa Fe	NO	NO	24
CWA FCF	Distribution			D-006	N/A -- Eliminated				
Gano	Distribution	1b	1	D-007	Reservoir	8400 Artesian Trail, San Diego	NO	YES	24
Gaty	Distribution	1b	1	D-008	Reservoir	1790 Rancho Summit Dr, Encinitas	NO	NO	24
Oaks South #1	Distribution	1b	1	D-009	PRS	7330 Rancho Santa Fe Rd, Carlsbad	NO	YES	24
Miller Res/Hydro	Distribution	1b	1	D-010	Reservoir/Hydro	1796 Rancho Summit Dr, Encinitas	NO	YES	24
Oaks South #3	Distribution	1b	1	D-011	PRS	3562 Camino Cereza, Carlsbad	NO	YES	24
Peay	Distribution	1b	1	D-012	Reservoir/Flow Ctrl	19404 Fortuna Del Este, Escondido	NO	NO	24
Santa Fe Valley	Distribution	1b	1	D-013	Reservoir/PS	8988 Artesian Rd, San Diego	NO	YES	24
Unit M	Distribution	1b	1	D-014	Flow Ctrl	1625 Fallsview Rd, San Marcos	NO	YES	24
Unit Z	Distribution	1b	1	D-015	PS	15808 1/3 Camino Del Sur, San Diego	NO	NO	24
Via De Las Flores	Distribution	1b	1	D-016	PRS	7045 A Corte Laguna, Rancho Santa Fe	NO	NO	24
Village Park	Distribution	1b	1	D-017	Recycled PS	294 N. El Camino Real, Encinitas	NO	NO	12
Zorro	Distribution	1b	1	D-018	Reservoir	17267 Circa Oriente, San Diego	NO	YES	24
Avenida Apice	Wastewater	1a	1	4S-103	SPS	18266 Avenida Apice, Rancho Santa Fe	NO	NO	6
Cerro Del Sol #1	Wastewater	1a	1	4S-105	SPS #1	18046 Cerro Del Sol, Rancho Santa Fe	NO	NO	6

Description	Facility Group	Phase	PLC Conversion Type	ID	Function	Address (California, USA) Project Sites	Process Simulator Required for UFT/WFT	Original AutoCAD Exist	Allowable Site Shutdown - Startup Window For Install (Hours)
Cerro Del Sol #2	Wastewater	1a	1	4S-106	SPS #2	18184 Cerro Del Sol, Rancho Santa Fe	NO	NO	6
Cam Sin Puente #1	Wastewater	1a	1	4S-107	SPS #1	7703 Camino Sin Puente, Rancho Santa Fe	NO	YES	6
Cam Sin Puente #2	Wastewater	1a	1	4S-108	SPS #2	7719 Camino Sin Puente, Rancho Santa Fe	NO	YES	6
Cam Sin Puente #3	Wastewater	1a	1	4S-109	SPS #3	7791 Camino Sin Puente, Rancho Santa Fe	NO	YES	6
Cam Sin Puente #4	Wastewater	1a	1	4S-110	SPS #4	7853 Camino Sin Puente, Rancho Santa Fe	NO	YES	6
Del Dios	Wastewater	1a	1	4S-111	SPS	8204 Del Dios Highway B, Rancho Santa Fe	NO	NO	6
Fire Station	Wastewater	1a	1	4S-113	SPS	10605 Rancho Bernardo Rd, San Diego	NO	NO	6
Midpoint	Wastewater	1a	1	4S-114	SPS	9541 Artesian Rd, San Diego	NO	YES	6
Neighborhood #3	Wastewater	1a	1	4S-115	SPS	10249 Camino San Thomas, San Diego	NO	YES	6
SantaLuz	Wastewater	1a	1	4S-120	SPS	9719 1/2 Tallus Glen Dr, San Diego	NO	YES	6
Avenida Orilla	Wastewater	1a	1	4S-121	SPS	18136 Avenida Orilla, Rancho Santa Fe	NO	YES	6

APPENDIX 17000-B.1 CONTRACT DRAWINGS

CONTRACT DRAWINGS

Appendix B.1 – Contract Drawings

Included within.

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L.A.S.

08/22/2023



Municipal Water District
1966 Olivenhain Road
Encinitas,CA 92024 (760)753-6466

PLANS FOR THE OMWD PLC REPLACEMENT PROJECT

PROJECT NUMBER	PROJECT NAME
D120091	DISTRICT-WIDE PLC REPLACEMENT (POTABLE WATER/RECYCLED WATER)
D700036	DISTRICT-WIDE PLC REPLACEMENT (WASTE WATER)

AUGUST 2023

OLIVENHAIN MUNICIPAL WATER DISTRICT
1966 OLIVENHAIN ROAD
ENCINITAS, CA 92024
(760) 753-6466

BOARD OF DIRECTORS

LAWRENCE A. WATT
CHRISTY GUERIN
NEAL MEYERS

MATTHEW R. HAHN
MARCO SAN ANTONIO

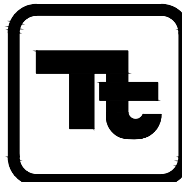
LINDSEY STEPHENSON, P.E.
ENGINEER MANAGER

DATE

SHT NO.	DRAWING TITLE
I-001	DRAWING INDEX
I-002	SYMBOLS AND LEGENDS
I-003	4SWRF - PLC SYSTEM ARCHITECTURE
I-004	REMOTE SITES - TYPICAL PLC SYSTEM ARCHITECTURE
I-005	DCMWTP - PLC SYSTEM ARCHITECTURE
I-006	TYPE 1 - MODIFIED CONTROL PANEL AND WIRING DIAGRAMS (EXAMPLE 8 SHEETS)
I-007	TYPE 2 - MODIFIED CONTROL PANEL AND WIRING DIAGRAMS (EXAMPLE 9 SHEETS)
I-008	TYPE 3 - MODIFIED CONTROL PANEL AND WIRING DIAGRAMS (EXAMPLE 7 SHEETS)
I-009	TYPE 4 - REDRAWN FROM PDF - CONTROL PANEL AND WIRING DIAGRAMS (EXAMPLE 6 SHEETS)
I-101	TYPE 2 DETAILS - ENTRELEC WIRING HARNESS 1746-IA16 to 5069-IA16 PLC CONVERSION
I-102	TYPE 2 DETAILS - ENTRELEC WIRING HARNESS 1746-OA16 to 5069-OA16 PLC CONVERSION
I-103	TYPE 2 DETAILS - ENTRELEC WIRING HARNESS 1746-NI8 to 5069-IF8 PLC CONVERSION
I-104	TYPE 2 DETAILS - ENTRELEC WIRING HARNESS 1746-NO4I to 5069-OF4 PLC CONVERSION

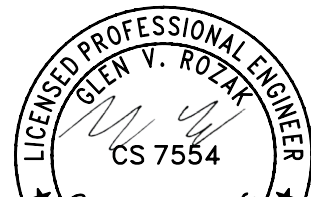


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(626) 351-4664



8/18/23

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A	3-30-23	INITIAL RELEASE FOR REVIEW	GR
B	8-18-23	RELEASE FOR BID	GR

OLIVENHAIN MUNICIPAL WATER DISTRICT

OLIVENHAIN PLC UPGRADE PROJECT

DRAWING INDEX

DESN:	VR
DRWN:	GR
CHKD:	SY
DWG NO.	I-001
PROJ:	D120091 D700036

Bar measures 1 inch, otherwise drawing is not to scale

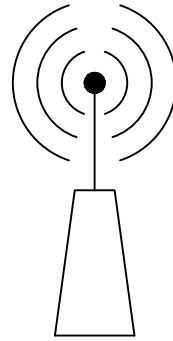
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8/19/2023 10:32:01 AM - C:\USERS\SHUKANG.YAO\TETRA TECH\INC\OMWD - CLIENTINFO - GENERAL\T4-SPECIFICATIONS (100PCT) - TOCLIENTRELEASEIDWGSII-002.DWG - YAO, SHUKANG

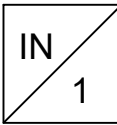
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123456

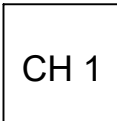
SYMBOLS:



RADIO COMMUNICATION STATION



INPUT CHANNEL #1, TERMINAL NUMBER 1



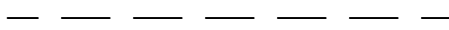
IO CHANNEL #1



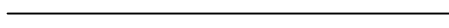
FUSE



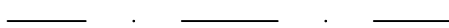
TRANSMITTER #1



FIELD WIRING



PANEL WIRING



COMMUNICATION

ABBREVIATIONS:

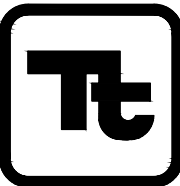
- Gbps GIGABYTE PER SECOND
- HMI HUMAN MACHINE INTERFACE
- SCADA SUPERVISORY CONTROL AND DATA ACQUISITION

NOTES:

1. ONLY SYMBOLS AND ABBREVIATIONS USED IN THE PLC REPLACEMENT PROJECT ARE SHOWN.
2. SYMBOLS AND ABBREVIATIONS USED IN EXISTING DRAWINGS ARE NOT SHOWN FOR SIMPLICITY.



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OLIVENHAIN MUNICIPAL WATER DISTRICT

OLIVENHAIN PLC UPGRADE PROJECT

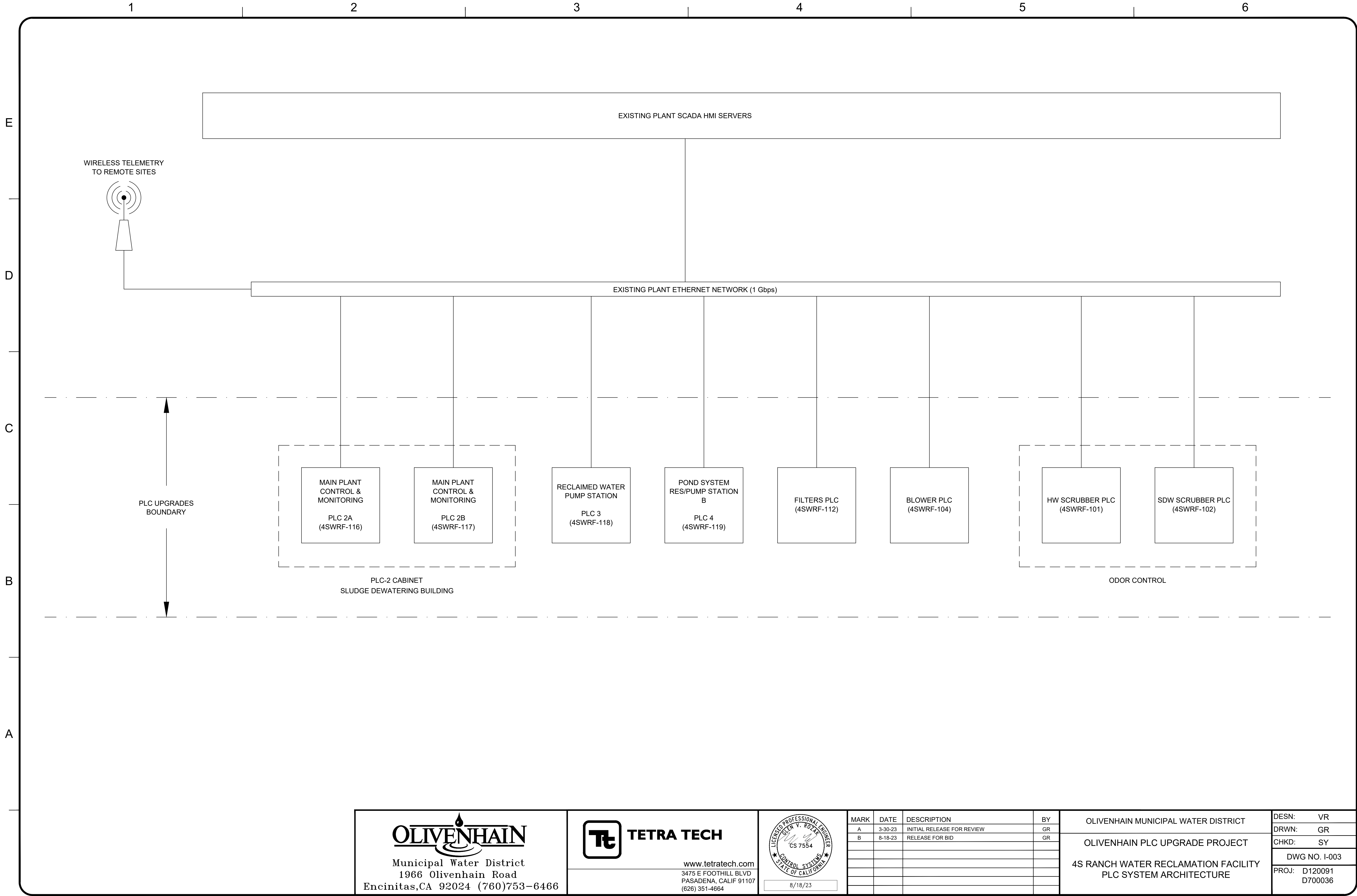
LEGENDS AND SYMBOLS

DESN:	VR
DRWN:	GR
CHKD:	SY
DWG NO.	I-002
PROJ:	D120091 D700036

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OLIVENHAIN MUNICIPAL WATER DISTRICT

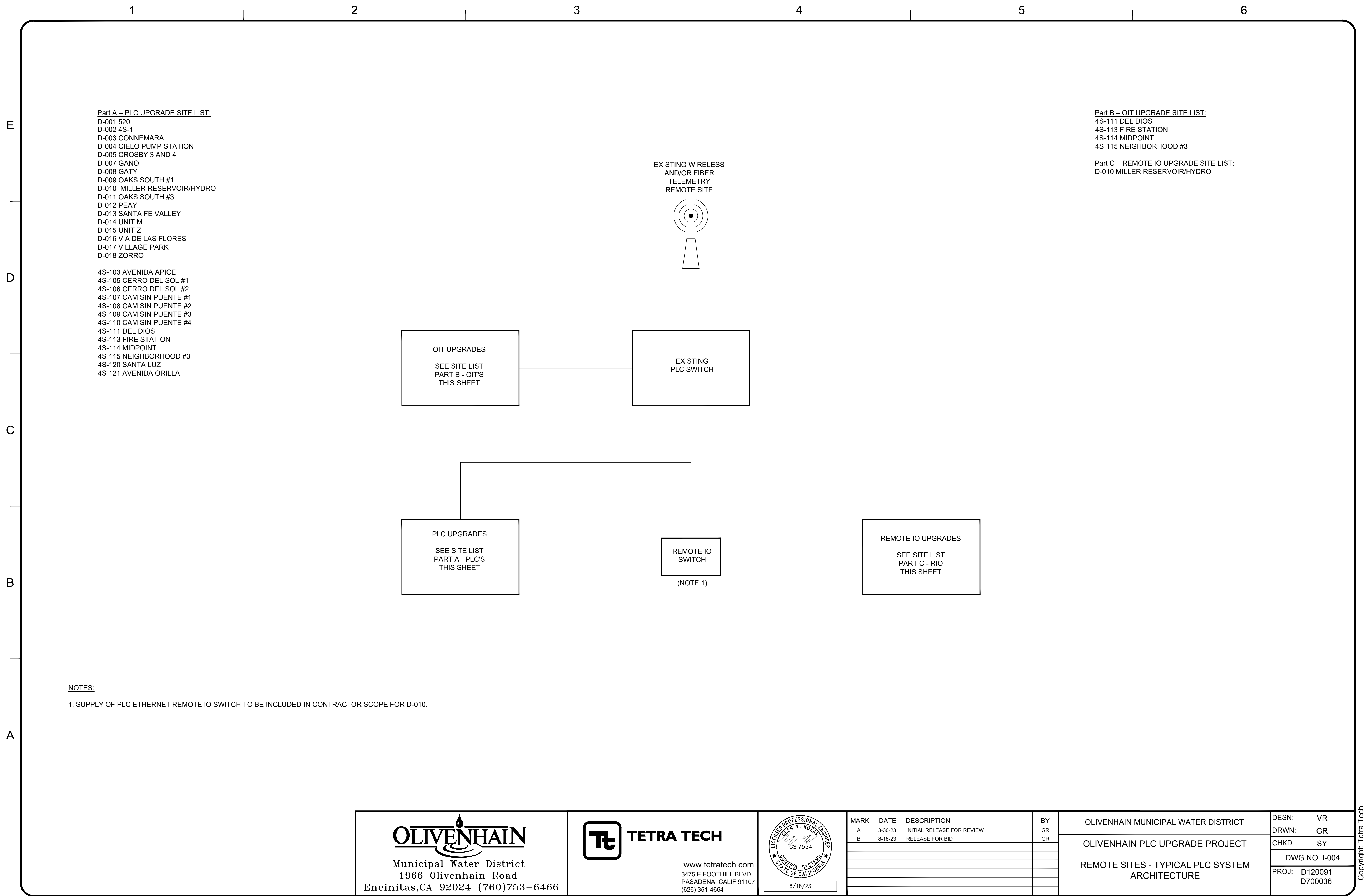
OLIVENHAIN PLC UPGRADE PROJECT

4S RANCH WATER RECLAMATION FACILITY
PLC SYSTEM ARCHITECTURE

DESIGN: VR
DRAWN: GR
CHECKED: SY
DWG NO. I-003
PROJECT: D120091 D700036

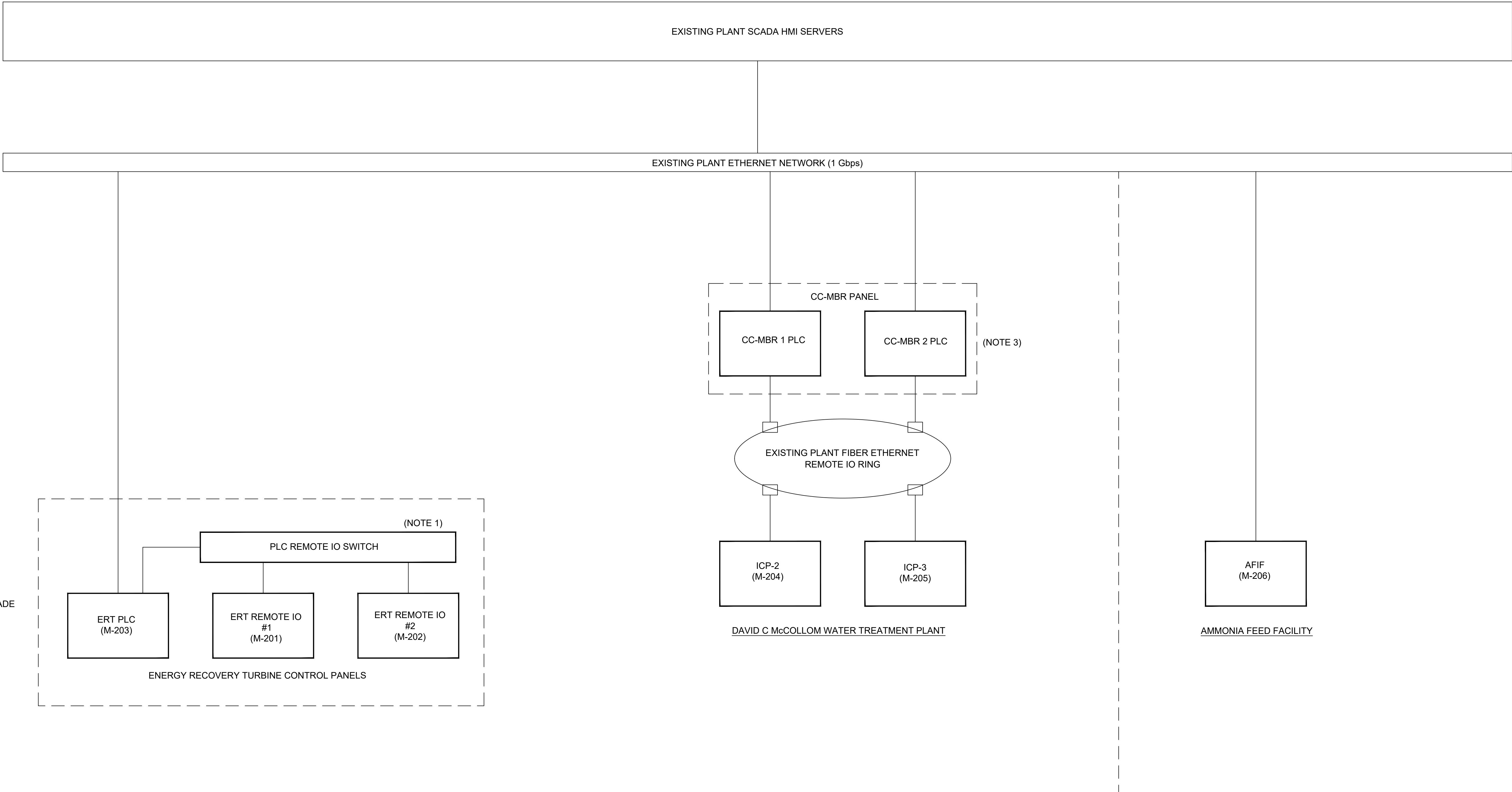
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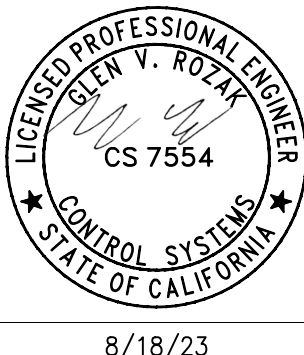
- NOTES:
1. PLC REMOTE IO SWITCH TO BE INCLUDED IN CONTRACTOR SCOPE
2. EXISTING NETWORK SUPPLIED BY DISTRICT
3. PROGRAMMING MODIFICATIONS TO BE PERFORMED BY CONTRACTOR TO INCORPORATE ICP-2 AND ICP-3 ETHERNET REMOTE IO TO CC-MBR HOT STANDBY PLC'S.



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B	8-18-23	RELEASE FOR BID	GR

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OLIVENHAIN PLC UPGRADE PROJECT

OLIVENHAIN PLC UPGRADE PROJECT
DCMWTP - PLC SYSTEM ARCHITECTURE

DESN:	VR
DRWN:	GR
CHKD:	SY
DWG NO.	I-005
PROJ:	D120091 D700036

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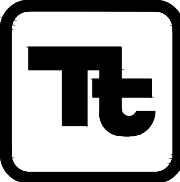
I-006

TYPE 1 - MODIFIED CONTROL PANEL AND
WIRING DIAGRAMS

(EXAMPLE 8 SHEETS)




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OLIVENHAIN MUNICIPAL WATER DISTRICT

OLIVENHAIN PLC UPGRADE PROJECT

TYPE 1 - MODIFIED CONTROL PANEL AND
WIRING DIAGRAMS (EXAMPLE 8 SHEETS)

DESN: VR

DRWN: GR

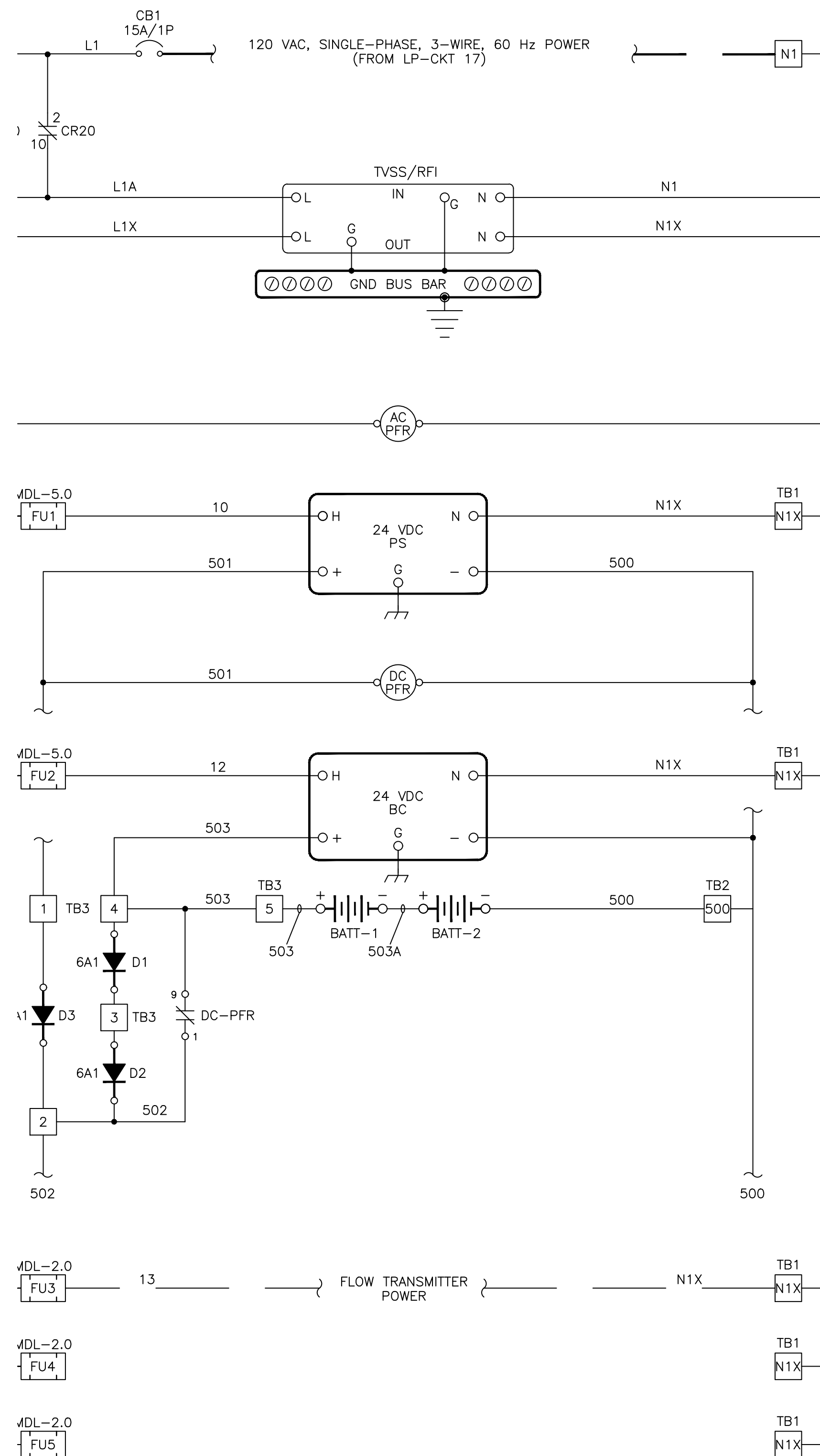
CHKD: SY

DWG NO. I-006

PROJ: D120091
D700036

Bar measures 1 inch, otherwise drawing is not to scale

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PLC POWER DISTRIBUTION WIRING DIAGRAM

TRABTECH
SURGE FILTER

24 VDC SWITCHING
POWER SUPPLY

DC POWER FAIL RELAY

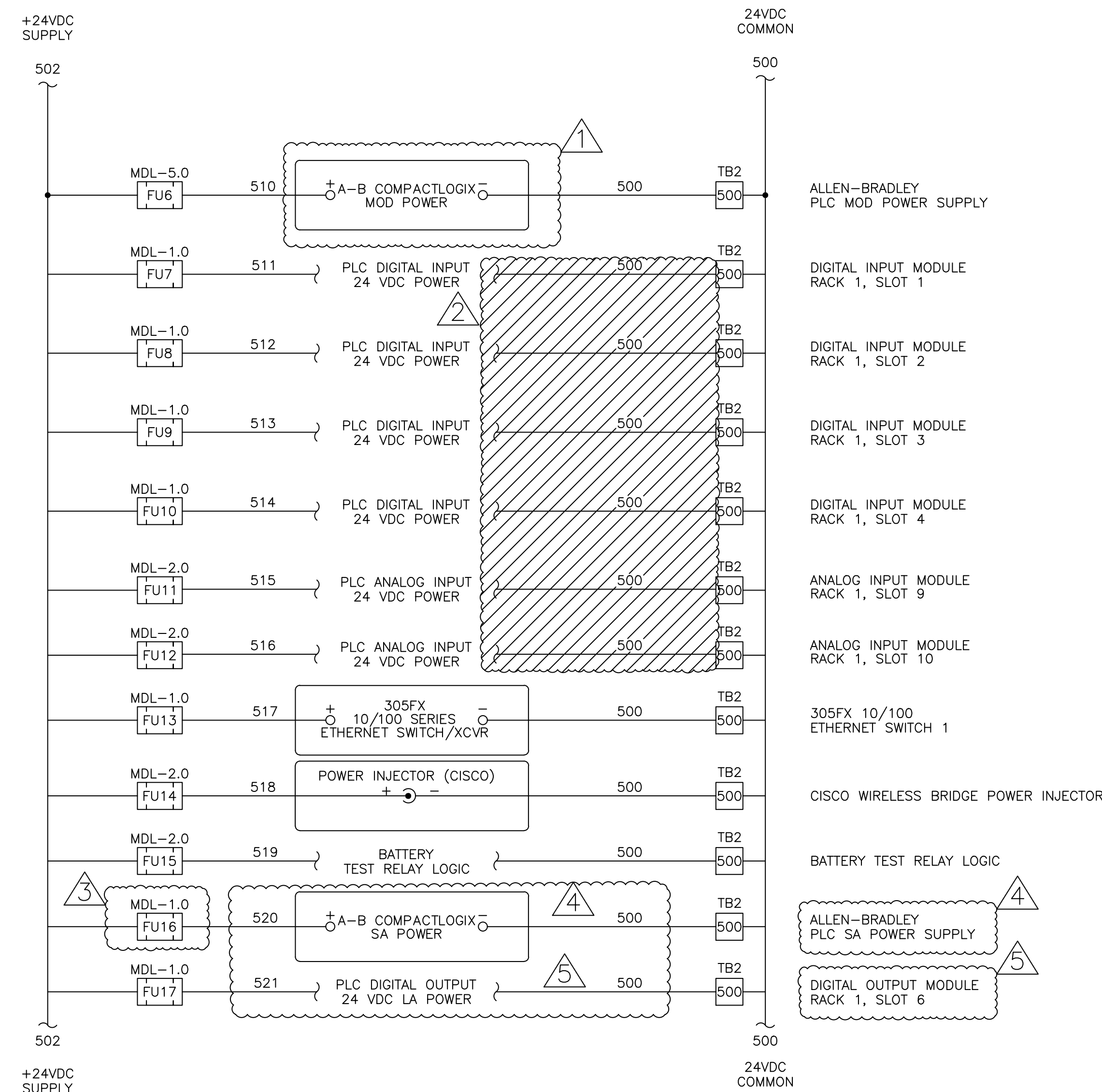
24 VDC BATTERY CHARGER

12 VDC BATTERIES
(WIRED IN SERIES)

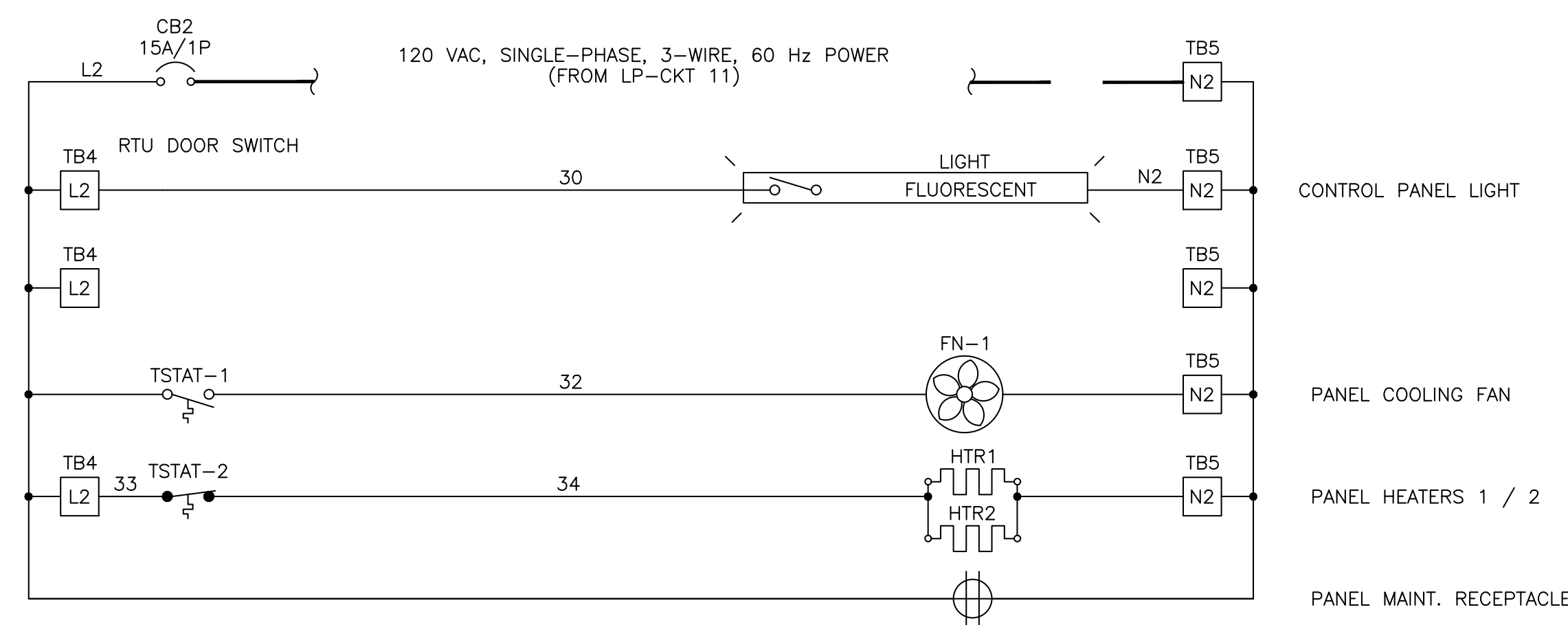
MARSH McBIRNEY FLOW TRANSMITTER

GENERAL NOTES

- ⚠ A-B CompactLogix MOD Power 24VDC Source.
- ⚠ DC Common to be provided via SA Bus.
- ⚠ Fusing and wiring for SA Source to be upsized as needed by Contractor for total SA Bus Load.
- ⚠ A-B CompactLogix SA Power 24VDC Source.
- ⚠ DC Power Supply to PLC D0.

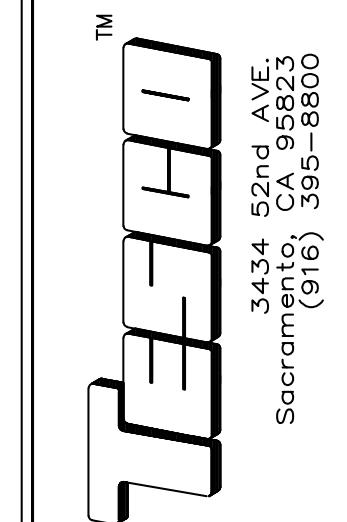


DC POWER DISTRIBUTION



LIGHT, RECEPTACLE AND HEATER WIRING DIAGRAM

DESIGN	DWG	DRAWN	DWG	CHECK	DWG	MARK	DATE	BY	REVISIONS



CIELO
PUMP STATION
PLC ELECTRICAL POWER
& WIRING DIAGRAM

SHEET
12 of 12
DRAWING
23597AQ-12

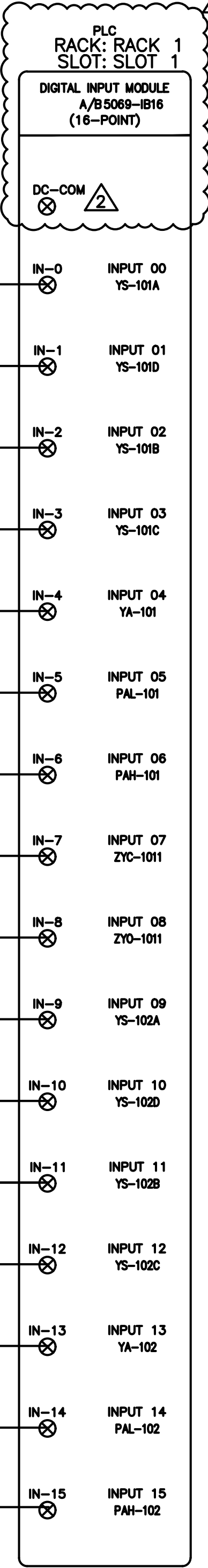
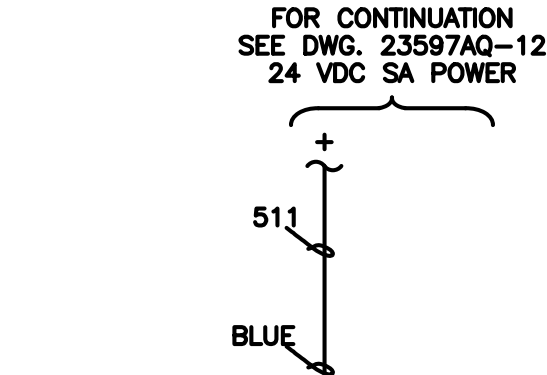
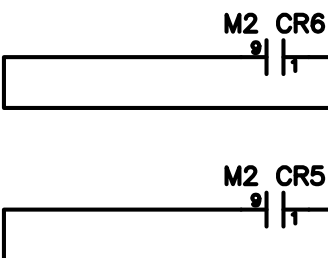
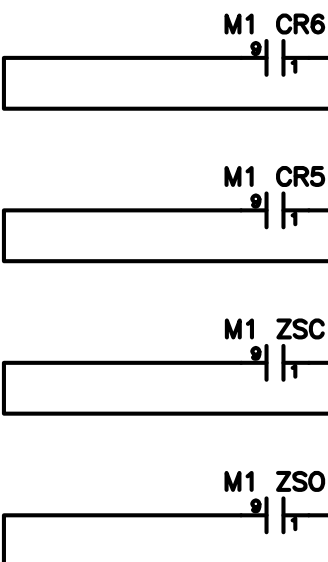
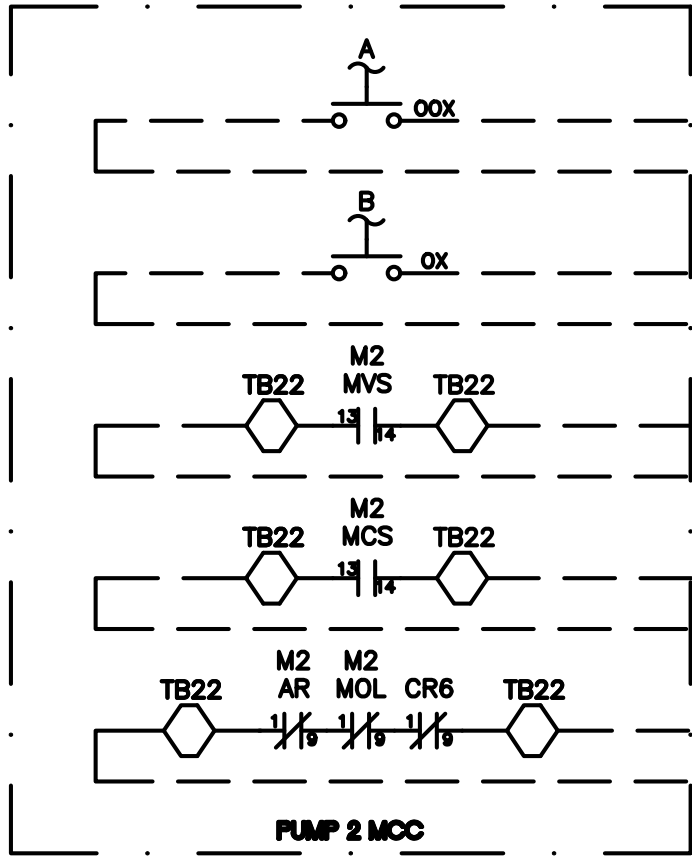
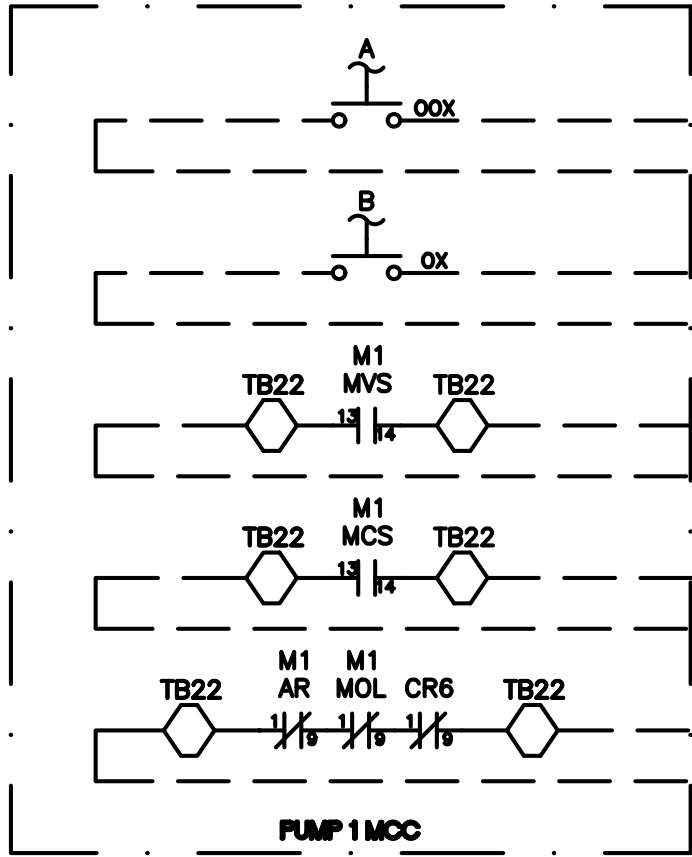
FOR PRODUCTION ONLY

ORIGINAL SCALE IN INCHES

FIELD / MCC'S

REAR PANEL

PROGRAMMABLE LOGIC CONTROLLER
(REAR PANEL)

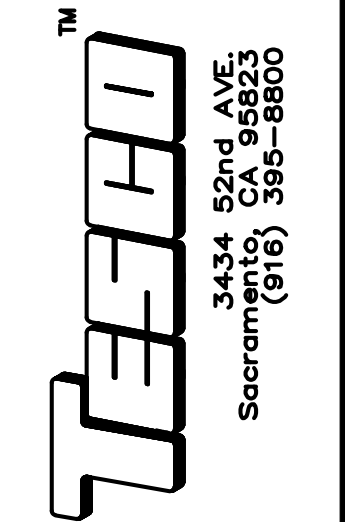


GENERAL NOTES

- REPLACE THE DI MODULE WITH COMPACTLOGIX PLC DI MODULE.
- DC-COM VIA PLC INTERNAL SA POWER BUS. NO WIRING REQUIRED.

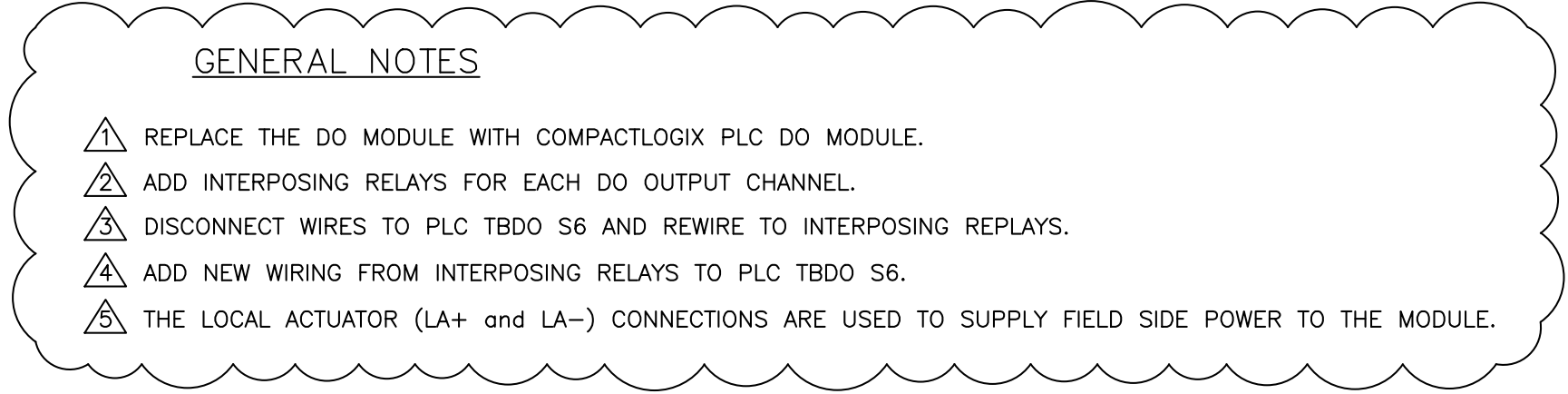
1511	511	1000	IN-0	INPUT 00	PUMP NO. 1
1100	100		YS-101A		AUTO
1511	511	1001	IN-1	INPUT 01	PUMP NO. 1
1101	101		YS-101D		IN BYPASS
1511	511	1002	IN-2	INPUT 02	PUMP NO. 1
1102	102		YS-101B		VFD RUNNING
1511	511	1003	IN-3	INPUT 03	DIGITAL INPUT
1103	103		YS-101C		BYPASS RUNNING
1511	511	1004	IN-4	INPUT 04	PUMP NO. 1
1104	104		YA-101		FAILURE
1511	511	1005	IN-5	INPUT 05	PUMP NO. 1
1105	105		PAL-101		LOW SUCTION PRESSURE
1511	511	1006	IN-6	INPUT 06	PUMP NO. 1
1106	106		PAH-101		HIGH DISCHARGE PRESSURE
1511	511	1007	IN-7	INPUT 07	PUMP NO. 1
1107	107		ZYC-1011		CONTROL VALVE CLOSED
1511	511	1008	IN-8	INPUT 08	DIGITAL INPUT
1108	108		ZYO-1011		CONTROL VALVE OPEN
1511	511	1009	IN-9	INPUT 09	PUMP NO. 2
1109	109		YS-102A		AUTO
1511	511	1010	IN-10	INPUT 10	DIGITAL INPUT
1110	110		YS-102D		IN BYPASS
1511	511	1011	IN-11	INPUT 11	PUMP NO. 2
1111	111		YS-102B		RUNNING IN VFD MODE
1511	511	1012	IN-12	INPUT 12	PUMP NO. 2
1112	112		YS-102C		RUNNING IN BYPASS MODE
1511	511	1013	IN-13	INPUT 13	PUMP NO. 2
1113	113		YA-102		FAILURE
1511	511	1014	IN-14	INPUT 14	PUMP NO. 2
1114	114		PAL-102		LOW SUCTION PRESSURE
1511	511	1015	IN-15	INPUT 15	PUMP NO. 2
1115	115		PAH-102		HIGH DISCHARGE PRESSURE


DESIGN	DWG	DRAWN	DWG	CHECK	DWG	DATE	BY	REVISIONS

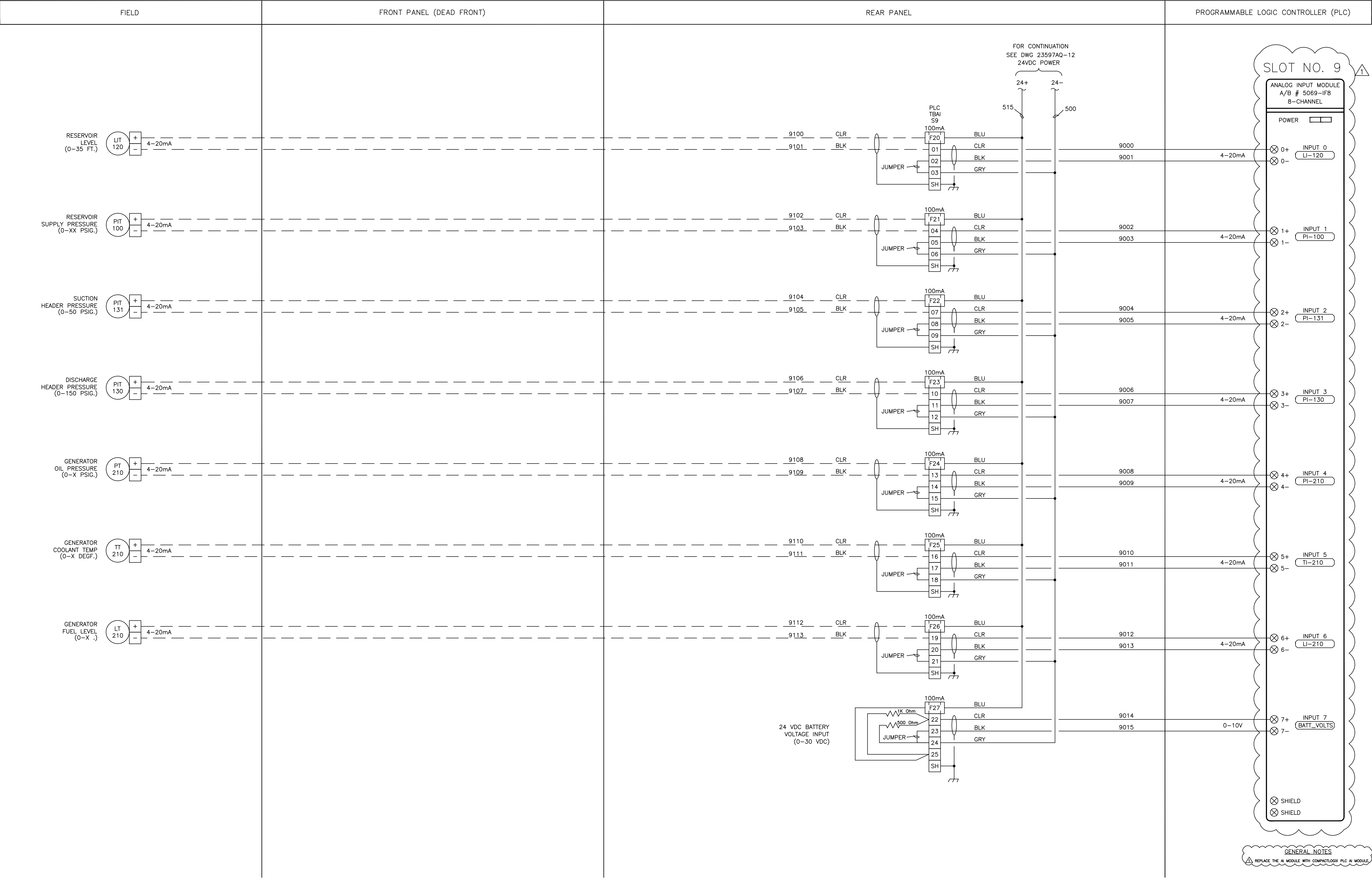


OLIVENHAIN
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1966 Olivenhain Road
Encinitas, CA 92024 (760)753-6466

CIELO
PUMP STATION #1
PLC DIGITAL INPUT
WIRING DIAGRAM



CAMINO SIN PUENTE SEWER PUMP STATION #1		 Municipal Water District 1966 Olivenhain Road Encinitas, CA 92024 (760)753-8466		 3434 52nd AVE. Sacramento, CA 95823 (916) 395-6800		<table><tr><th>DESIGN</th><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>DLG</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>DRAWN</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>DLG</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CHECK</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>DLG</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td colspan="5">MARK DATE</td><td>BY</td><td>REVISIONS</td></tr><tr><td colspan="5"></td><td></td><td></td></tr><tr><td colspan="5"></td><td></td><td></td></tr><tr><td colspan="5"></td><td></td><td></td></tr><tr><td colspan="5"></td><td></td><td></td></tr></table>		DESIGN							DLG							DRAWN							DLG							CHECK							DLG							MARK DATE					BY	REVISIONS																												
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DLG

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(916) 395-8800

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CAMINO SIN PUENTE
SEWER PUMP STATION #1

PLC ANALOG INPUT
WIRING DIAGRAM

SHEET
21 of 21

DRAWING
21

23597AQ-21

SLOT NO. 9

ANALOG INPUT MODULE
A/B # 5069-IF8
8-CHANNEL

POWER

INPUT 0
LI-120

INPUT 1
PI-100

INPUT 2
PI-131

INPUT 3
PI-130

INPUT 4
PI-210

INPUT 5
TI-210

INPUT 6
LI-210

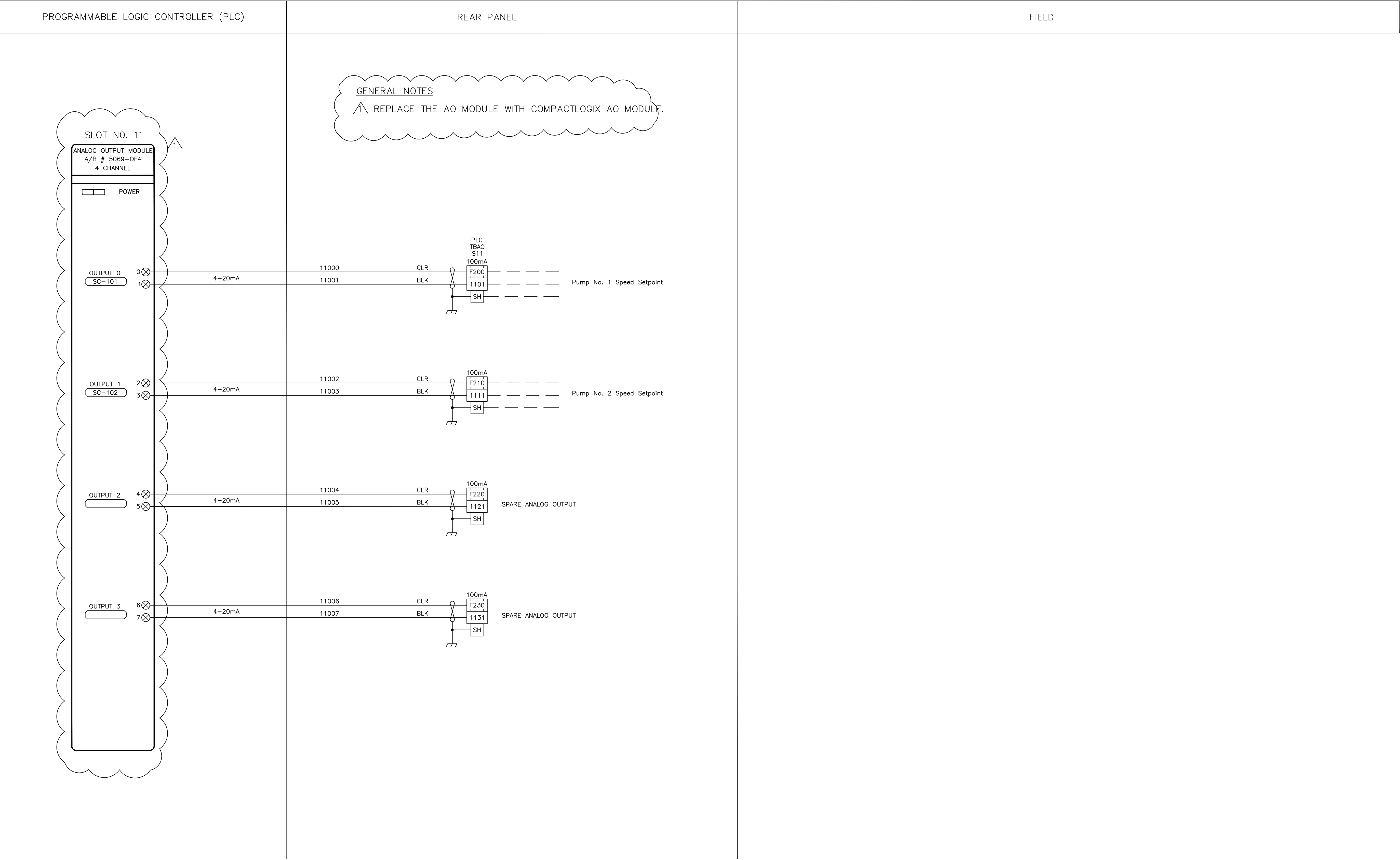
INPUT 7
BATT_VOLTS

SHIELD

SHIELD

GENERAL NOTES

REPLACE THE A MODULE WITH COMPACTLOGIX PLC A MODULE



DESIGN

DLG

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DLG

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DLG

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CAMINO SIN PUENTE
SEWER PUMP STATION #1

PLC ANALOG OUTPUT
WIRING DIAGRAM

SHEET

23 of 23

DRAWING

23

23597AN-23

ORIGINAL SCALE IN INCHES

0 1 2 3 4

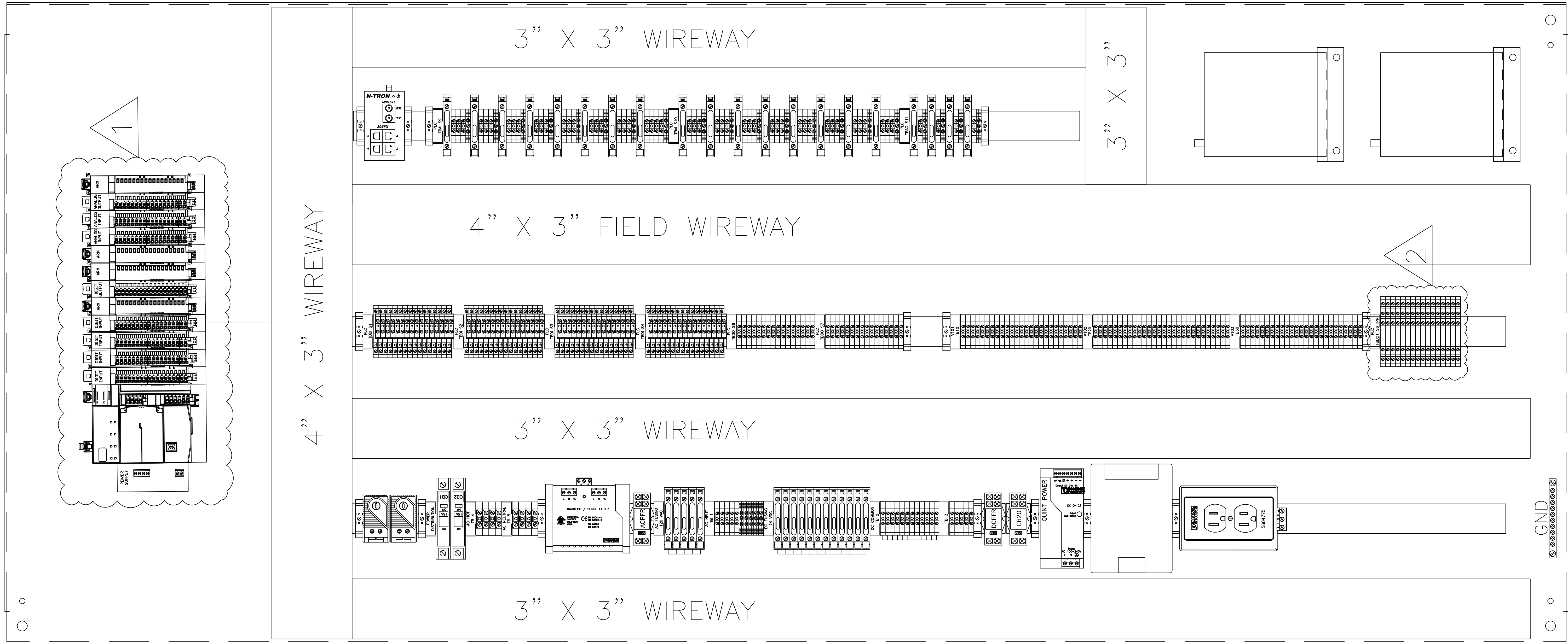
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GENERAL NOTES

- 1 REPLACE THE EXISTING PLC WITH COMPACTLOGIX PLC AND POWER SUPPLY.
- 2 ADD INTERPOSING RELAYS (MODEL # 700-HLT1U1) FOR PLC DO'S.

- GENERAL NOTES

 - 1 REPLACE THE EXISTING PLC WITH COMPACTLOGIX PLC AND POWER SUPPLY.
 - 2 ADD INTERPOSING RELAYS (MODEL # 700-HLT1U1) FOR PLC DO'S.



CIELO PUMP STATION
 BOOSTER PUMP STATION
 ELEVATION (DETAILED)

OLIVENHAIN
Municipal Water District
1666 Olivenhain Road
Encinitas, CA 92024 (760) 753-6466


TESCOTM
3434 52nd AVE.
Sacramento, CA 95823
(916) 395-8800

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DLG			
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DLG			
CHECK			
DLG			
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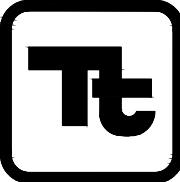
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I-007
TYPE 2 - MODIFIED CONTROL PANEL AND
WIRING DIAGRAMS
(EXAMPLE 9 SHEETS)



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PASADENA, CALIF 91107
(626) 351-4664



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OLIVENHAIN MUNICIPAL WATER DISTRICT

OLIVENHAIN PLC UPGRADE PROJECT

TYPE 2 - MODIFIED CONTROL PANEL AND
WIRING DIAGRAMS (EXAMPLE 9 SHEETS)

DESN: VR

DRWN: GR

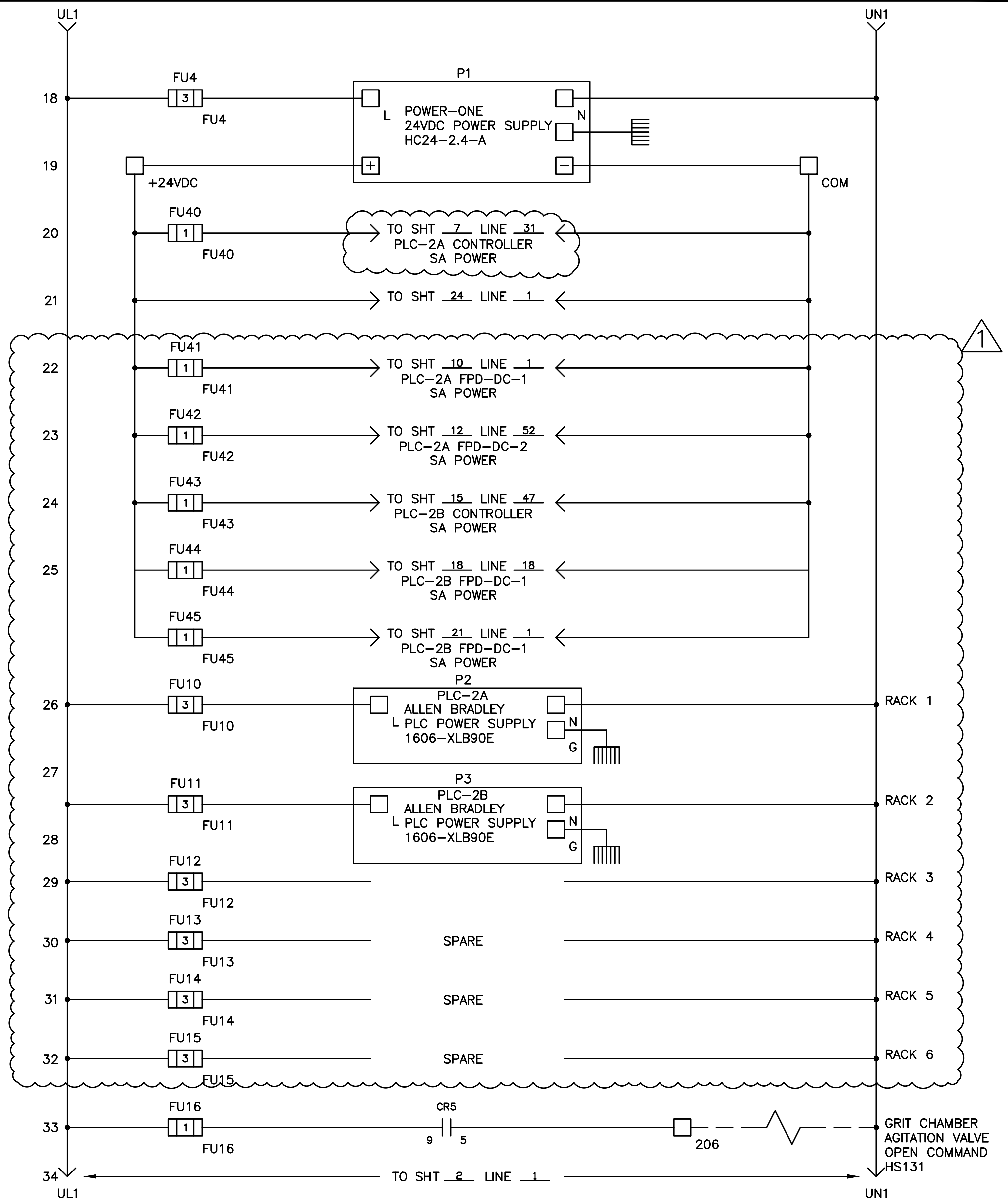
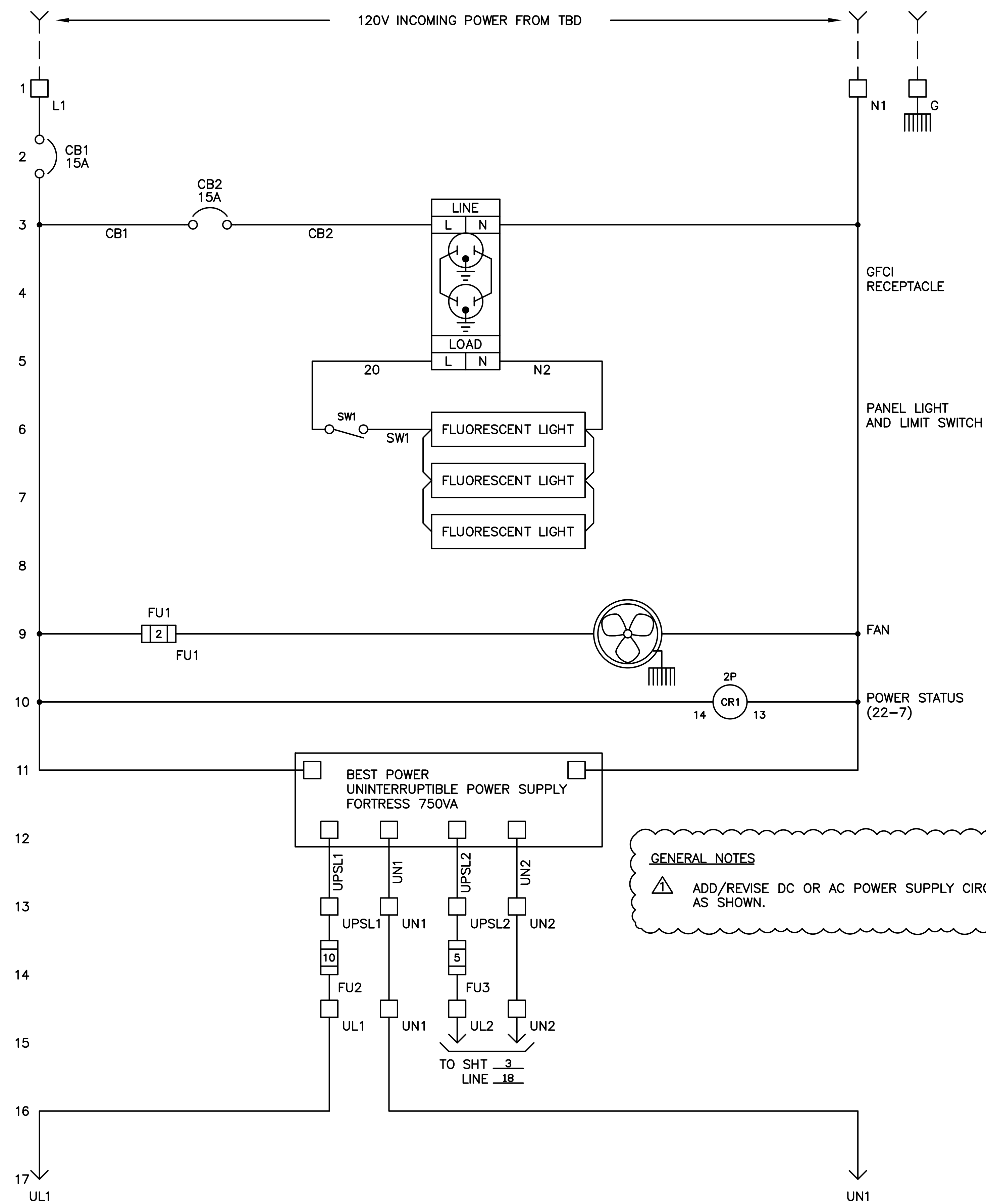
CHKD: SY

DWG NO. I-007

PROJ: D120091
D700036

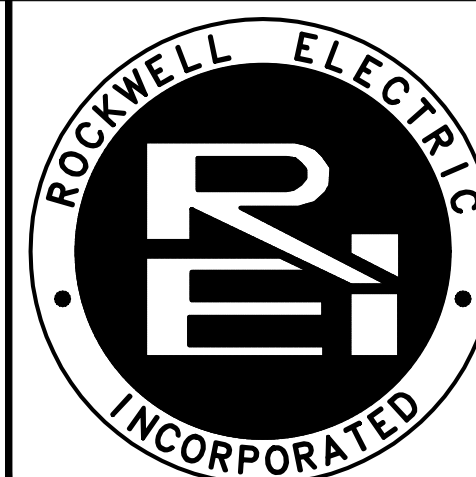
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ROCKWELL ELECTRIC, INC. • 545 CORPORATE DRIVE • ESCONDIDO, CA 92029 • (760) 489-6767

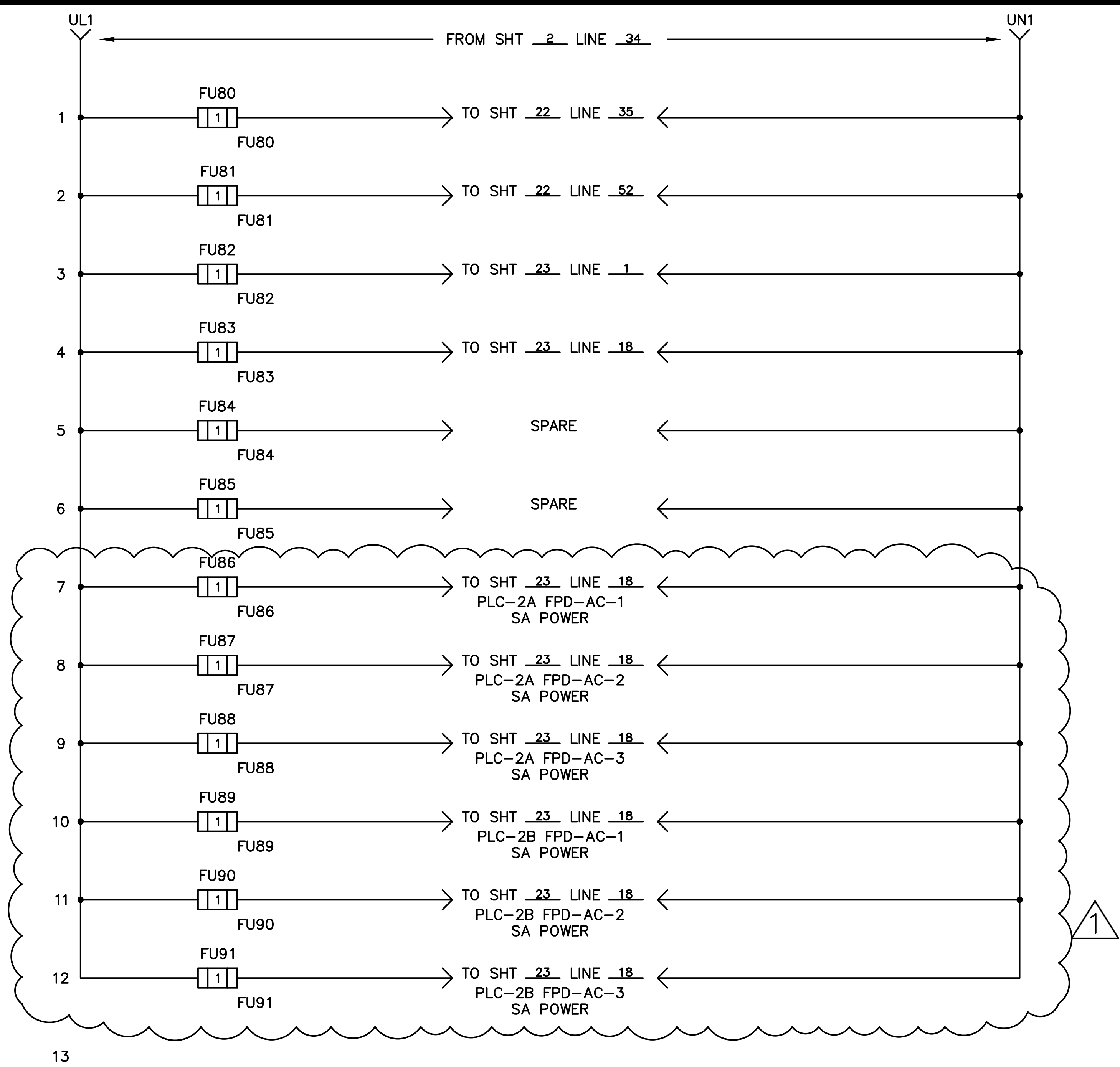
4S RANCH SANITATION DISTRICT WASTEWATER TREATMENT PLANT EXPANSION MAIN CONTROL PANEL PLC-2



DRAWING NUMBER:

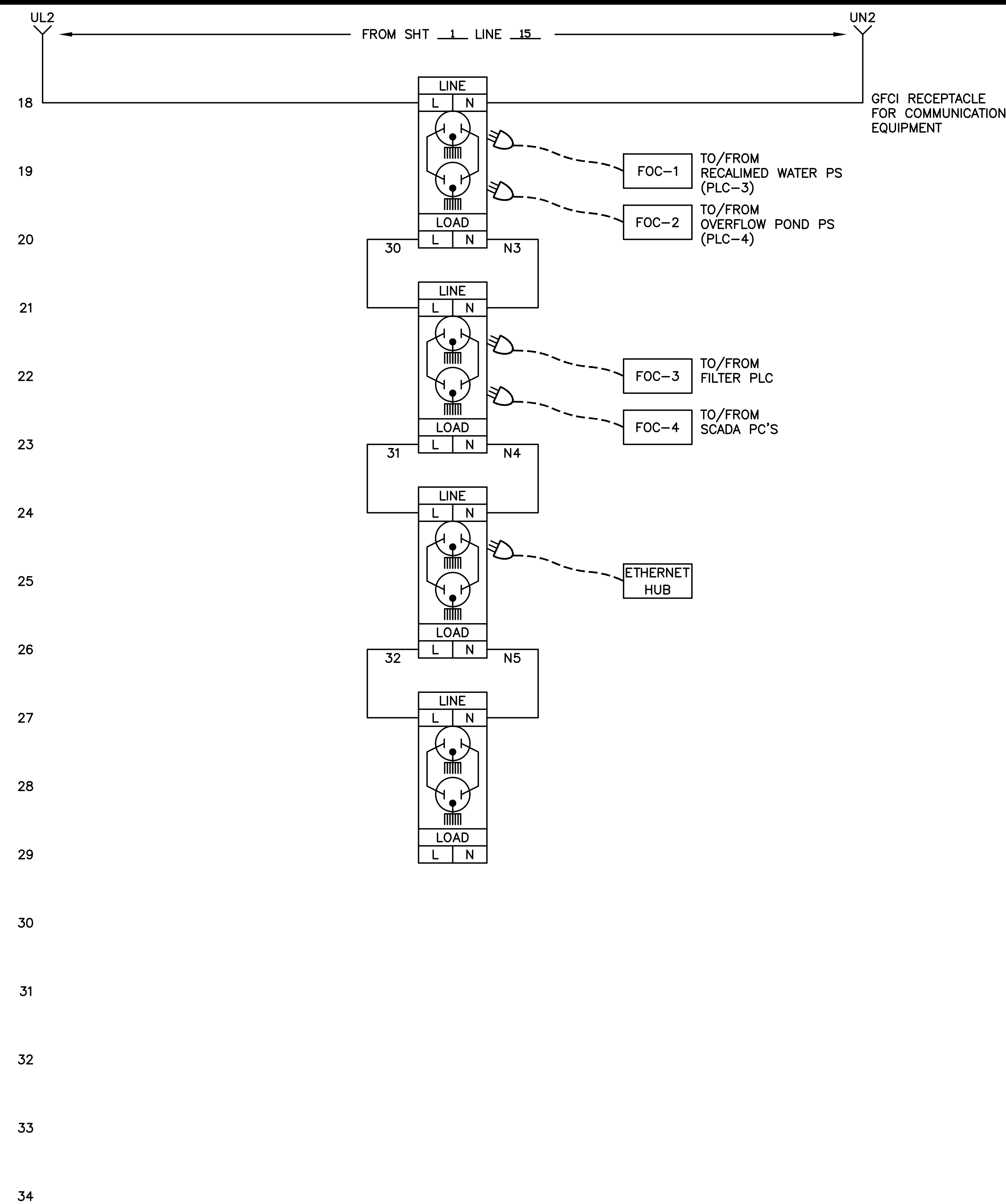
D500-L100-1200

DESIGNED BY: JS	DRAWN BY: KPD	REVISION DATE: 3-7-03	DRAWING FILE: L500100A	SHEET SIZE: B
DATE 12-4-00	APPROVED BY:	REVISION NO.: B	SCALE: N/A	SHEET: 1 OF 26



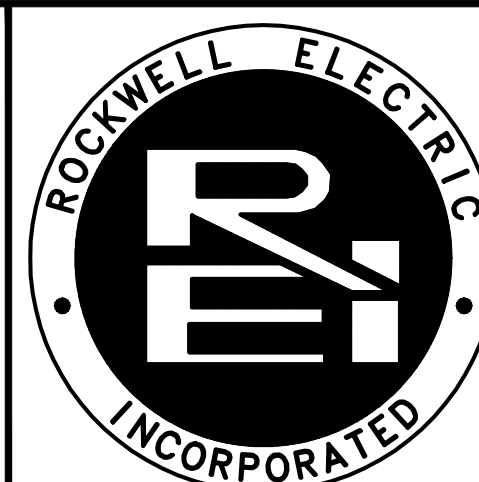
GENERAL NOTES

⚠ ADD/REVISE DC OR AC POWER SUPPLY CIRCUITS AS SHOWN.

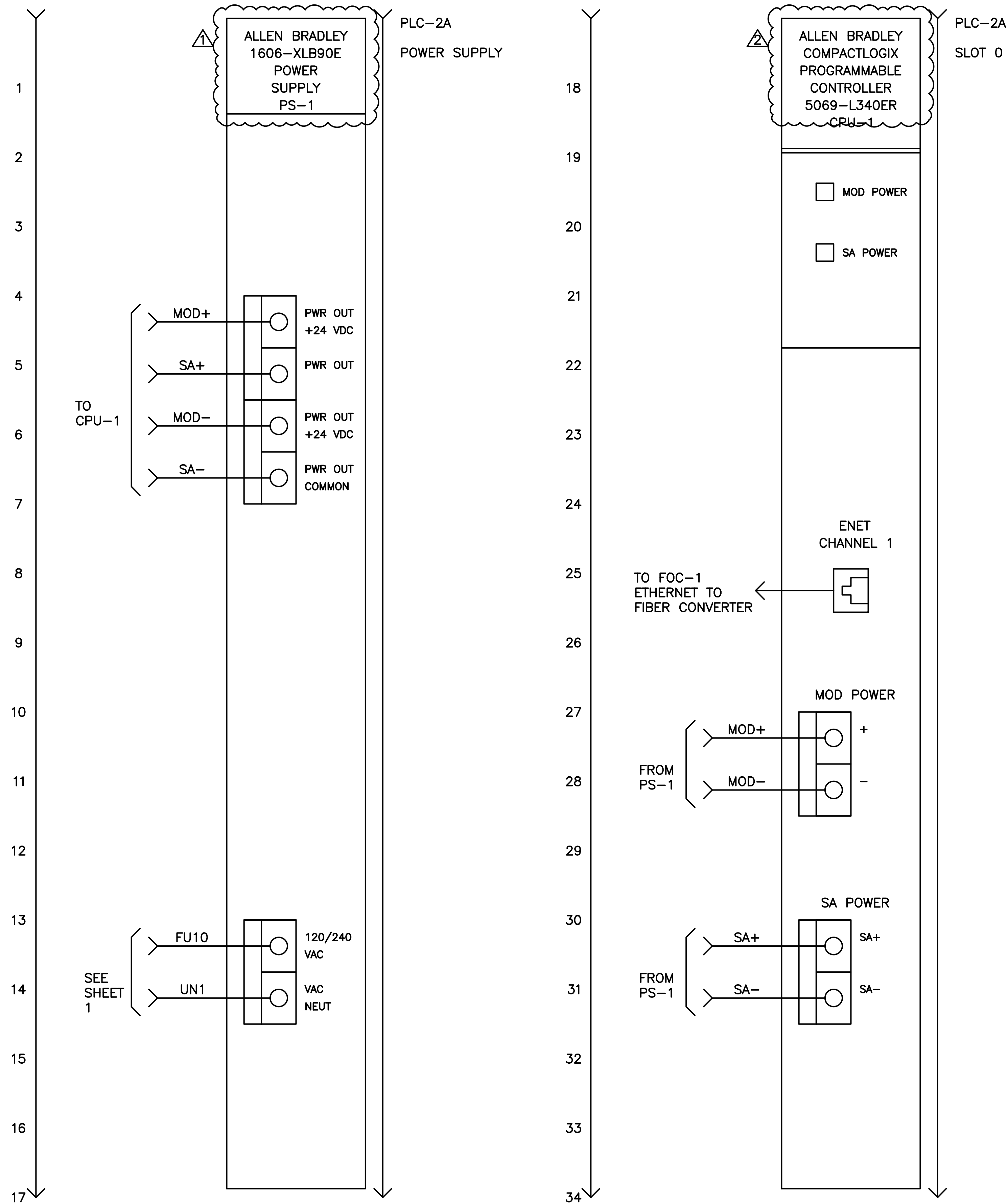


ROCKWELL ELECTRIC, INC. • 545 CORPORATE DRIVE • ESCONDIDO, CA 92029 • (760) 489-6767

4S RANCH SANITATION DISTRICT
WASTEWATER TREATMENT PLANT EXPANSION
MAIN CONTROL PANEL
PLC-2



DRAWING NUMBER: D500-L102-1200				
DESIGNED BY: JS	DRAWN BY: KPD	REVISION DATE: 4-16-01	DRAWING FILE: L500102-	SHEET SIZE: B
DATE 12-4-00	APPROVED BY:	REVISION NO.: A	SCALE: N/A	SHEET: 3 OF 26

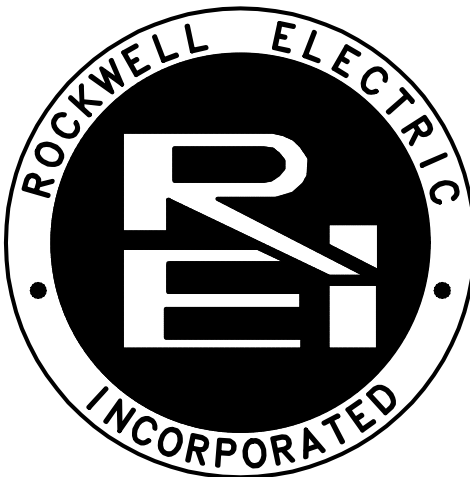


GENERAL NOTES

- NEW POWER SUPPLY.
- COMPACTLOGIX PLC CONTROLLER.

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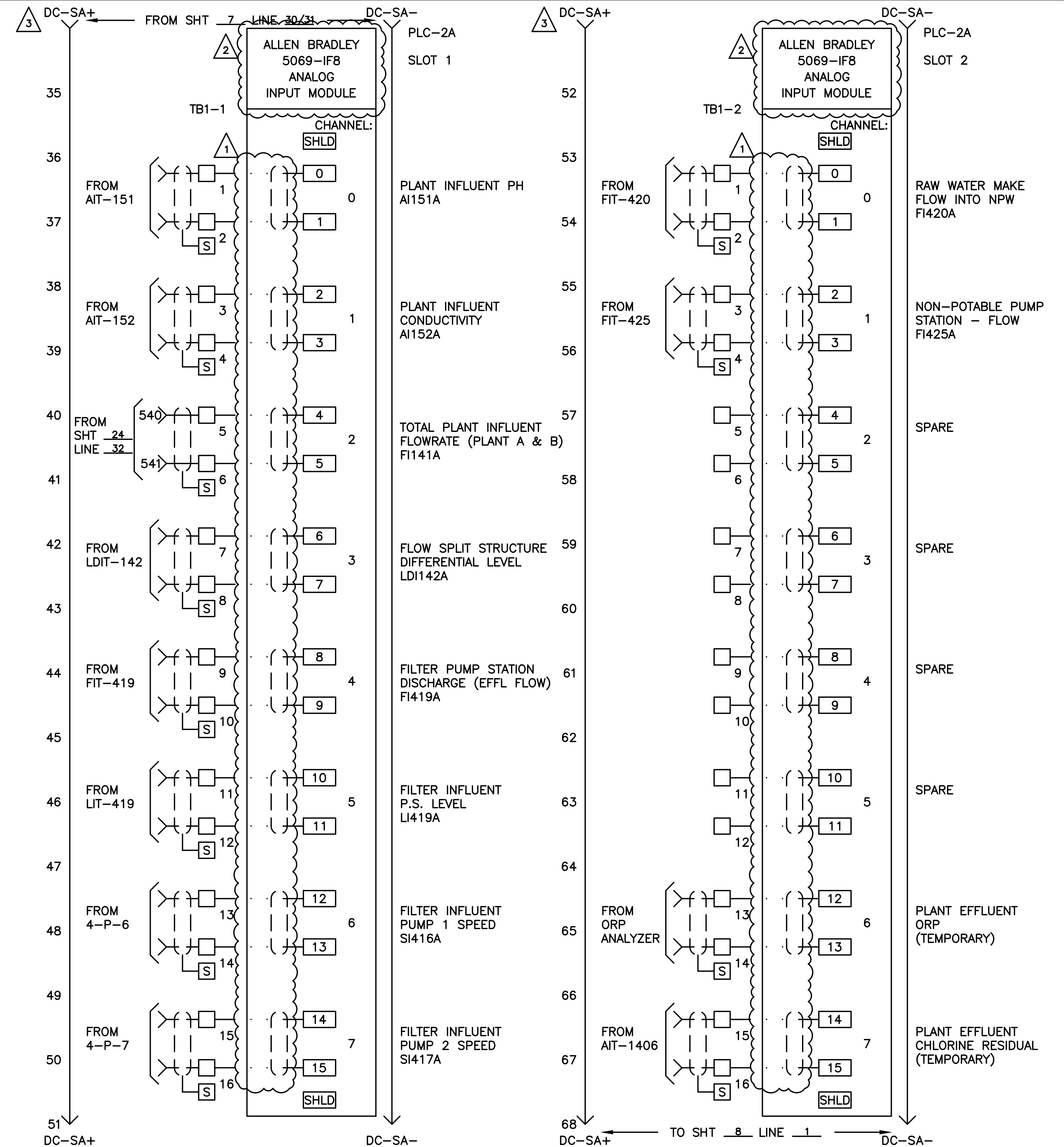
4S RANCH SANITATION DISTRICT
WASTEWATER TREATMENT PLANT EXPANSION
MAIN CONTROL PANEL
PLC-2



DRAWING NUMBER: D500-P100-1200				
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DATE 12-4-00	APPROVED BY:	REVISION NO.: C	SCALE: N/A	SHEET: 7 OF 26

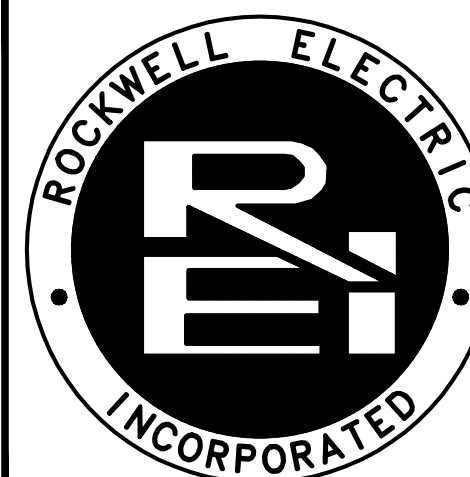
GENERAL NOTES

- △ NEW ENTRELEC CABLE (REF I-102).
- △ NEW COMPACTLOGIX MODULE.
- △ DC-SA POWER.



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4S RANCH SANITATION DISTRICT
WASTEWATER TREATMENT PLANT EXPANSION
MAIN CONTROL PANEL
PLC-2



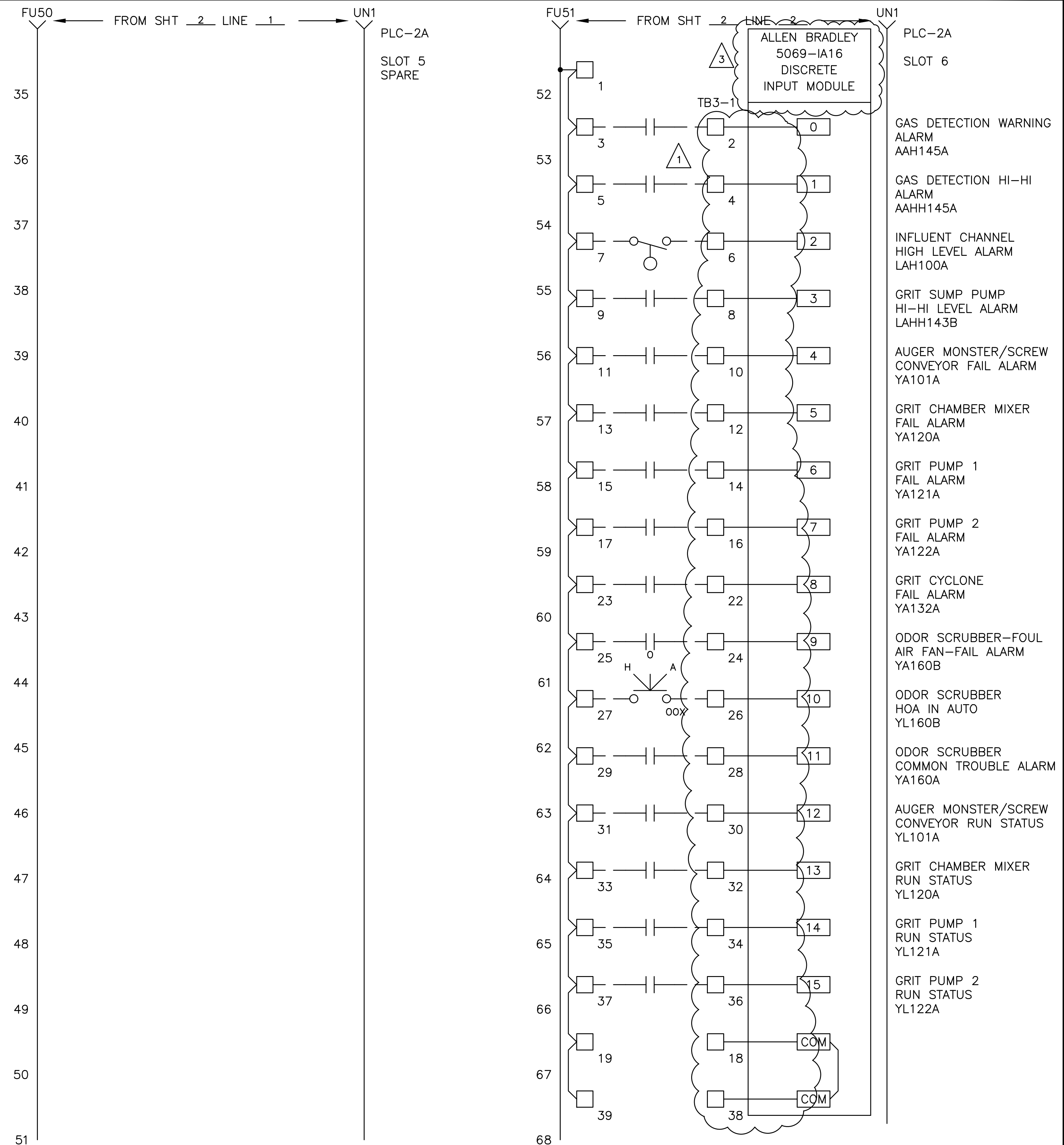
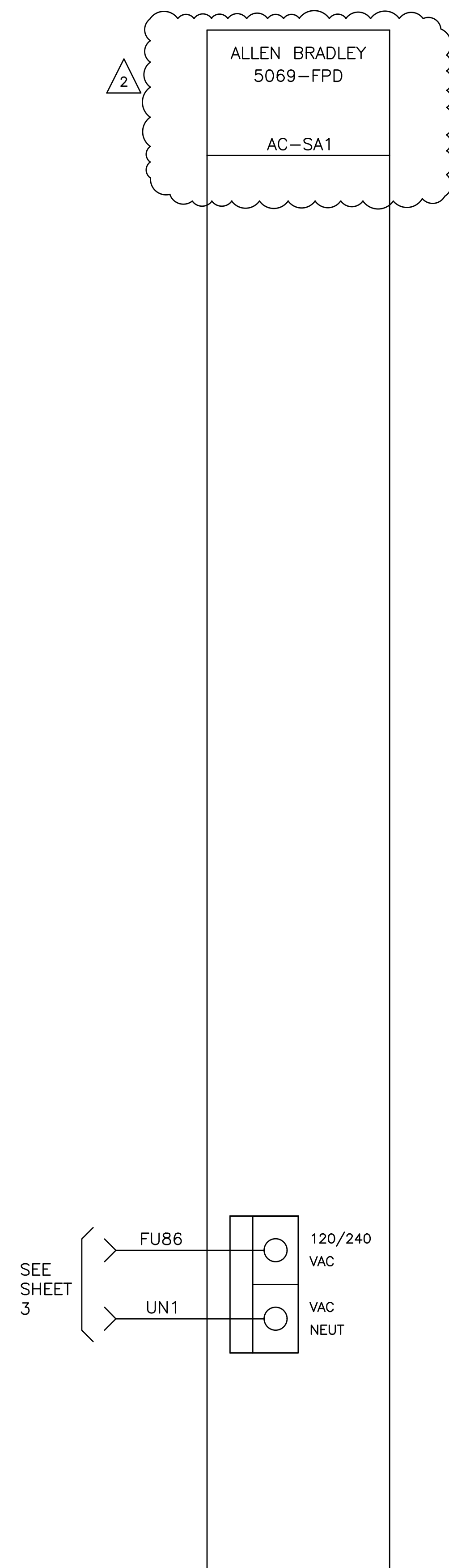
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DATE 12-4-00	APPROVED BY:	REVISION NO.: C	SCALE: N/A	SHEET: 7 OF 26

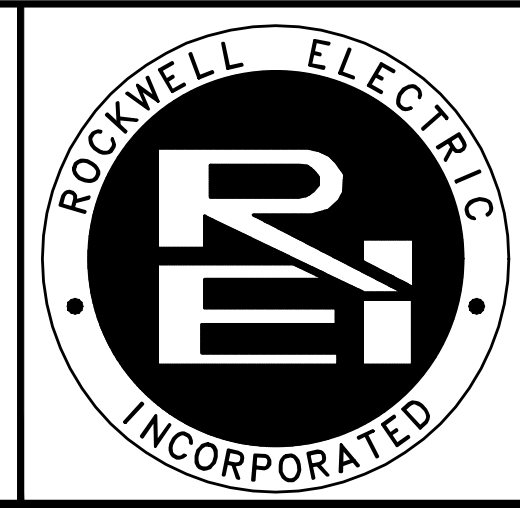
GENERAL NOTES

- NEW ENTRELEC CABLE (REF I-101).
- NEW POWER SUPPLY.
- NEW COMPACTLOGIX MODULE.

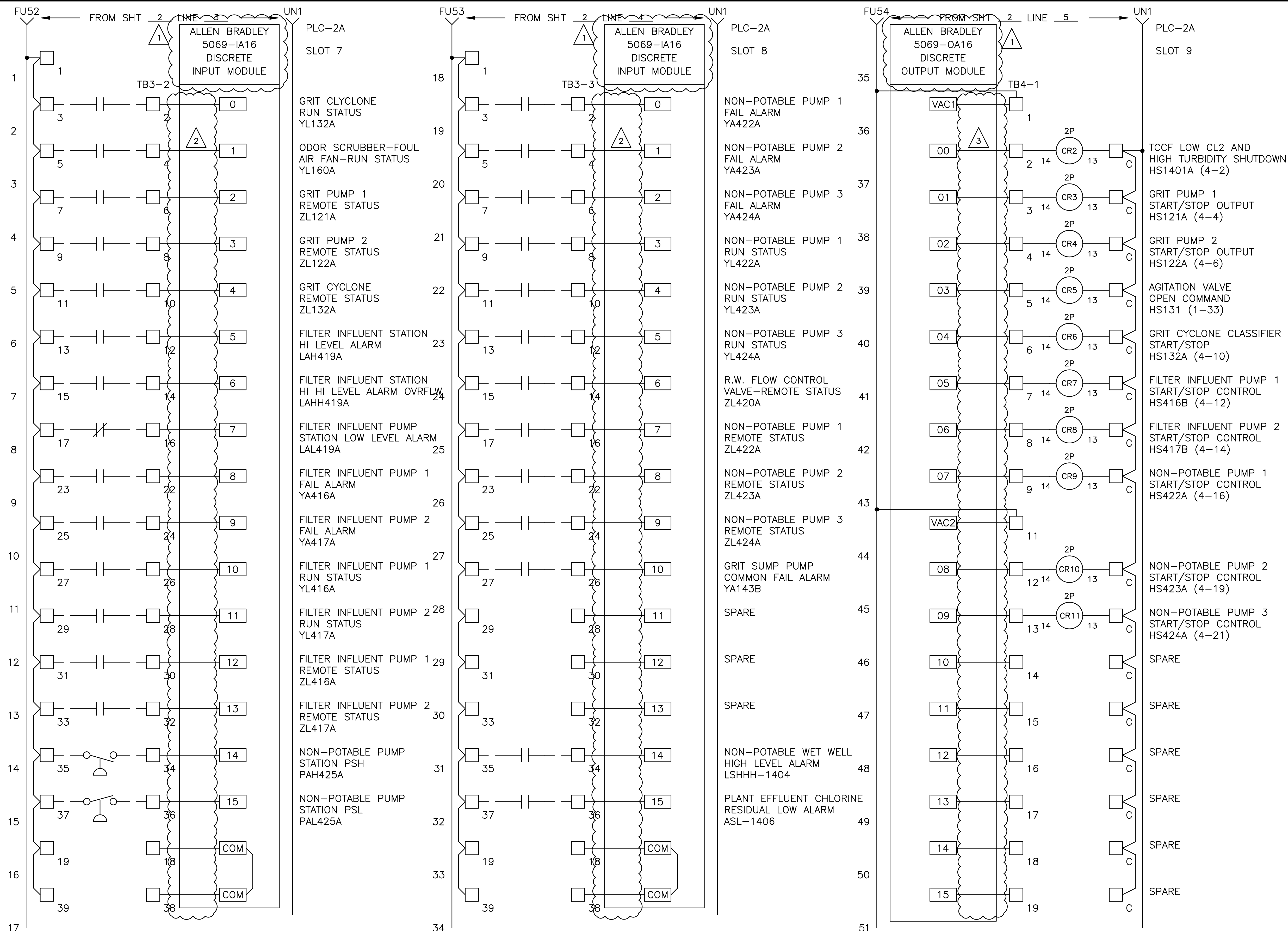


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4S RANCH SANITATION DISTRICT
WASTEWATER TREATMENT PLANT EXPANSION
MAIN CONTROL PANEL
PLC-2



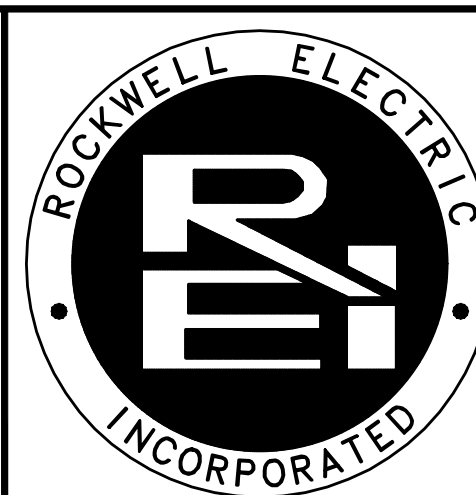
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DATE 12-4-00	APPROVED BY:	REVISION NO.: A	SCALE: N/A	SHEET: 8 OF 26



- GENERAL NOTES
- 1 NEW COMPACTLOGIX MODULE.
 - 2 NEW ENTRELEC CABLE (REF I-102).
 - 3 NEW ENTRELEC CABLE (REF I-101).

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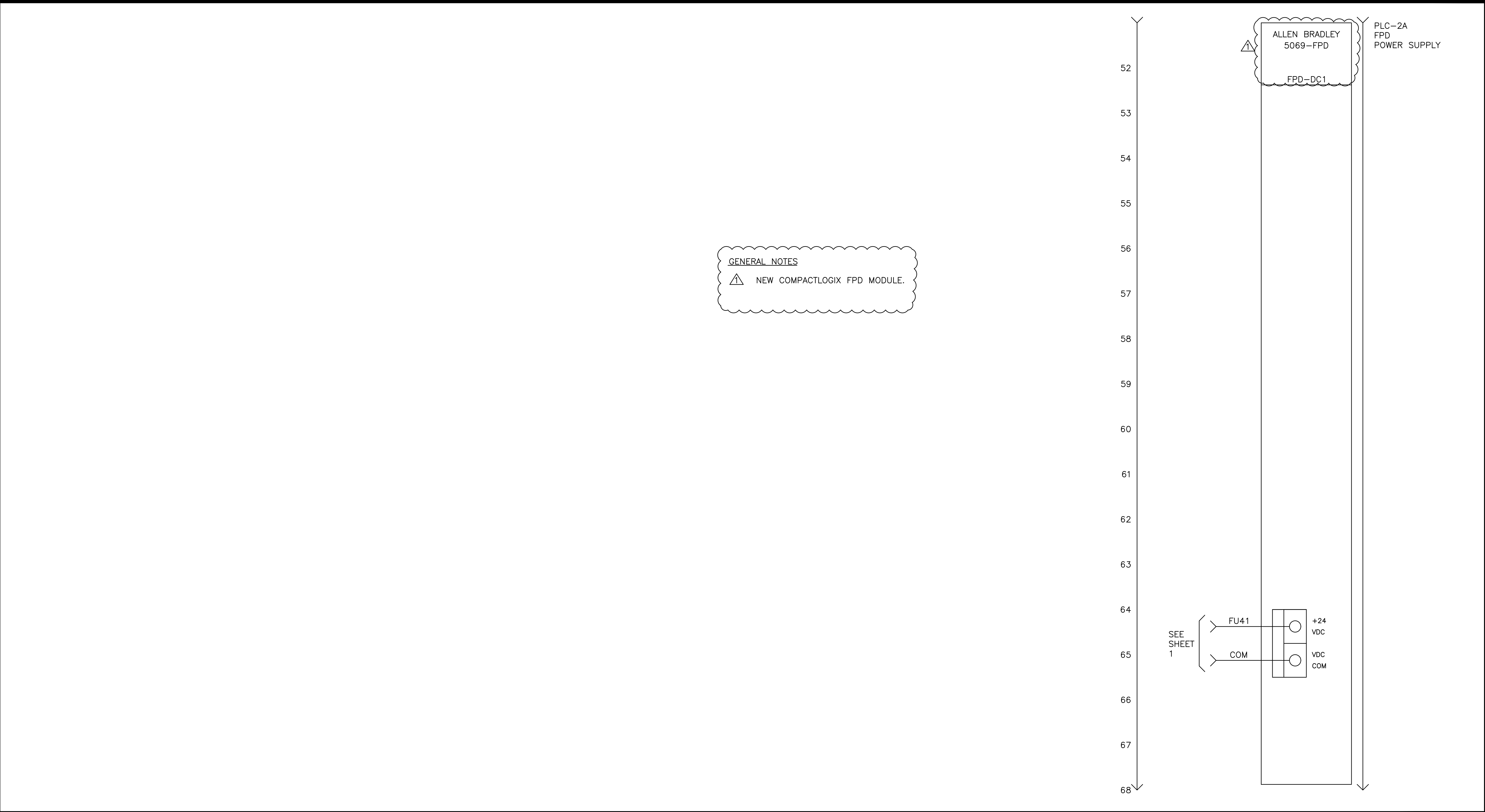
4S RANCH SANITATION DISTRICT
WASTEWATER TREATMENT PLANT EXPANSION
MAIN CONTROL PANEL
PLC-2

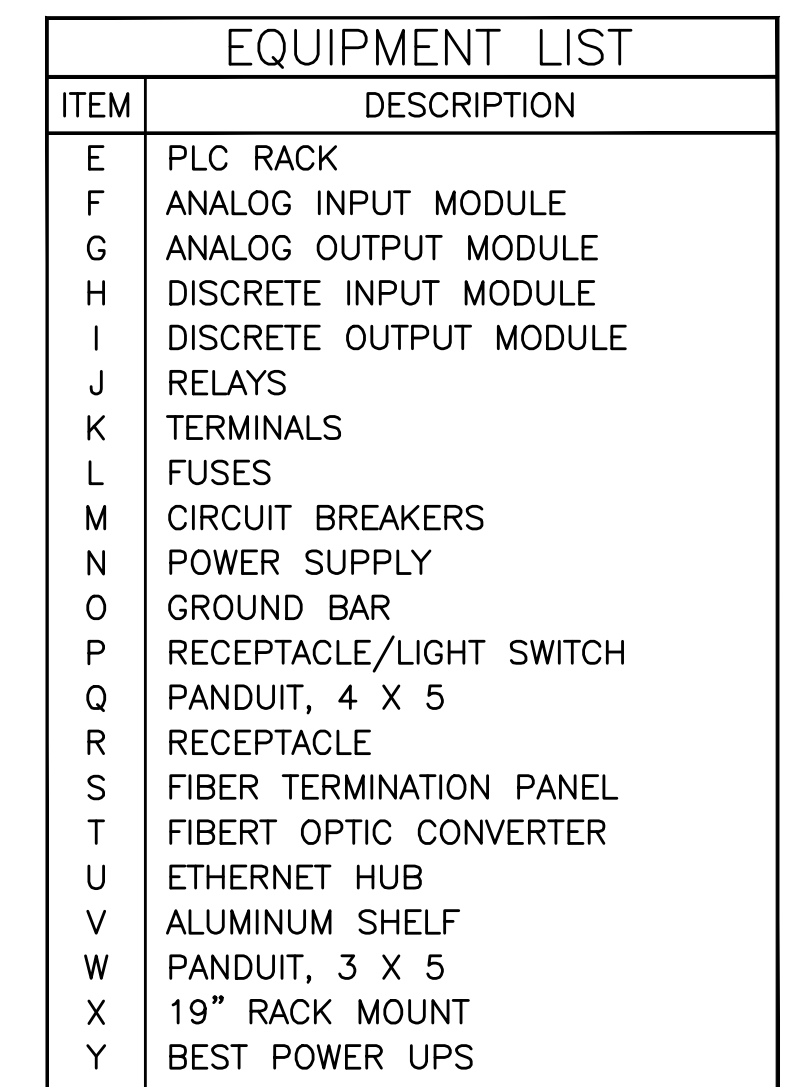
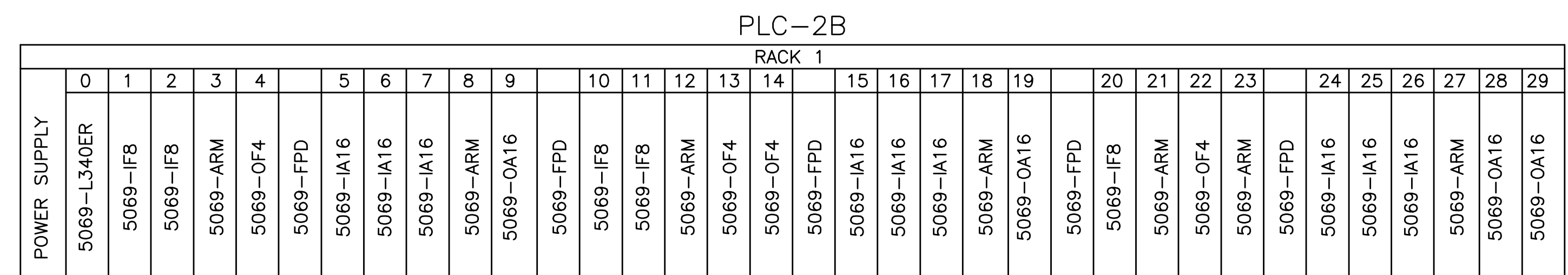


DRAWING NUMBER:


D500-P102-1200

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DATE 12-4-00	APPROVED BY:	REVISION NO.: B	SCALE: N/A	SHEET: 9 OF 26





5-DOOR CARBON STEEL ENCLOSURE – BACKPANEL VIEW




ROCKWELL ELECTRIC
INCORPORATED

SHEET: 9 OF 26

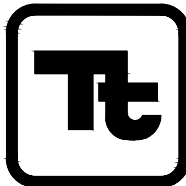
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I-008
TYPE 3 - MODIFIED CONTROL PANEL AND
WIRING DIAGRAMS
(EXAMPLE 7 SHEETS)



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8/18/23

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A	3-30-23	INITIAL RELEASE FOR REVIEW	GR
B	8-18-23	RELEASE FOR BID	GR

OLIVENHAIN MUNICIPAL WATER DISTRICT

OLIVENHAIN PLC UPGRADE PROJECT

TYPE 3 - MODIFIED CONTROL PANEL AND
WIRING DIAGRAMS (EXAMPLE 6 SHEETS)

DESN: VR

DRWN: GR

CHKD: SY

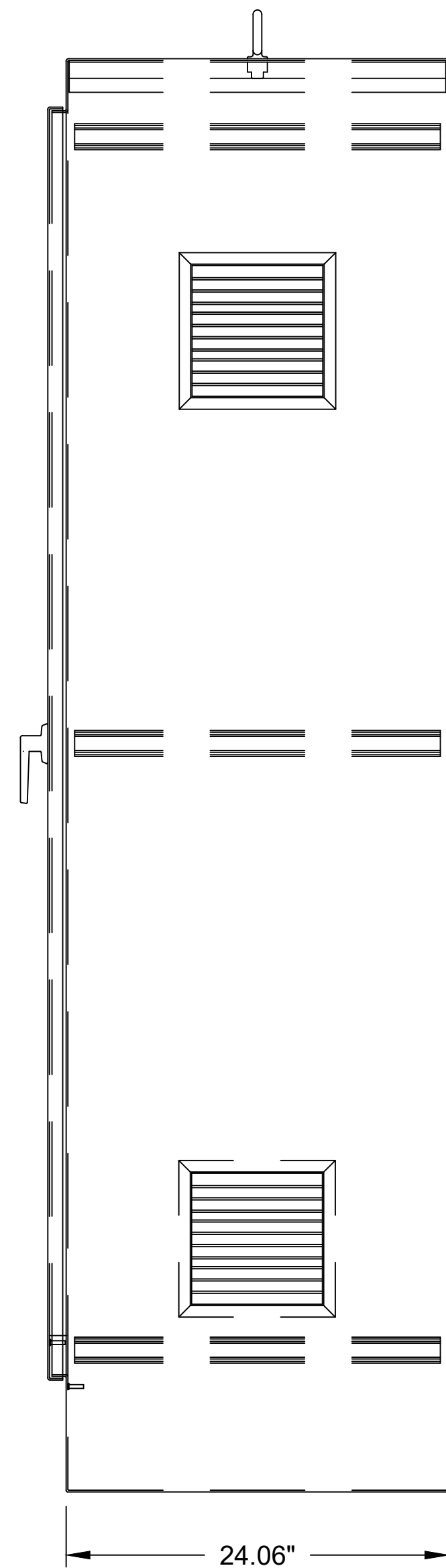
DWG NO. I-008

PROJ: D120091
D700036

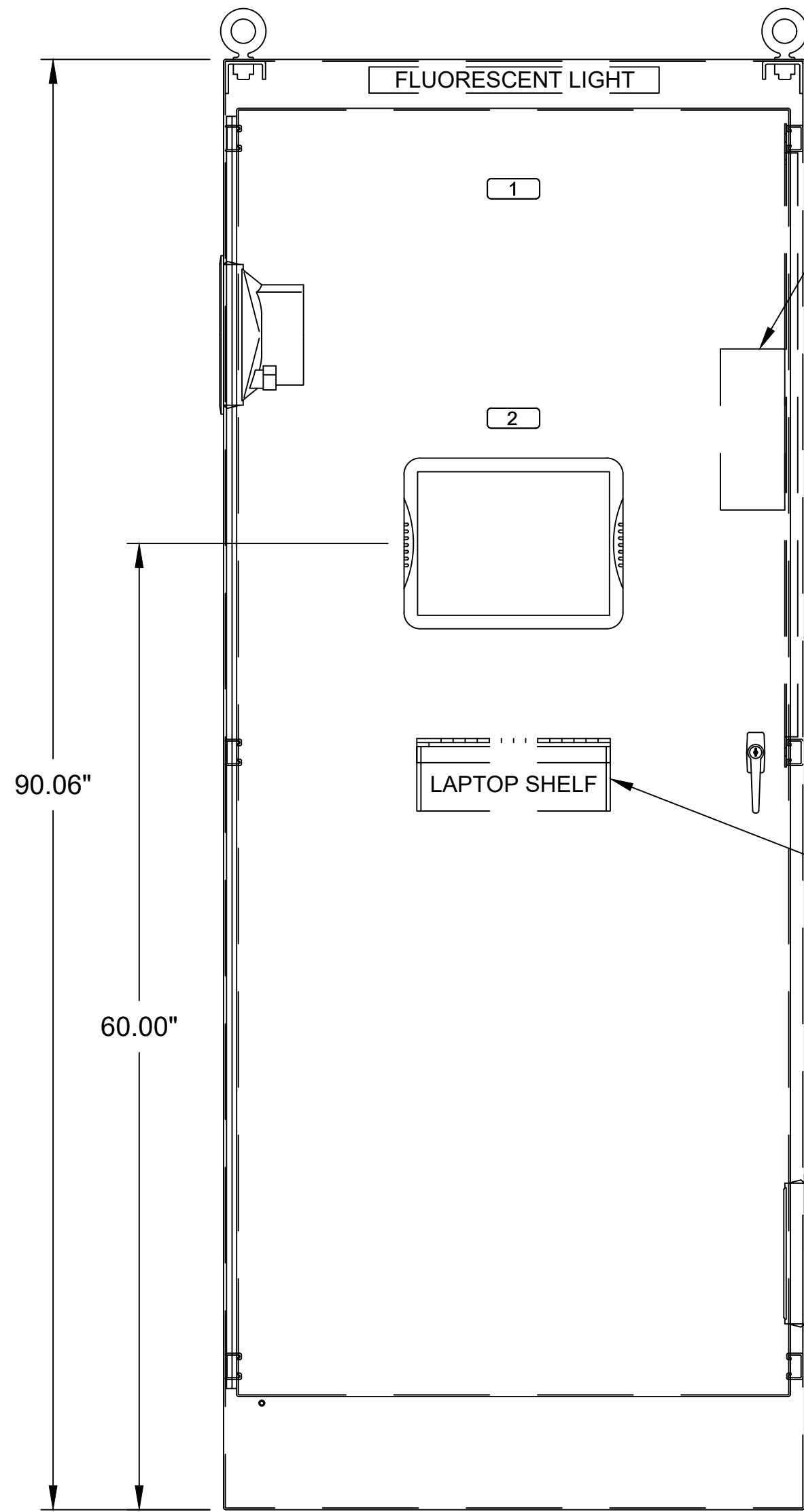
Bar measures 1 inch, otherwise drawing is not to scale

Copyright: Tetra Tech

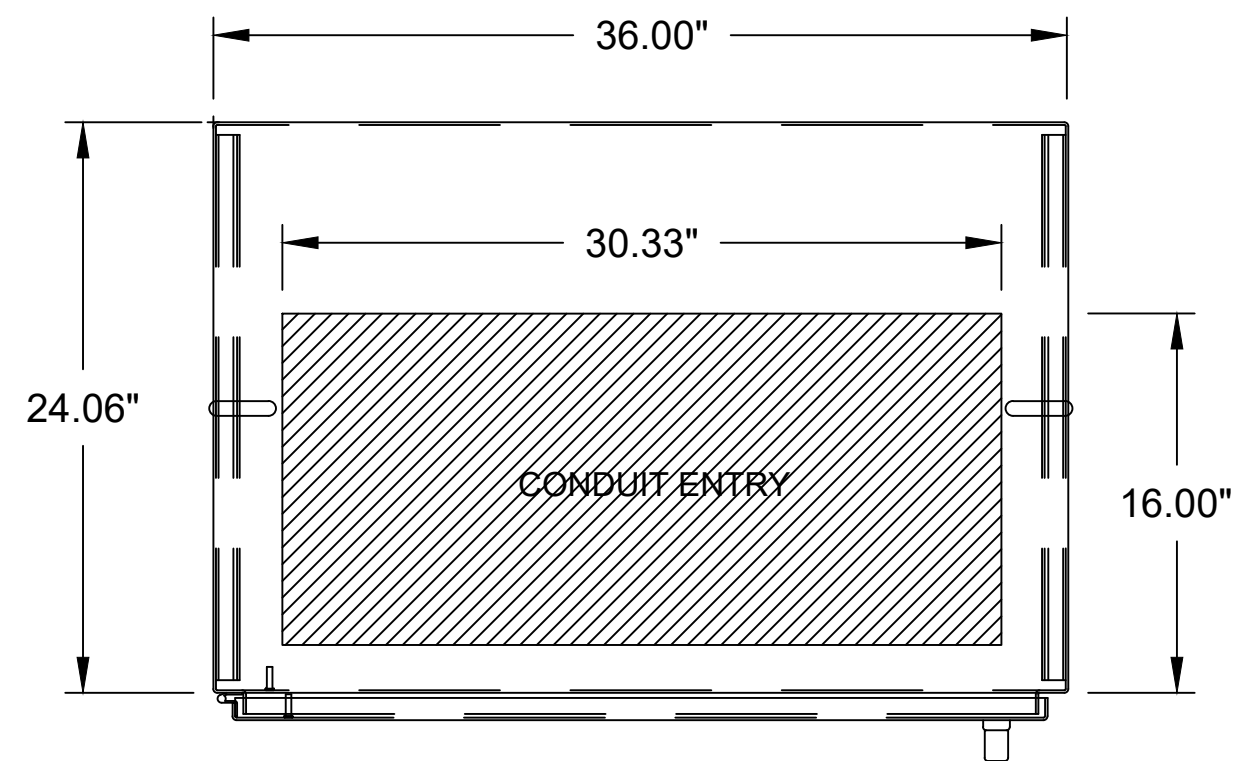
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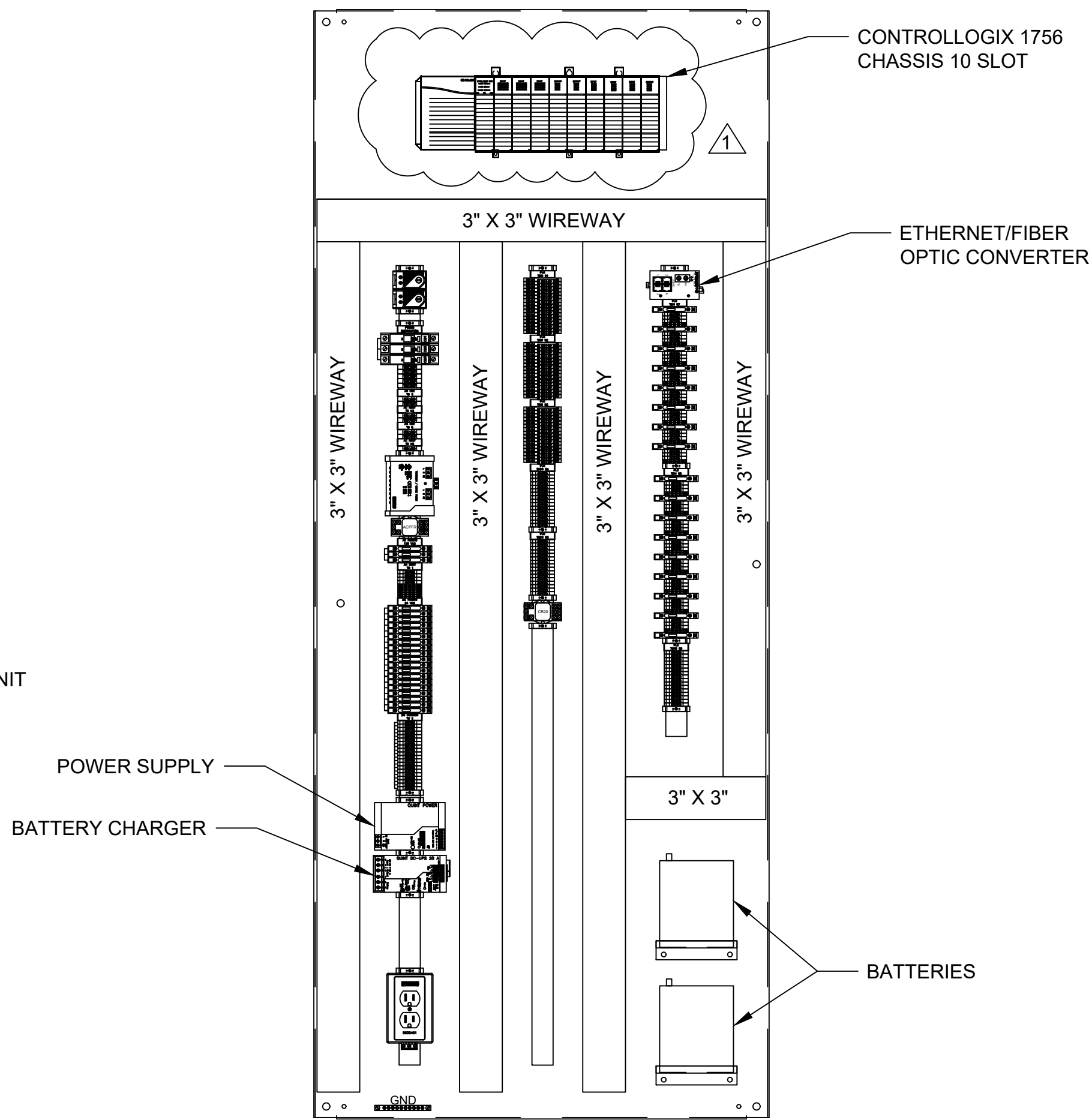
RIGHT SIDE VIEW



FRONT ELEVATION




BASE PLAN




BACKPANEL LAYOUT

NAMEPLATE SCHEDULE				
TAG#	QTY	TYPE	SIZE	INSCRIPTION
1	1	PLATE	.75" x 3"	LCP-6200
				CONTROL PANEL
2	1	PLATE	.75" x 3"	OPERATOR
				INTERFACE



Underwriters Laboratories Inc.
File No. E62062



TESCO CONTROLS INC.
815 305-2800
SACRAMENTO, CA
I-23597BH
HOFFMAN

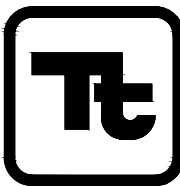
INDUSTRIAL CONTROL PANEL

VOLTAGE	PHASE	WIRES	MAINS AMPERES	HZ
120	1	3	20	60

SUITABLE FOR USE IN A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN:

AMPERES	AT	VOLTAGE
10,000	RMS SYM.	120 V

METER SOCKET RATING N/A A. CONT. ENCLOSURE TYPE 12



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MARK	DATE	DESCRIPTION	BY

OLIVENHAIN PLC UPGRADE PROJECT

AMMONIA FEED INJECTION
FACILITY
ELEVATION

PROJ: 23597BH-10

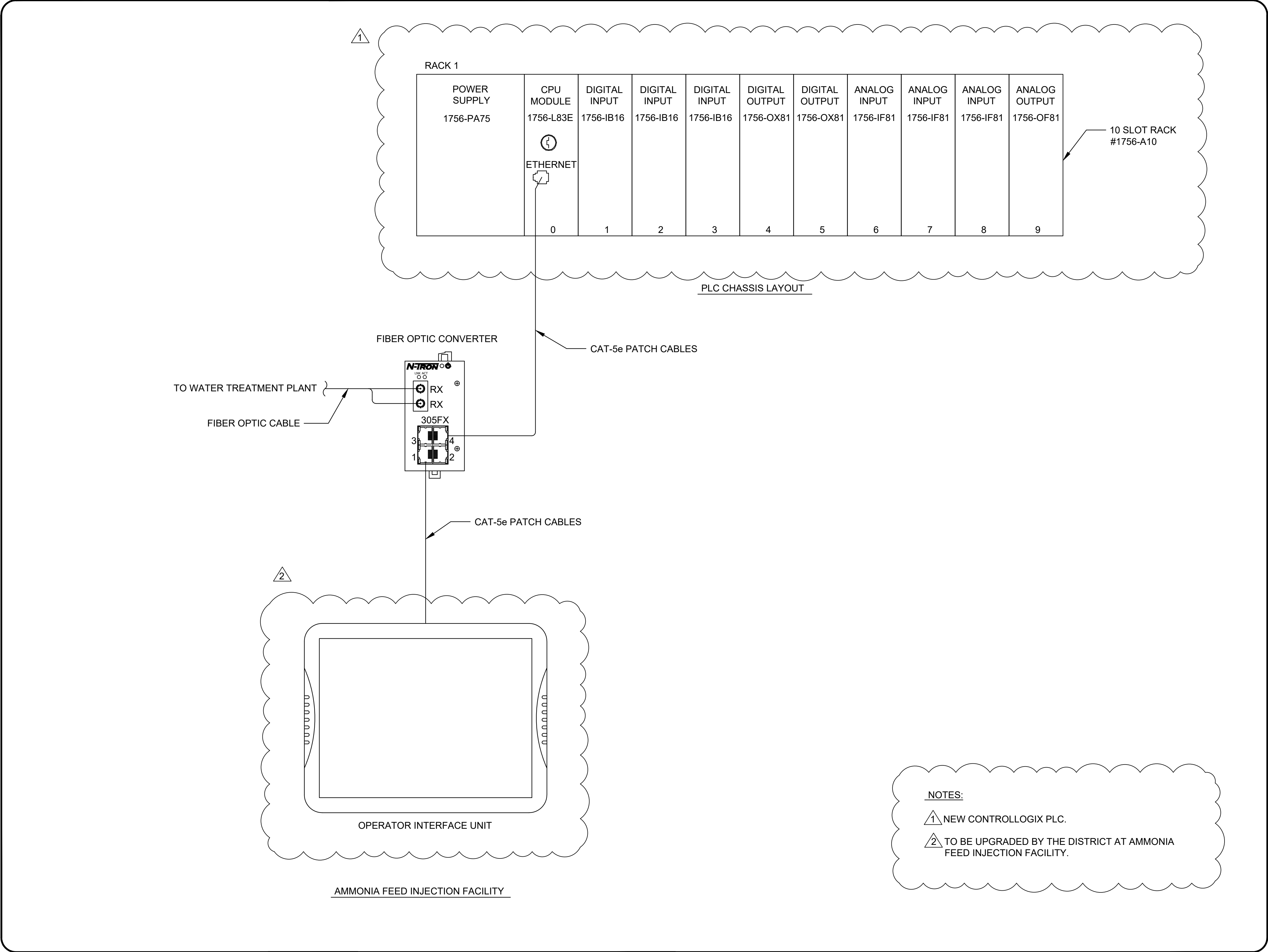
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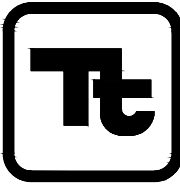

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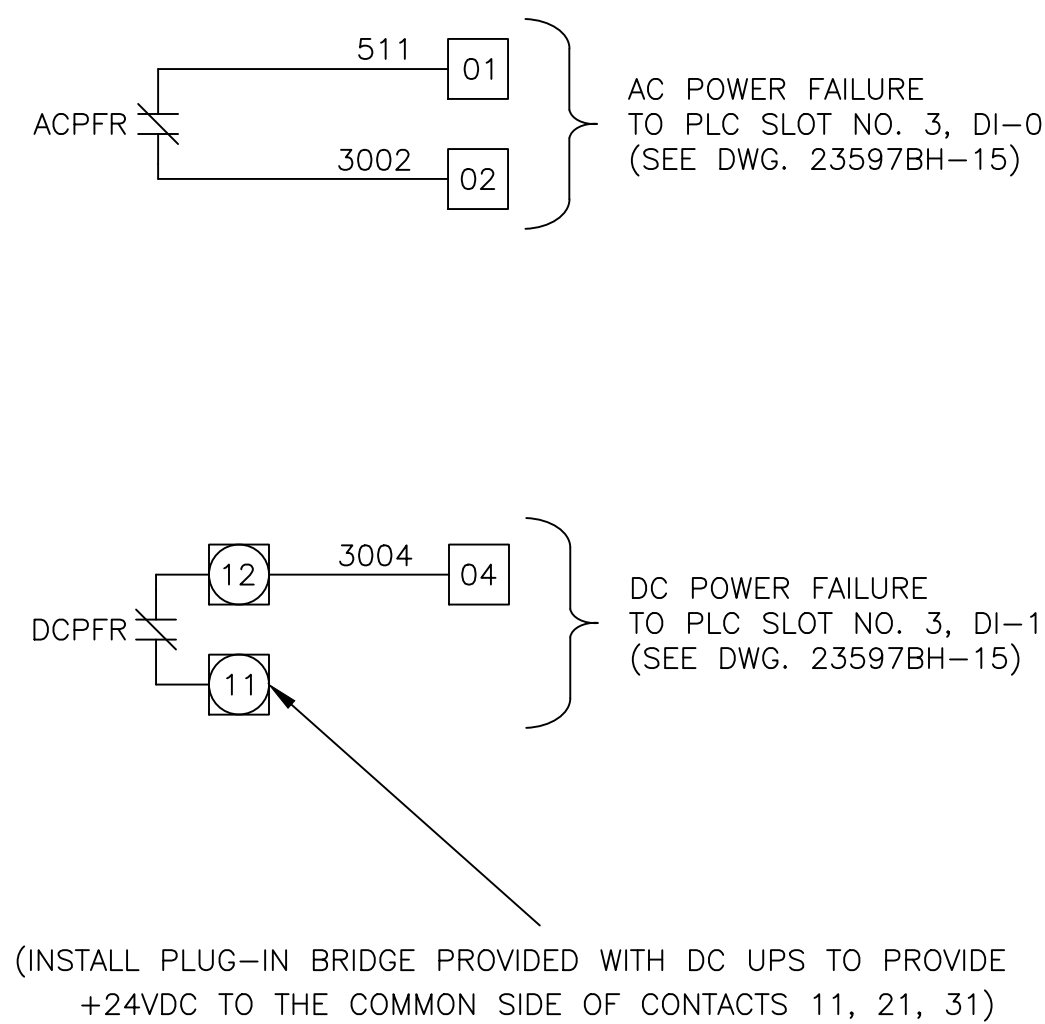
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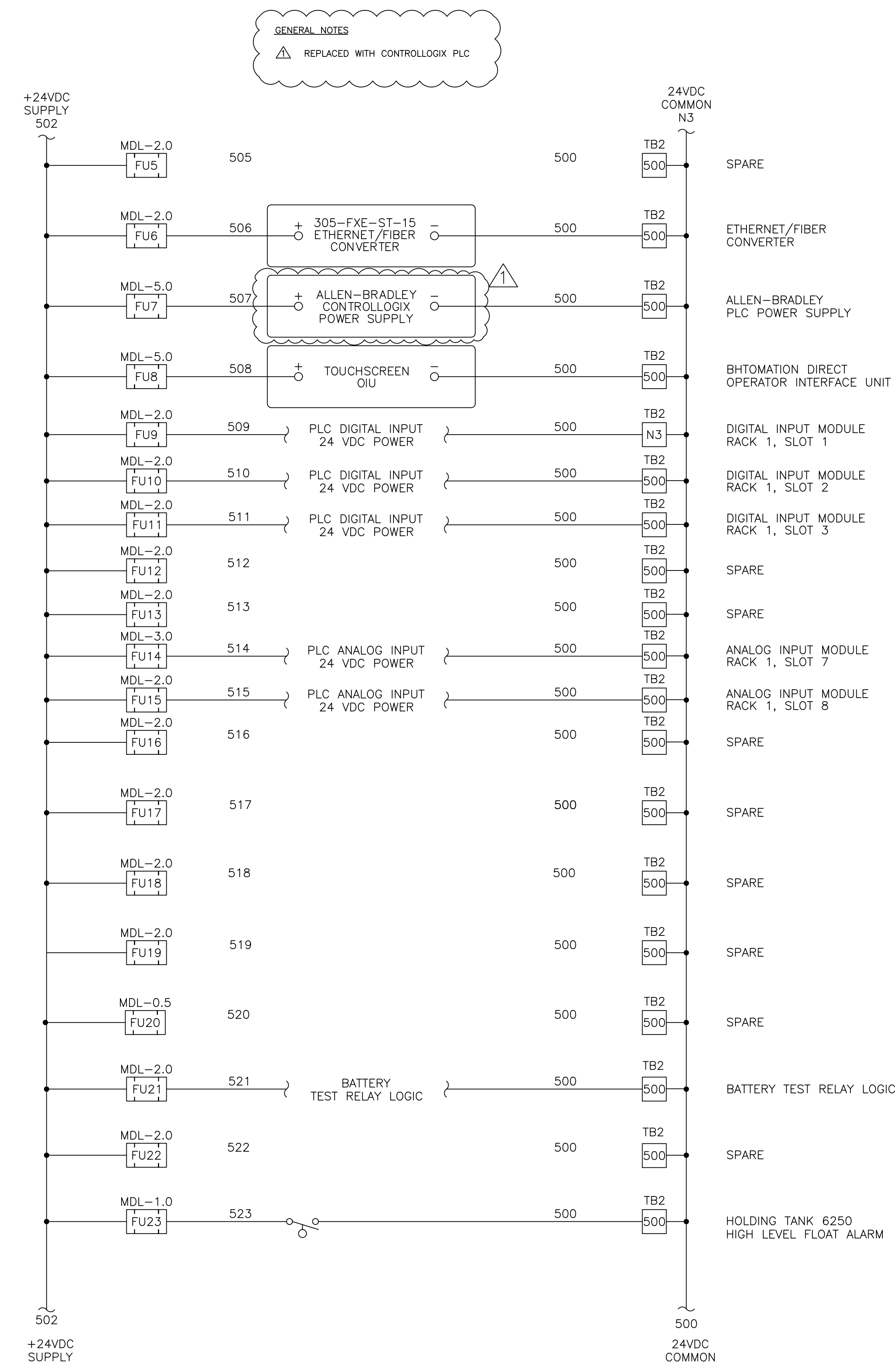
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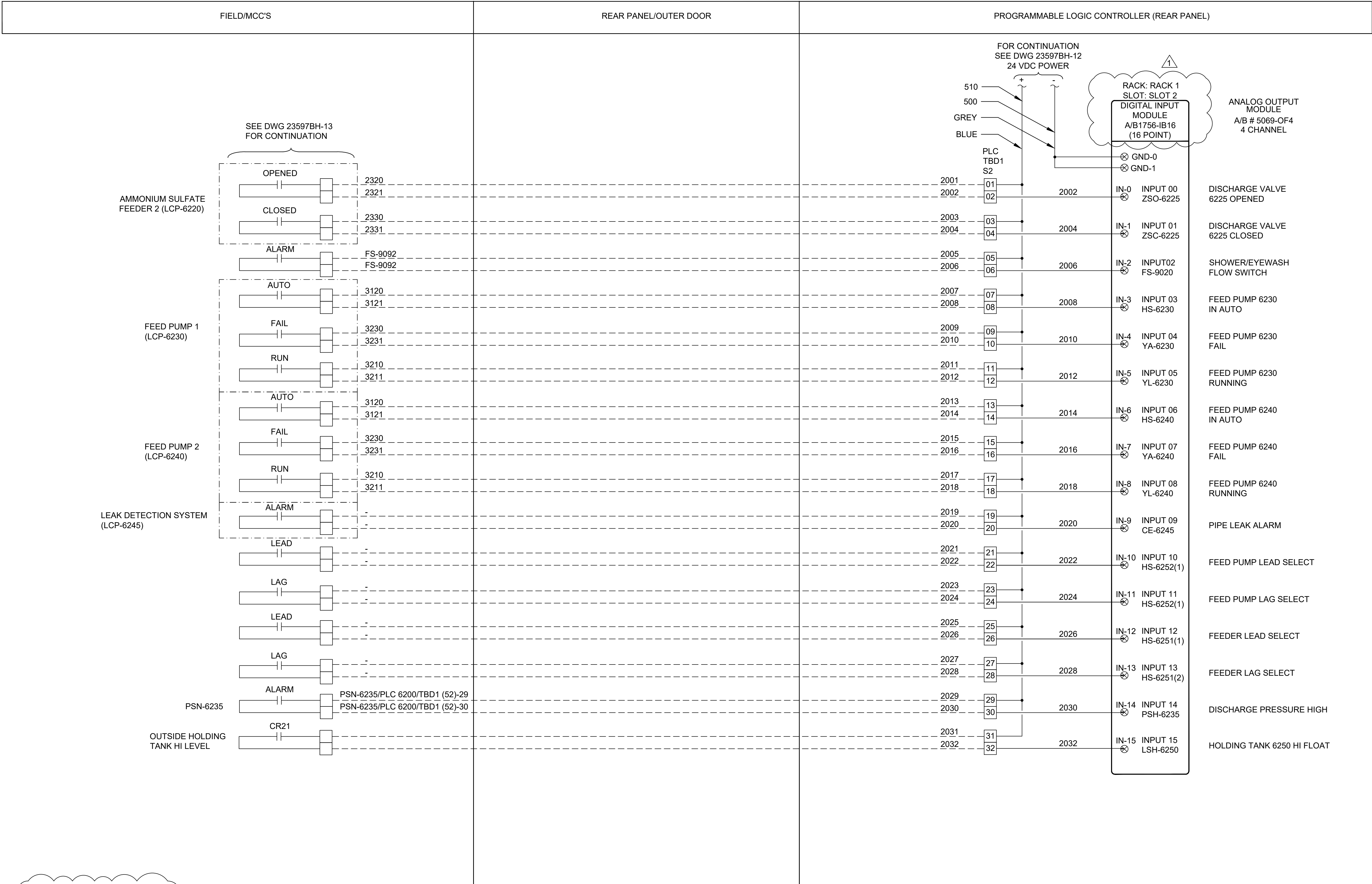
 TETRA TECH www.tetrattech.com 3475 E FOOTHILL BLVD PASADENA, CALIF 91107 (626) 351-4664	 OLIVENHAIN Municipal Water District 1966 Olivenhain Road Encinitas, CA 92024 (760)753-6466	MARK	DATE	DESCRIPTION	BY	OLIVENHAIN PLC UPGRADE PROJECT	PROJ: 23597BH-11
							AMMONIA FEED INJECTION FACILITY LAYOUT
							CHKD:
							11



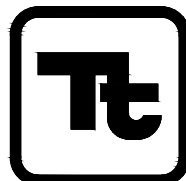
DC POWER DISTRIBUTION



8/20/2023 1:00:20 PM - C:\USERS\SHUKANG.YAOTETRA TECH, INC\OWID - CLIENT\INFO - GENERAL\14-SPECIFICATIONS (100PCT) - TO CLIENT\RELEASED\WGS\23597BH-14.DWG - YAO, SHUKANG



NOTES:
NEW CONTROLLOGIX MODULE



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MARK	DATE	DESCRIPTION	BY

OLIVENHAIN PLC UPGRADE PROJECT

AMMONIA FEED INJECTION
FACILITY

PLC DIGITAL INPUT WIRING DIAGRAM

PROJ: 23597BH-14

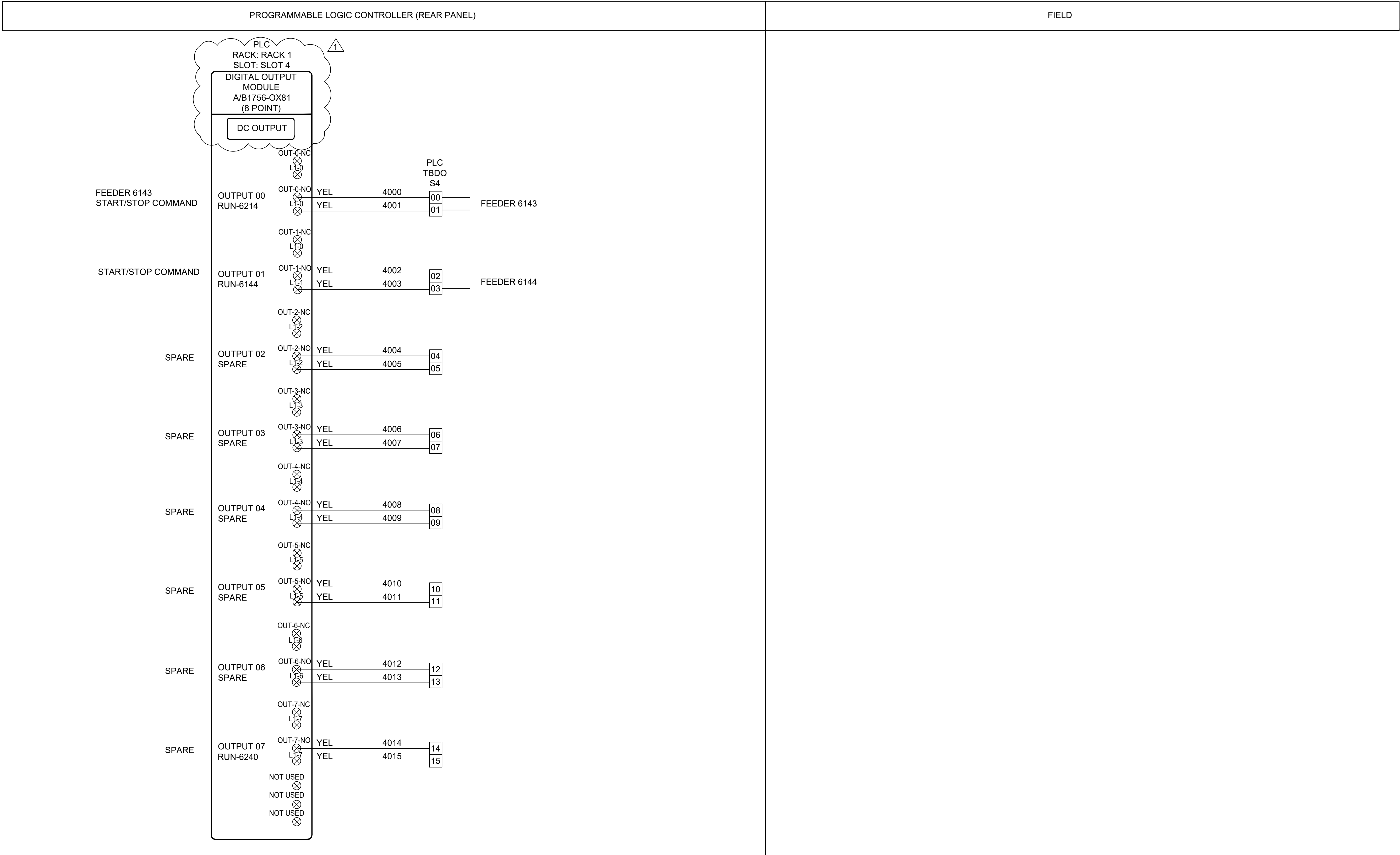
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DRWN:

CHKD:

14

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NOTES:
1 NEW CONTROLLOGIX MODULE.



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MARK	DATE	DESCRIPTION	BY

OLIVENHAIN PLC UPGRADE PROJECT

AMMONIA FEED INJECTION
FACILITY

PLC DIGITAL OUTPUT WIRING DIAGRAM

PROJ: 23597BH-16

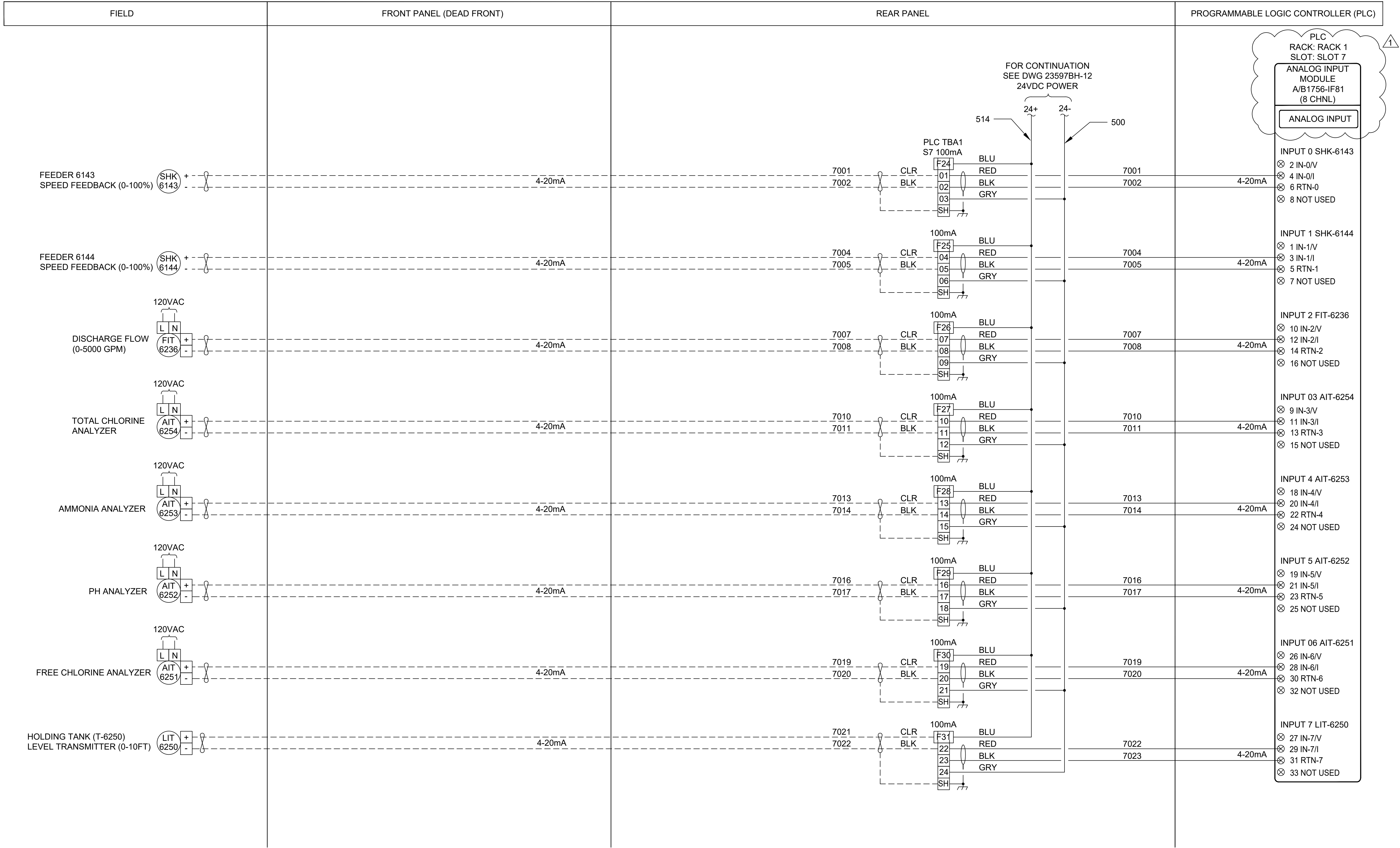
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CHKD:

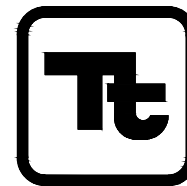
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NOTES:

NEW CONTROLLOGIX MODULE.



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MARK	DATE	DESCRIPTION	BY

OLIVENHAIN PLC UPGRADE PROJECT

AMMONIA FEED INJECTION
FACILITY

PLC ANALOG INPUT WIRING DIAGRAM

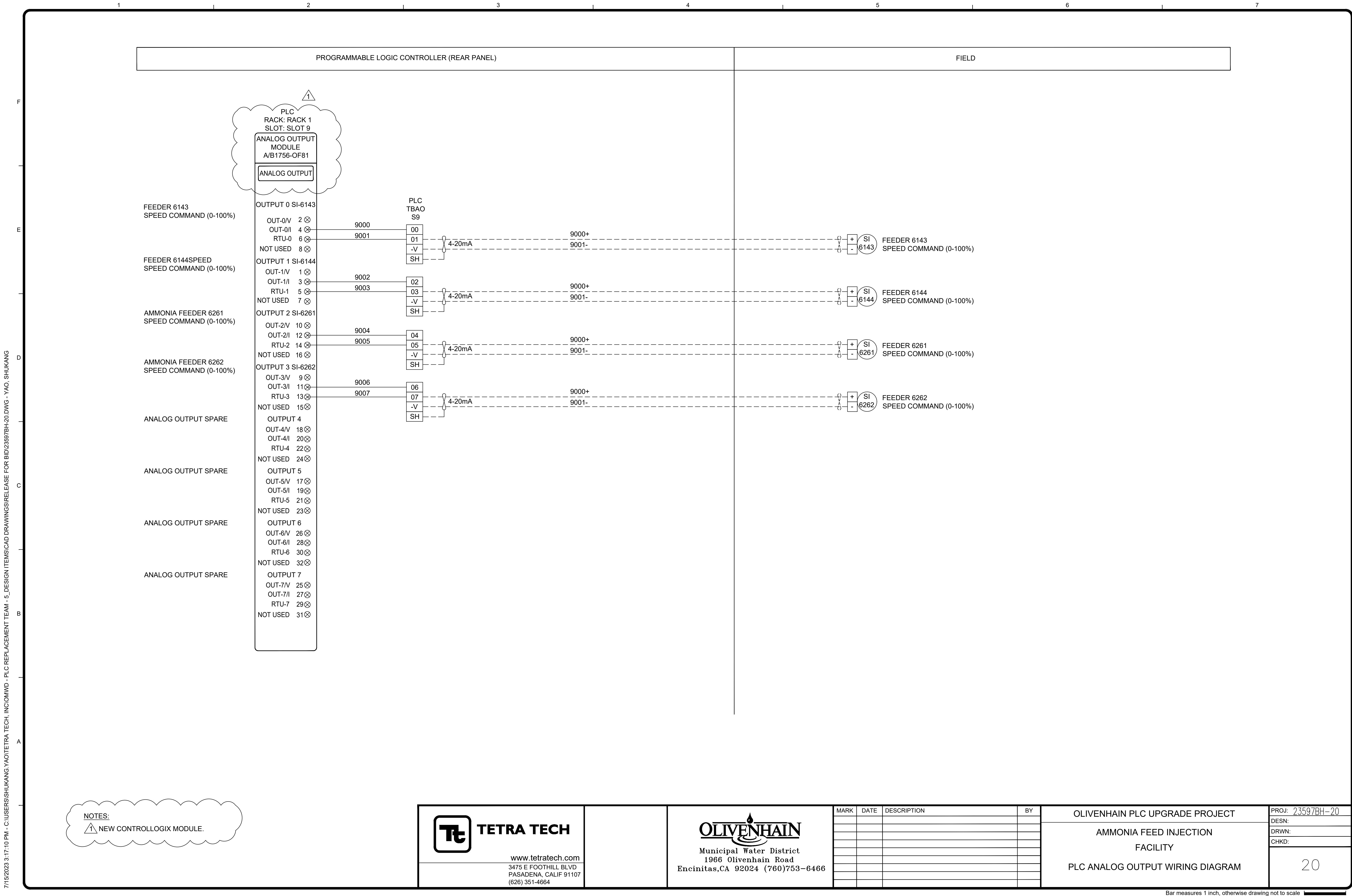
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DESN:

DRWN:

CHKD:

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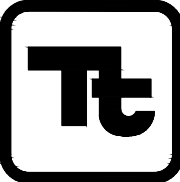
I-009

TYPE 4 - REDRAWN FROM PDF - CONTROL
PANEL AND WIRING DIAGRAMS

(EXAMPLE 6 SHEETS)




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OLIVENHAIN MUNICIPAL WATER DISTRICT

OLIVENHAIN PLC UPGRADE PROJECT

TYPE 4 - MODIFIED CONTROL PANEL AND
WIRING DIAGRAMS (EXAMPLE 6 SHEETS)

DESN: VR

DRWN: GR

CHKD: SY

DWG NO. I-009

PROJ: D120091
D700036

8/19/2023 10:40:28 AM - C:\USERS\SHUKANG.YAO\TETRA TECH\INC\OMWD - CLIENTINFO - GENERAL\T4-SPECIFICATIONS (100PCT) - TOCLIENTRELEASEIDWGS\I-009A.DWG - YAO, SHUKANG

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FROM SHEET 2, LINE 216

601 +24V COM

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ETHERNET SWITCH

ICP
5 PORT
ETHERNET SWITCH
MODEL # NS-205

PORT 1

PORT 2

PORT 3

PORT 4

PORT 5

TO MAIN CONTROL SYSTEM

1

PLC

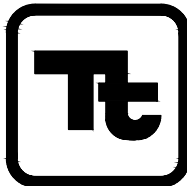
ALLEN-BRADLEY
COMPACTLOGIX
PLC

NOTES:

1 NEW COMPACTLOGIX PLC



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OLIVENHAIN MUNICIPAL WATER DISTRICT

DESN: VR

DRWN: GR

OLIVENHAIN PLC UPGRADE PROJECT

CHKD: SY

DWG NO. I-009A

4S RANCH SLUDGE DEWATERING PLANT
ODOR CONTROL PANEL
WIRING DIAGRAM

PROJ: D120091
D700036

Bar measures 1 inch, otherwise drawing is not to scale

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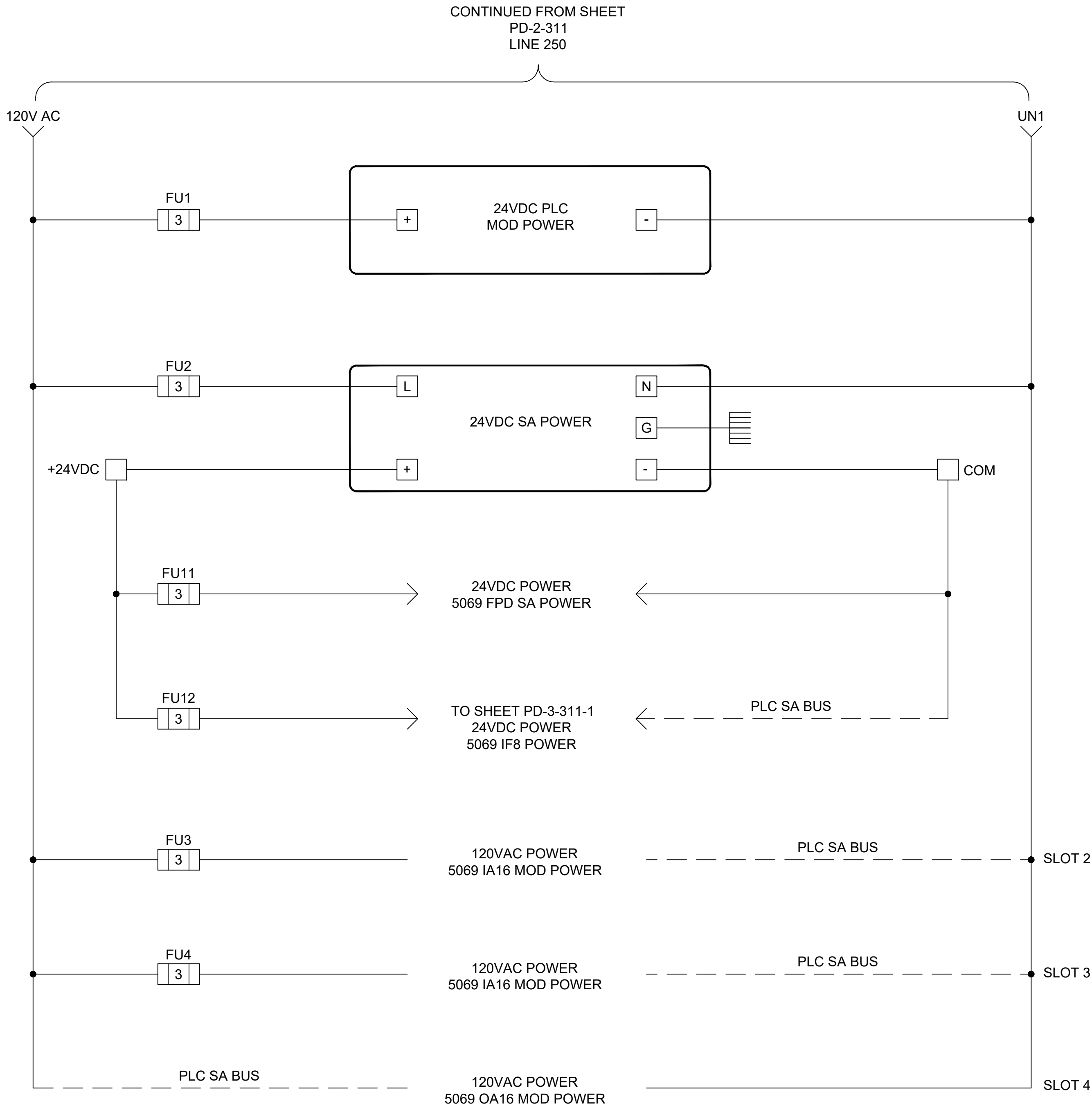
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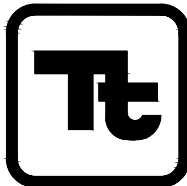
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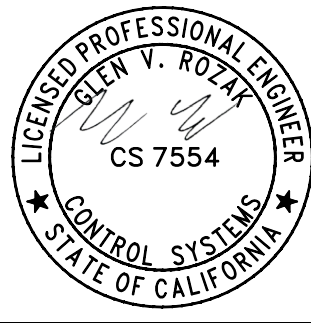


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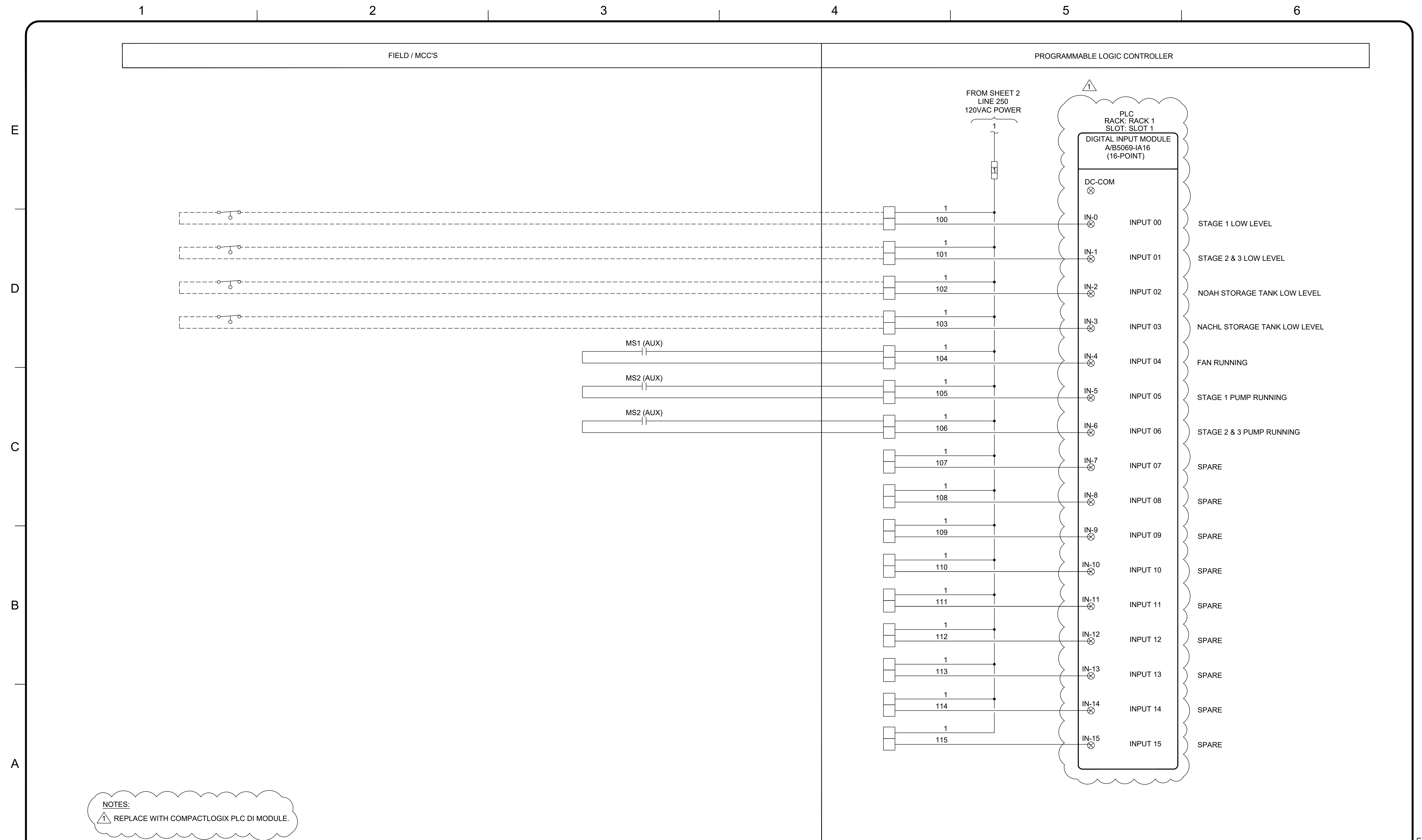
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A	3-30-23	INITIAL RELEASE FOR REVIEW	GR
B	8-18-23	RELEASE FOR BID	GR

OLIVENHAIN MUNICIPAL WATER DISTRICT	DESN: VR
OLIVENHAIN PLC UPGRADE PROJECT	DRWN: GR
4S RANCH SLUDGE DEWATERING PLANTWIRING	CHKD: SY
ODOR CONTROL PANEL	DWG NO. I-009B
ELECTRICAL POWER AND WIRING DIAGRAM	PROJ: D120091 D700036




Bar measures 1 inch, otherwise drawing is not to scale

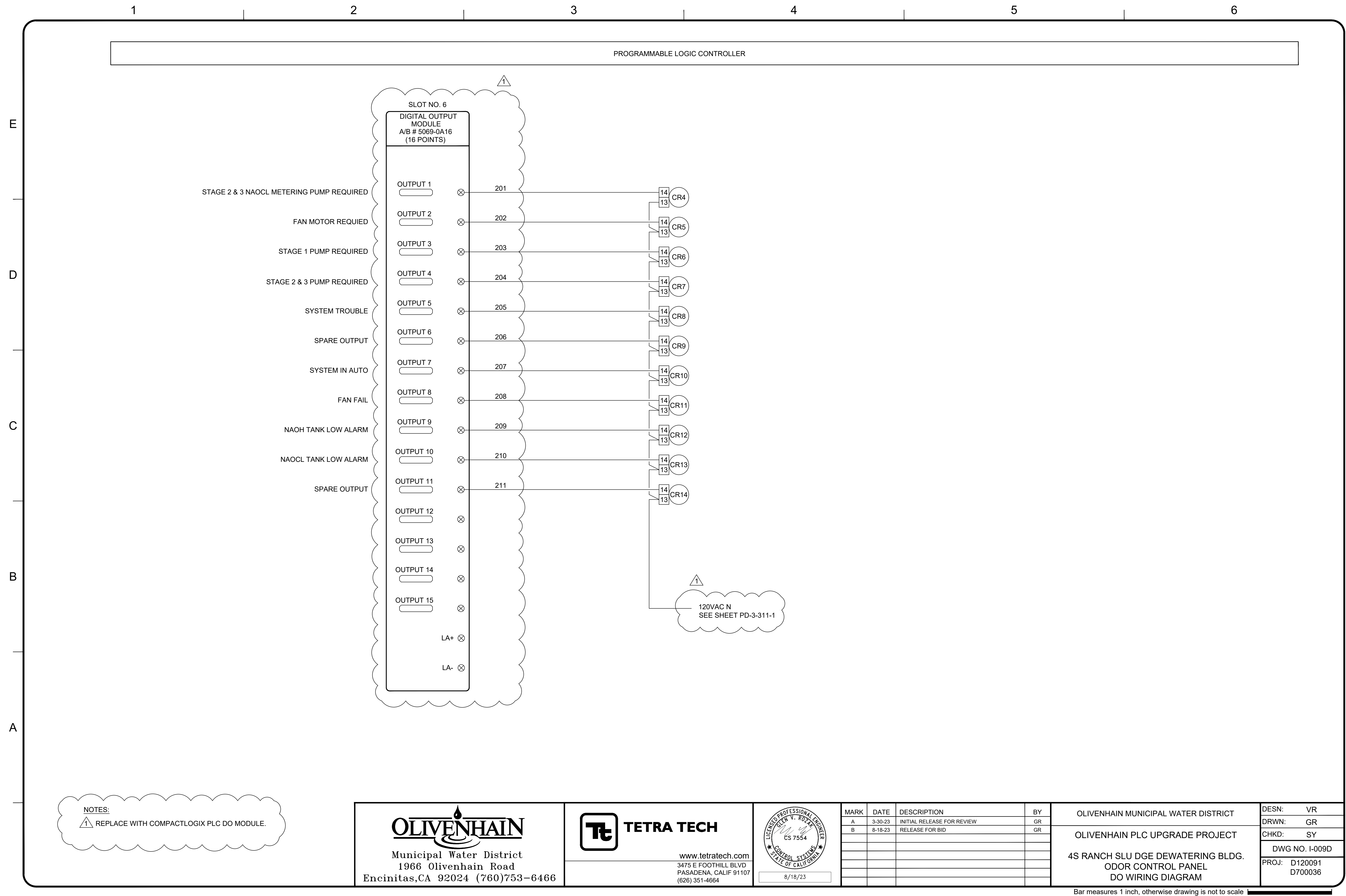
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NOTES:

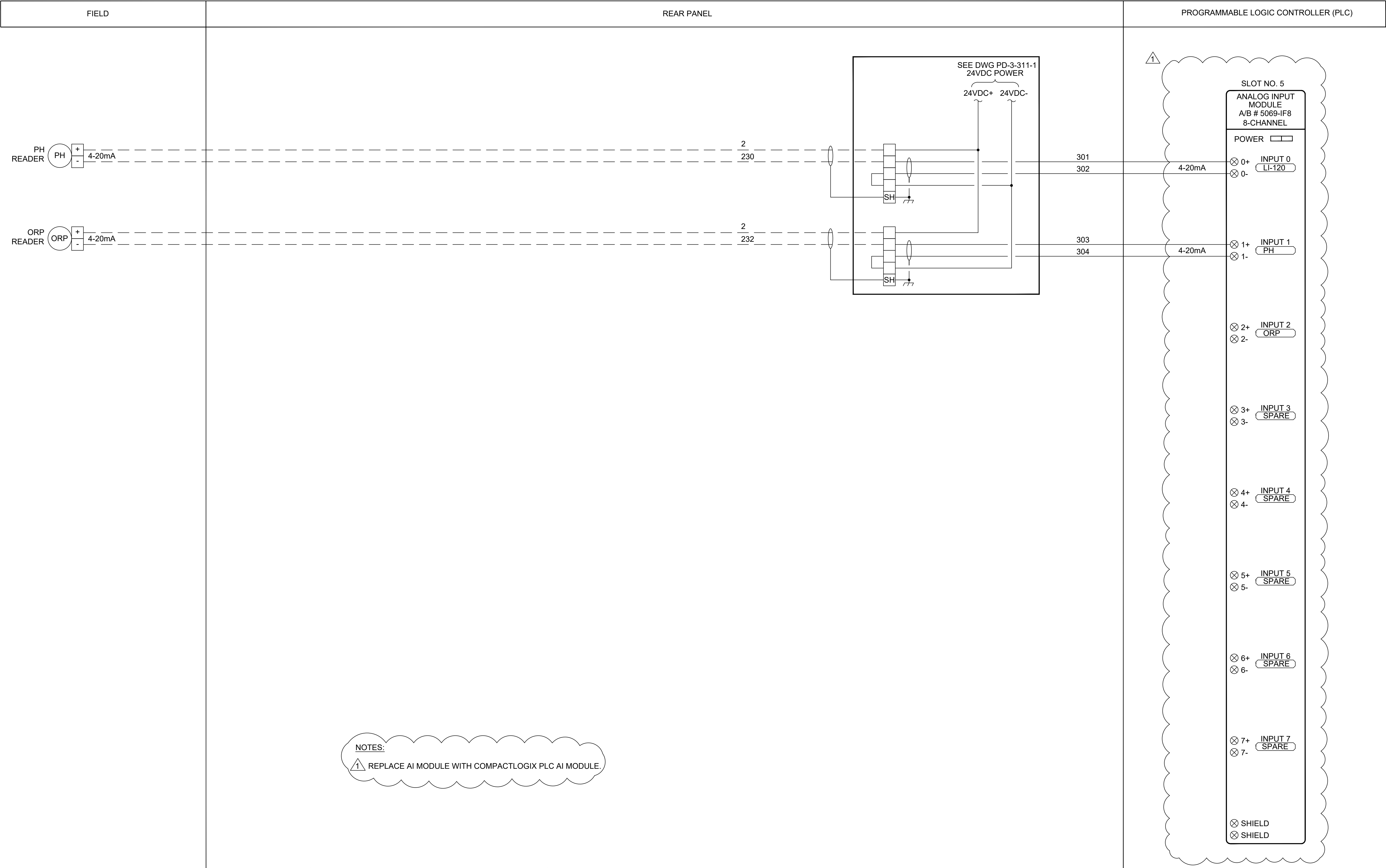
1. REPLACE WITH COMPACTLOGIX PLC DI MODULE.

 <p>OLIVENHAIN</p> <p>Municipal Water District 1966 Olivenhain Road Encinitas, CA 92024 (760)753-6466</p>	 <p>TETRA TECH</p> <p>www.tetrattech.com 3475 E FOOTHILL BLVD PASADENA, CALIF 91107 (626) 351-4664</p>	 <p>8/18/23</p>	<table border="1"> <thead> <tr> <th>MARK</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>3-30-23</td> <td>INITIAL RELEASE FOR REVIEW</td> <td>GR</td> </tr> <tr> <td>B</td> <td>8-18-23</td> <td>RELEASE FOR BID</td> <td>GR</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	MARK	DATE	DESCRIPTION	BY	A	3-30-23	INITIAL RELEASE FOR REVIEW	GR	B	8-18-23	RELEASE FOR BID	GR																									<p>OLIVENHAIN MUNICIPAL WATER DISTRICT</p> <p>OLIVENHAIN PLC UPGRADE PROJECT</p> <p>4S RANCH SLU DGE DEWATERING BLDG. ODOR CONTROL PANEL WIRING DIAGRAM</p>	<p>DESN: VR</p> <p>DRWN: GR</p> <p>CHKD: SY</p> <p>DWG NO. I-009C</p> <p>PROJ: D120091 D700036</p>
			MARK	DATE	DESCRIPTION	BY																																			
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B	8-18-23	RELEASE FOR BID	GR																																						



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NOTES:

⚠️ REPLACE AI MODULE WITH COMPACTLOGIX PLC AI MODULE.

OLIVENHAIN

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OLIVENHAIN MUNICIPAL WATER DISTRICT

OLIVENHAIN PLC UPGRADE PROJECT

4S RANCH SLU DGE DEWATERING BLDG.
ODOR CONTROL PANEL
AI WIRING DIAGRAM

DESN:	VR
DRWN:	GR
CHKD:	SY
DWG NO.	I-009E
PROJ:	D120091 D700036

8/19/2023 10:45:35 AM - C:\USERS\SHUKANG.YAO\TETRA TECH\INC\OMWD - CLIENTINFO - GENERAL\T4-SPECIFICATIONS (100PCT) - TOCLIENTRELEASEIDWGS\I-009F.DWG - YAO, SHUKANG

E
D
C
B
A

1

2

3

4

5

6

PROGRAMMABLE LOGIC CONTROLLER (PLC)

FIELD

1

SLOT NO. 5

ANALOG OUTPUT
MODULE
A/B # 5069-OF4
4 CHANNEL

POWER

OUTPUT 0

0

1

4-20mA

401

COM

GND

STAGE 2 & 3 NAOH METERING PUMP SPEED SIGNAL (4-20mA)

OUTPUT 1

2

3

4-20mA

402

COM

GND

STAGE 2 & 3 NAOCL METERING PUMP SPEED SIGNAL (4-20mA)

OUTPUT 2

4

5

4-20mA

403

COM

GND

SPARE OUTPUT (4-20mA)

OUTPUT 3

6

7

4-20mA

404

COM

GND

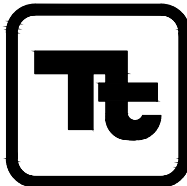
SPARE OUTPUT (4-20mA)

NOTES:

1 REPLACE WITH COMPACTLOGIX AO MODULE.



Municipal Water District
1966 Olivenhain Road
Encinitas, CA 92024 (760)753-6466



TETRA TECH

www.tetratech.com
3475 E FOOTHILL BLVD
PASADENA, CALIF 91107
(626) 351-4664



8/18/23

MARK	DATE	DESCRIPTION	BY
A	3-30-23	INITIAL RELEASE FOR REVIEW	GR
B	8-18-23	RELEASE FOR BID	GR

OLIVENHAIN MUNICIPAL WATER DISTRICT

DESIGN: VR

DRAWN: GR

CHECKED: SY

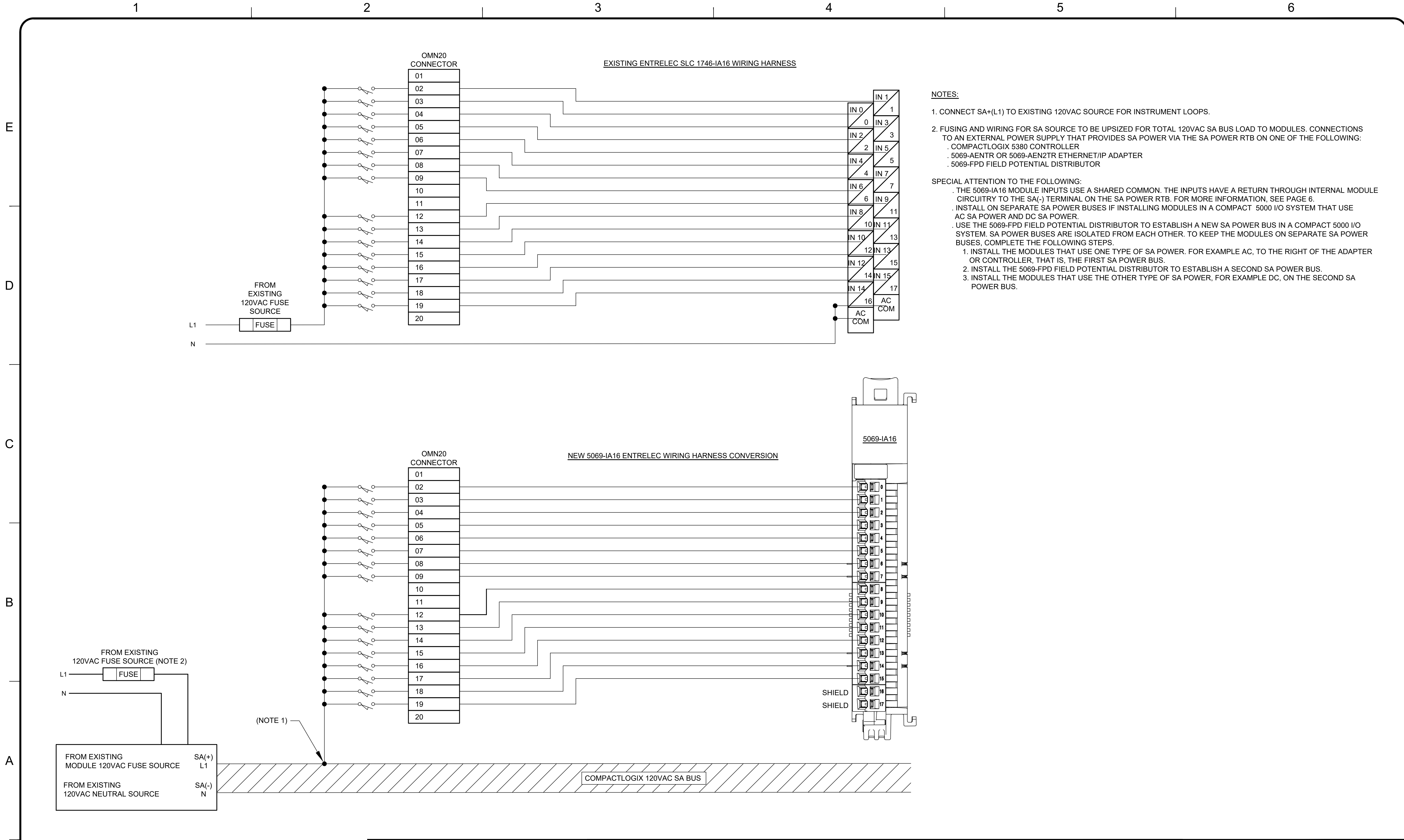
DWG NO. I-009F


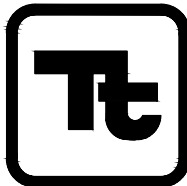

PROJECT: D120091
D700036

Bar measures 1 inch, otherwise drawing is not to scale

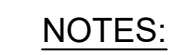
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 Municipal Water District 1966 Olivenhain Road Encinitas, CA 92024 (760)753-6466		 TETRA TECH www.tetratech.com 3475 E FOOTHILL BLVD PASADENA, CALIF 91107 (626) 351-4664		 8/18/23		MARK	DATE	DESCRIPTION	BY	OLIVENHAIN MUNICIPAL WATER DISTRICT		DESN:	VR
						A	3-30-23	INITIAL RELEASE FOR REVIEW	GR	OLIVENHAIN PLC UPGRADE PROJECT		DRWN:	GR
						B	8-18-23	RELEASE FOR BID	GR			CHKD:	SY
												DWG NO. I-101	
										SLC TO COMPACTLOGIX 5000 TYPE 2 DETAILS - ENTRELEC WIRING HARNESS 1746-IA16 TO 5069-IA16 PLC CONVERSION		PROJ:	D120091 D700036

Bar measures 1 inch, otherwise drawing is not to scale



1. INSTALL THE MODULES THAT USE ONE TYPE OF SA POWER, FOR EXAMPLE AC, TO THE RIGHT OF THE ADAPTER OR CONTROLLER, THAT IS, THE FIRST SA POWER BUS.
2. INSTALL THE 5069-FPD FIELD POTENTIAL DISTRIBUTOR TO ESTABLISH A SECOND SA POWER BUS.
3. INSTALL THE MODULES THAT USE THE OTHER TYPE OF SA POWER, FOR EXAMPLE DC, ON THE SECOND SA POWER BUS.



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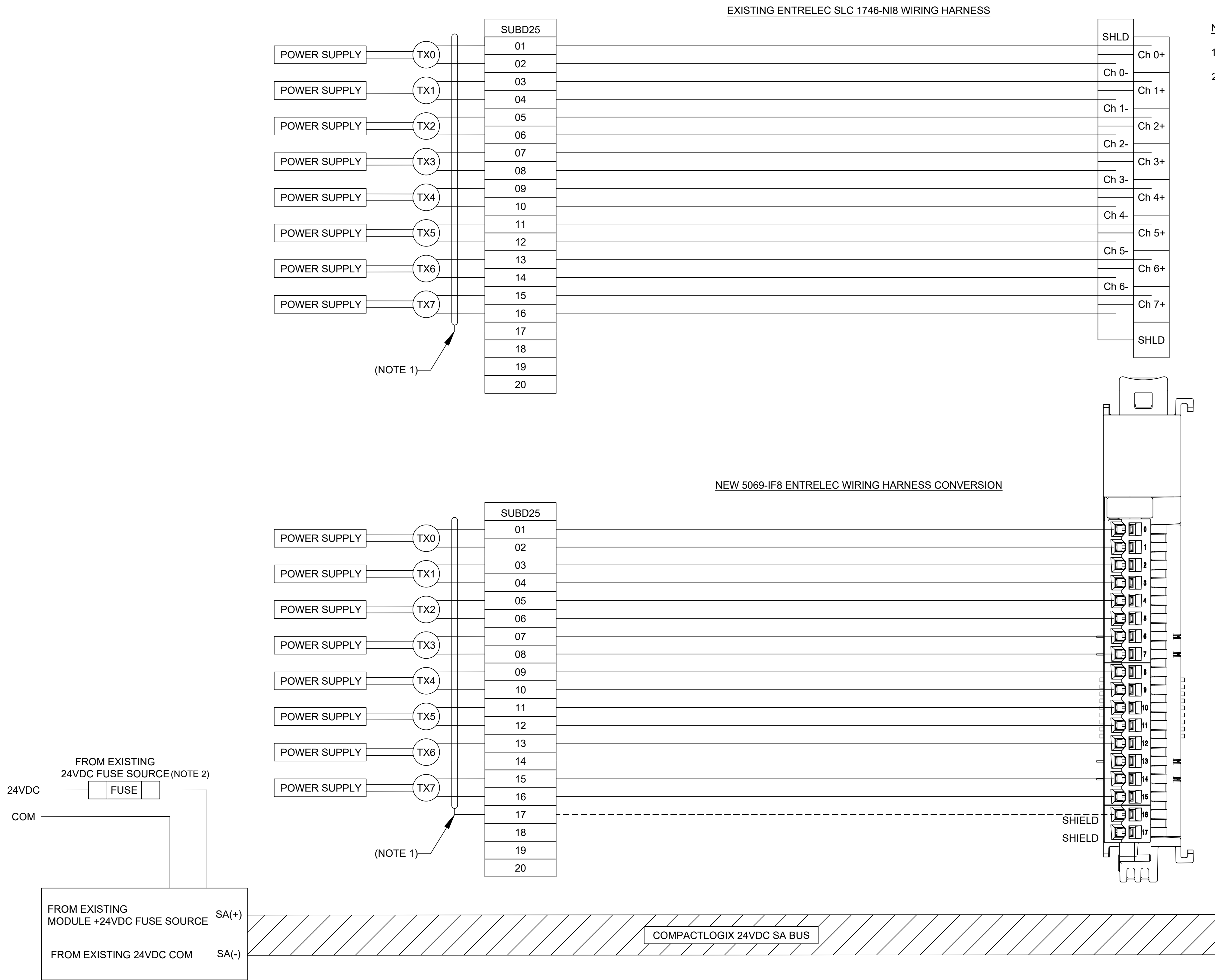
E




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 Municipal Water District 1966 Olivenhain Road Encinitas, CA 92024 (760)753-6466	 www.tetratech.com 3475 E FOOTHILL BLVD PASADENA, CALIF 91107 (626) 351-4664	 8/18/23	MARK	DATE	DESCRIPTION	BY	OLIVENHAIN MUNICIPAL WATER DISTRICT OLIVENHAIN PLC UPGRADE PROJECT SLC TO COMPACTLOGIX 5000 TYPE 2 DETAILS - ENTRELEC WIRING HARNESS 1746-NI8 to 5069-IF8 PLC CONVERSION	DESN: VR
			A	3-30-23	INITIAL RELEASE FOR REVIEW	GR		DRWN: GR
			B	8-18-23	RELEASE FOR BID	GR		CHKD: SY
								DWG NO. I-103
							PROJ: D120091 D700036	

Bar measures 1 inch, otherwise drawing is not to scale

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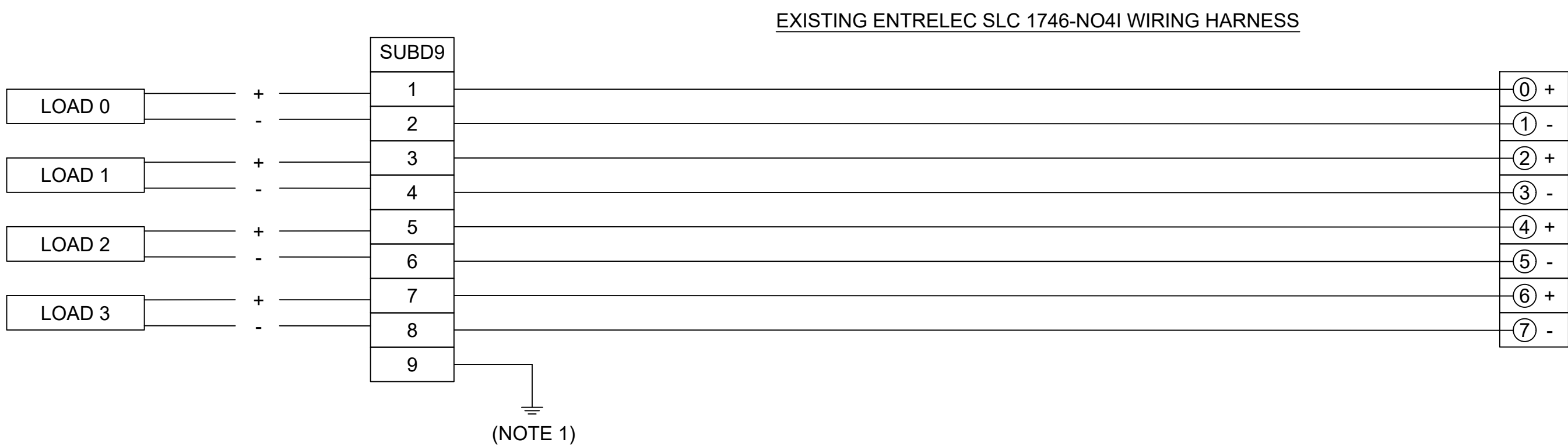
E

D

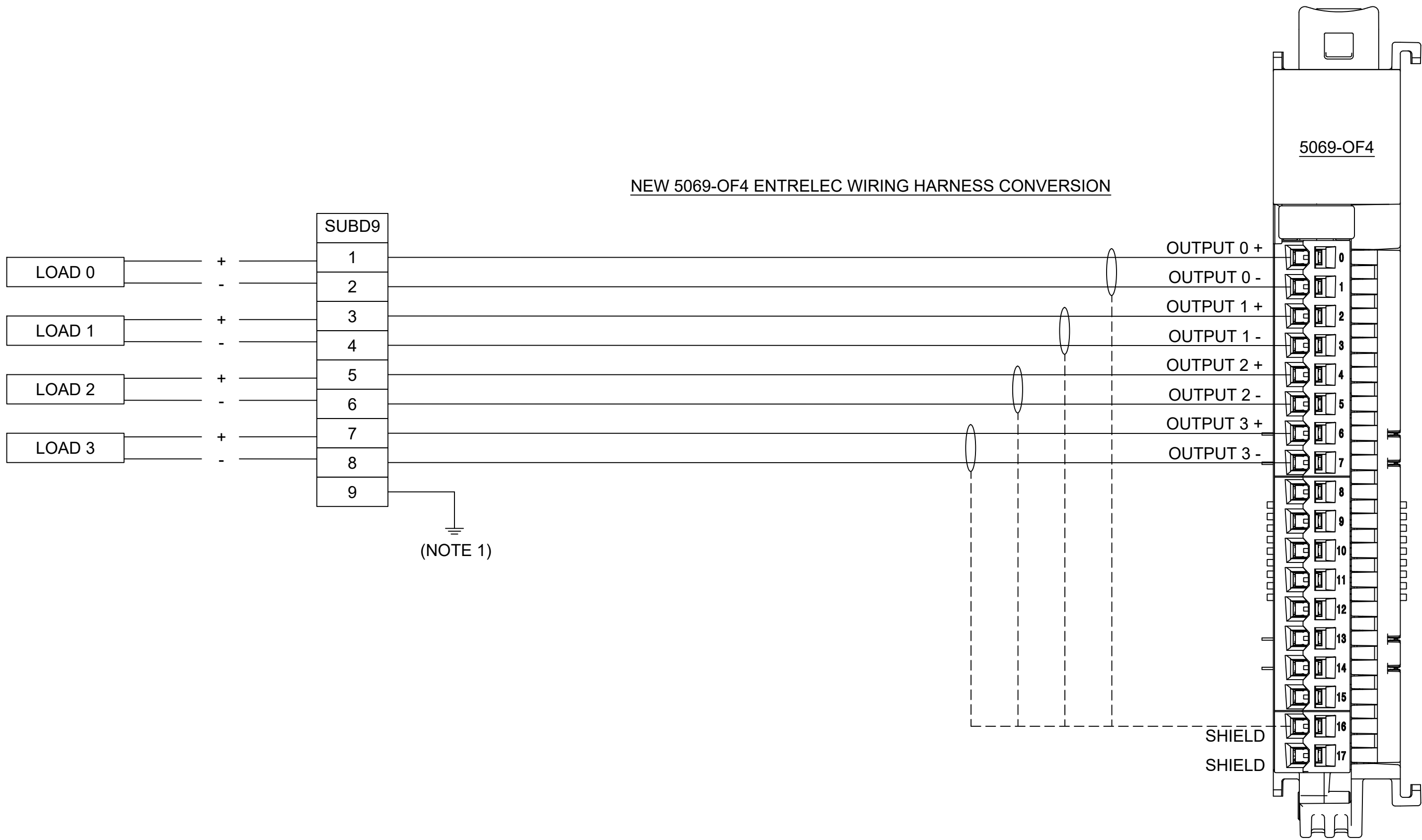
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NOTES:
1. SHIELDS TO BE CONNECTED TO SINGLE GROUND ONLY (ONE-END) TO INSTRUMENT EARTH.



OLIVENHAIN
Municipal Water District
1966 Olivenhain Road
Encinitas, CA 92024 (760)753-6466

Tt TETRA TECH
www.tetratech.com
3475 E FOOTHILL BLVD
PASADENA, CALIF 91107
(626) 351-4664

8/18/23

MARK	DATE	DESCRIPTION	BY
A	3-30-23	INITIAL RELEASE FOR REVIEW	GR
B	8-18-23	RELEASE FOR BID	GR

OLIVENHAIN MUNICIPAL WATER DISTRICT
OLIVENHAIN PLC UPGRADE PROJECT
SLC TO COMPACTLOGIX 5000
TYPE 2 DETAILS - ENTRELEC WIRING HARNESS
1746-NO4I to 5069-OF4 PLC CONVERSION

DESN:	VR
DRWN:	GR
CHKD:	SY
DWG NO.	I-104
PROJ:	D120091 D700036

Bar measures 1 inch, otherwise drawing is not to scale

APPENDIX 17000-B.2

BILL OF MATERIALS

Appendix B.2 – Bill of Materials

A Provisional Bills of Materials are included in Section 17300 Appendix-B.2. The Bills of Materials are for reference use only by the Contractor, and do not necessarily reflect exact quantities. The Contractor is responsible to verify all configurations, part numbers and quantities. All components and devices shall be furnished and installed as required to provide a complete operable, ready for use and reliable system for accomplishing the functions and meeting the performance set forth herein

APPENDIX 17000-B.2

APPENDIX B.2

TYPE 1 – COMPACTLOGIX UPGRADES WITH RETERMINATION SUMMARY

Facility Name	Control Panel ID	Function	Existing PLC	PLC Power Supply Type	Upgraded PLC Supplied by Contractor
520	D-001	PS	SLC 1747-L551	24VDC	5069-L320ER
4S-1	D-002	Reservoir	SLC 1747-L552	24VDC	5069-L320ER
Connemara	D-003	PS	SLC 1747-L553	120VAC	5069-L320ER
Cielo PS	D-004	PS	SLC 1747-L552	24VDC	5069-L320ER
Crosby 3 and 4	D-005	PRS	SLC 1747-L551	24VDC	5069-L320ER
Gano	D-007	Reservoir	SLC 1747-L552	24VDC	5069-L320ER
Gaty	D-008	Reservoir	SLC 1747-L551	24VDC	5069-L320ER
Oaks South #1	D-009	PRS	SLC 1747-L552	24VDC	5069-L320ER
Miller Res/Hydro	D-010	Reservoir/Hydro	SLC 1747-L553 & 1747-ASB	24VDC	5069-L320ER & 5069AENTR
Oaks South #3	D-011	PRS	SLC 1747-L552	24VDC	5069-L320ER
Peay	D-012	Reservoir/Flow Ctrl	SLC 1747-L551	24VDC	5069-L320ER
Santa Fe Valley	D-013	Reservoir/PS	SLC 1747-L551	120VAC	5069-L320ER
Unit M	D-014	Flow Ctrl	SLC 1747-L553	24VDC	5069-L320ER
Unit Z	D-015	PS	SLC 1747-L551	120VAC	5069-L320ER
Via De Las Flores	D-016	PRS	SLC 1747-L551	24VDC	5069-L320ER
Village Park	D-017	Recycled PS	SLC 1747-L551	120VAC	5069-L320ER
Zorro	D-018	Reservoir	SLC 1747-L551	24VDC	5069-L320ER

APPENDIX 17000-B.2

Facility Name	Control Panel ID	Function	Existing PLC	PLC Power Supply Type	Upgraded PLC Supplied by Contractor
Avenida Apice	4S-103	SPS	SLC 1747-L551	24VDC	5069-L320ER
Blower	4S-104	Blower Control PLC	SLC 1747-L553	24VDC	5069-L320ER
Cerro Del Sol #1	4S-105	SPS #1	SLC 1747-L551	24VDC	5069-L320ER
Cerro Del Sol #2	4S-106	SPS #2	SLC 1747-L551	24VDC	5069-L320ER
Cam Sin Puente #1	4S-107	SPS #1	SLC 1747-L551	24VDC	5069-L320ER
Cam Sin Puente #2	4S-108	SPS #2	SLC 1747-L551	24VDC	5069-L320ER
Cam Sin Puente #3	4S-109	SPS #3	SLC 1747-L551	24VDC	5069-L320ER
Cam Sin Puente #4	4S-110	SPS #4	SLC 1747-L551	24VDC	5069-L320ER
Del Dios	4S-111	SPS	SLC 1747-L553	24VDC	5069-L320ER
Fire Station	4S-113	SPS	SLC 1747-L551	24VDC	5069-L320ER
Midpoint	4S-114	SPS	SLC 1747-L553	24VDC	5069-L320ER
Neighborhood #3	4S-115	SPS	SLC 1747-L553	24VDC	5069-L320ER
PLC 3	4S-118	Reclaimed Water Pump Station	SLC 1747-552	120VAC	5069-L320ER
PLC4	4S-119	Pond Systems Res/Pump Station	SLC 1747-553	120VAC	5069-L320ER
SantaLuz	4S-120	SPS	SLC 1747-553	24VDC	5069-L320ER
Avenida Orilla	4S-121	SPS	SLC 1747-L551	24VDC	5069-L320ER

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

1.1 Project's hardware platforms list

This Project contains the following Hardware platforms:

HW Platform Type	HW Platform Name
5069 Compact I/O	D-001-23597_520R1-r001
5069 Compact I/O	D-002-FOUR S 10-1-2007-r001
5069 Compact I/O	D-003-87746E4 CONNEMARA - r001
5069 Compact I/O	D-004-CIELO_PS-r001
5069 Compact I/O	D-005-23597_7-r001
5069 Compact I/O	D-007-GANO_10-9-14-r001
5069 Compact I/O	D-008-GATY-r001
5069 Compact I/O	D-009-23597XU_OAKS1-r001
5069 Compact I/O	D-010-MILLER R4_5202015-r001
5069 Compact I/O	D-010-MILLER R4_5202015-RIO-r001
5069 Compact I/O	D-011-23597XU_OAKS3-r001
5069 Compact I/O	D-012-PEAY_031016-r001
5069 Compact I/O	D-013-SFVPS-r001
5069 Compact I/O	D-014-23597_UNITM_09_23_1-r001
5069 Compact I/O	D-015-Z_BPS-r001
5069 Compact I/O	D-016-23597_VDLF_R1-r001
5069 Compact I/O	D-017-VP_RWPS-r001
5069 Compact I/O	D-018-23597_ZORRO-r001
5069 Compact I/O	4S-103-AA_SPS-r001
5069 Compact I/O	4S-104-BLOWER_PLC-r001
5069 Compact I/O	4S-105-CDS_SPS1-r001
5069 Compact I/O	4S-106-CDS_SPS2-r001
5069 Compact I/O	4S-107-CSP_SPS1-r001
5069 Compact I/O	4S-108-CSP_SPS2-r001
5069 Compact I/O	4S-109-CSP_SPS3-r001
5069 Compact I/O	4S-110-CSP_SPS4-r001
5069 Compact I/O	4S-111-DELDIOS_SPS-r001
5069 Compact I/O	4S-113-FIRE STATION SPS-r001
5069 Compact I/O	4S-114-MIDPOINT_SPS-r001
5069 Compact I/O	4S-115-NHD3_SPS-r001
5069 Compact I/O	4S-118-PLC_3-r001
5069 Compact I/O	4S-119-PLC_4-r001
5069 Compact I/O	4S-120-SLNAH_SPS1-r001
5069 Compact I/O	4S-121-AO_SPS-r001
View	4S-111-DELDIOS (New OIT)
View	4S-113-FIRE STN (New OIT)
View	4S-114-MIDPOINT (New OIT)
View	4S-115-NHD3 (New OIT)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

2 Bill of Materials

2.1 Consolidated BOM

Qty	Catalog #	Description
33	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
33	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
42	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
174	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
22	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
56	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
33	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
6	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
14	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
6	5069-FPD	5069 Compact I/O Field Potential Distributor Module
6	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
13	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
1	5069-SERIAL	5069 Compact I/O 2 channel 9-pin D sub serial interface module supporting Generic ASCII, Modbus RTU/ASCII, DF1, DH485.
1	5069-AENTR	5069 Compact I/O EtherNet/IP Adapter, Dual Ethernet port, 10/100/1000Mbps, supports up to 31 I/O modules, IP address rotary switch (last Octal)
1	5069-RTB5-SCREW	Power terminal RTB kit for 5069-AENTR.
4	5069-IY4	5069 Compact I/O 4 Channel Universal Voltage/Current/RTD/TC Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
1	5069-OF8	5069 Compact I/O 8 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
2	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
4	2711P-T10C21D8S	Graphic Terminal, Standard Model, 10.4 in. Display, TFT Color, Touch Screen, Single Ethernet, 18-30 V DC
1	Generic 8-port Managed Switch	Generic 8-port Managed Switch
As Needed	1585J-M8TBJM-2	Patchcord: RJ45 Male / RJ45 Male, 8-Conductor, Teal Robotic TPE, Flex Rated, 2 meters (6.56 feet), Cat 5e
As Needed	1585J-M4TBJM-2	Patchcord: RJ45 Male / RJ45 Male, 4-Conductor, Teal TPE, Flex Rated, 2 meters (6.56 feet), Cat 5e
64	700-HLT1U1	INTERFACE MODULE, 110VAC & 125VDC, 50/60HZ

2.2 Control Panel Organized BOM's

Pos/Slot	Catalog #	Description
		Networks
		D-010-MILLER R4_5202015-r001 : D-010-MILLER (New Switch)
N/A	Generic 8-port Managed Switch	Generic 8-port Managed Switch
3	1585J-M8TBJM-2	Patchcord: RJ45 Male / RJ45 Male, 8-Conductor, Teal Robotic TPE, Flex Rated, 2 meters (6.56 feet), Cat 5e
2	5069-AENTR	(D-010-MILLER R4_5202015-RIO-r001) 5069 Compact I/O EtherNet/IP Adapter, Dual Ethernet port, 10/100/1000Mbps, supports up to 31 I/O modules, IP address rotary switch (last Octal)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		Hardware
		D-001-23597_520R1-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-002-FOUR S 10-1-2007-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-003-87746E4 CONNEMARA - r001
N/A	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

	SCREW	
3	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-FPD	5069 Compact I/O Field Potential Distributor Module
N/A	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
6	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
7	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
8	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-004-CIELO_PS-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
6	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
7	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
8	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
9	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
10	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
11	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		D-005-23597_7-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-007-GANO_10-9-14-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-008-GATY-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-009-23597XU_OAKS1-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-010-MILLER R4_5202015-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
7	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
8	5069-SERIAL	5069 Compact I/O 2 channel 9-pin D sub serial interface module supporting Generic ASCII, Modbus RTU/ASCII, DF1, DH485.

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		D-010-MILLER R4_5202015-RIO-r001
0	5069-AENTR	5069 Compact I/O EtherNet/IP Adapter, Dual Ethernet port, 10/100/1000Mbps, supports up to 31 I/O modules, IP address rotary switch (last Octal)
0.1	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB5-SCREW	Power terminal RTB kit for 5069-AENTR.
1	5069-IY4	5069 Compact I/O 4 Channel Universal Voltage/Current/RTD/TC Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IY4	5069 Compact I/O 4 Channel Universal Voltage/Current/RTD/TC Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-011-23597XU_OAKS3-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-012-PEAY_031016-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-013-SFVPS-r001
N/A	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-FPD	5069 Compact I/O Field Potential Distributor Module
N/A	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-IY4	5069 Compact I/O 4 Channel Universal Voltage/Current/RTD/TC Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-014-23597_UNITM_09_23_1-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-015-Z_BPS-r001
N/A	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-FPD	5069 Compact I/O Field Potential Distributor Module
N/A	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-IY4	5069 Compact I/O 4 Channel Universal Voltage/Current/RTD/TC Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-016-23597_VDLF_R1-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		D-017-VP_RWPS-r001
N/A	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-FPD	5069 Compact I/O Field Potential Distributor Module
N/A	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-OF8	5069 Compact I/O 8 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-	5069 Compact I/O 18 pins Screw type terminal block kit

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

	SCREW	
		D-018-23597_ZORRO-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-103-AA_SPS-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-104-BLOWER_PLC-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
7	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
8	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
9	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-105-CDS_SPS1-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-106-CDS_SPS2-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-107-CSP_SPS1-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-108-CSP_SPS2-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

	SCREW	
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-109-CSP_SPS3-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-110-CSP_SPS4-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		4S-111-DELDIOS_SPS-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
7	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
8	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-113-FIRE STATION SPS-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
4	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		4S-114-MIDPOINT_SPS-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
6	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
7	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
8	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
9	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-115-NHD3_SPS-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
6	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
7	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
8	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
9	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-118-PLC_3-r001
N/A	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
4	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
5	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
7	5069-FPD	5069 Compact I/O Field Potential Distributor Module
N/A	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
8	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
9	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
10	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-119-PLC_4-r001
N/A	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-FPD	5069 Compact I/O Field Potential Distributor Module
N/A	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
4	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

5	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-120-SLNAH_SPS1-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-121-AO_SPS-r001
N/A	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
N/A	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
N/A	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
1	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-IB16	5069 Compact I/O 16 Channel 24VDC Sink Input Module, 100µs response, up to 500hz simple counter
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
3	5069-OB16	5069 Compact I/O 16 Channel 24VDC Source Output Module, 100µs response, 2 tier fault mode, hold last state
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
4	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
N/A	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
		4S-111-DELDIOS (New OIT)
N/A	2711P-T10C21D8S	Graphic Terminal, Standard Model, 10.4 in. Display, TFT Color, Touch Screen, Single Ethernet, 18-30 V DC
		4S-113-FIRE STN (New OIT)
N/A	2711P-T10C21D8S	Graphic Terminal, Standard Model, 10.4 in. Display, TFT Color, Touch Screen, Single Ethernet, 18-30 V DC

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		4S-114-MIDPOINT (New OIT)
N/A	2711P-T10C21D8S	Graphic Terminal, Standard Model, 10.4 in. Display, TFT Color, Touch Screen, Single Ethernet, 18-30 V DC
		4S-115-NHD3 (New OIT)
N/A	2711P-T10C21D8S	Graphic Terminal, Standard Model, 10.4 in. Display, TFT Color, Touch Screen, Single Ethernet, 18-30 V DC
		CYA
		Output Devices
N/A	700-HLT1U1	INTERFACE MODULE, 110VAC & 125VDC, 50/60HZ

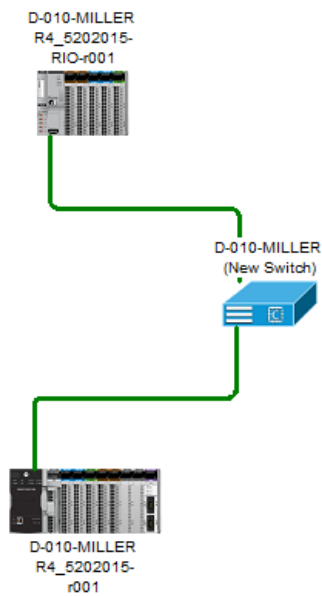
3 Network Details

3.1 Network 'D-010-MILLER R4_5202015-r001'

3.1.1 EtherNet/IP network status : Ok

3.1.2 Graphics:

Zone: Network



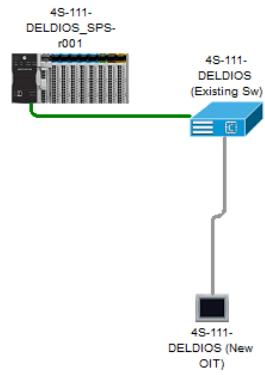
APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

3.2 Network '4S-111-DELDIOS_SPS-r001'

3.2.1 EtherNet/IP network status : Ok

3.2.2 Graphics:

Zone: Network



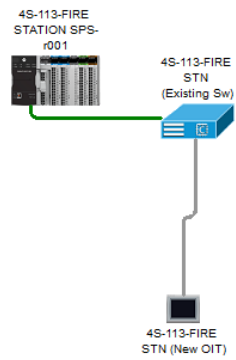
APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

3.3 Network '4S-113-FIRE STATION SPS-r001'

3.3.1 EtherNet/IP network status : Ok

3.3.2 Graphics:

Zone: Network



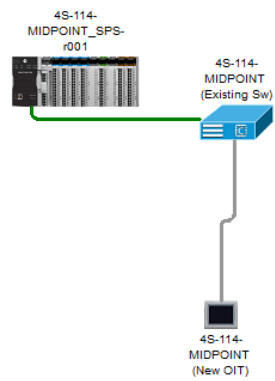
APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

3.4 Network '4S-114-MIDPOINT_SPS-r001'

3.4.1 EtherNet/IP network status : Ok

3.4.2 Graphics:

Zone: Network



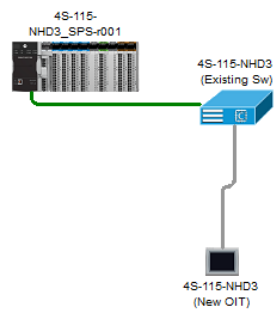
APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

3.5 Network '4S-115-NHD3_SPS-r001'

3.5.1 EtherNet/IP network status : Ok

3.5.2 Graphics:

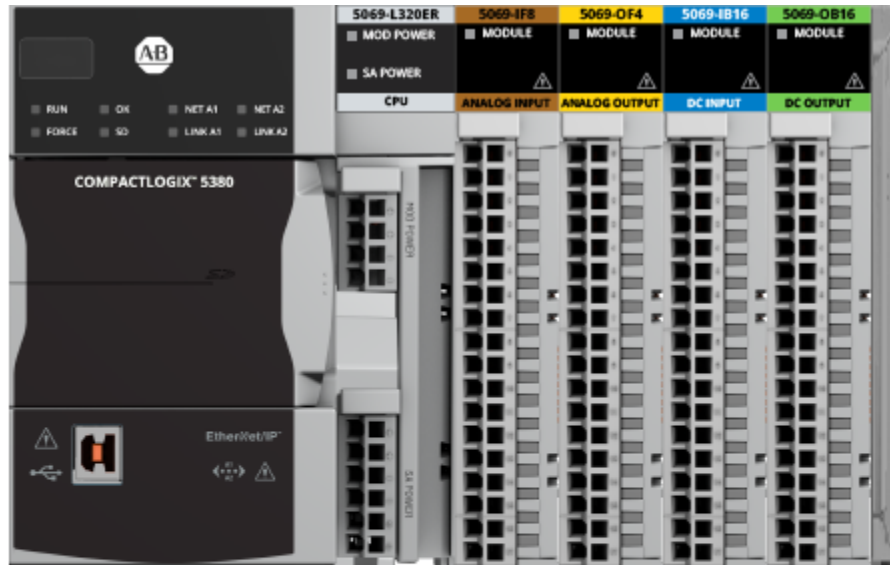
Zone: Network



4 Hardware Platforms

4.1 Platform 'D-001-23597_520R1-r001'

4.1.1 Graphics:



4.1.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	460 mA
SA Power Remaining:	9540 mA

Field Power Information

Field Power Status:	From Existing Field Power
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.1.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IF8
N/A	5069-RTB18-SCREW
2	5069-OF4
N/A	5069-RTB18-SCREW
3	5069-IB16
N/A	5069-RTB18-SCREW
4	5069-OB16
N/A	5069-RTB18-SCREW

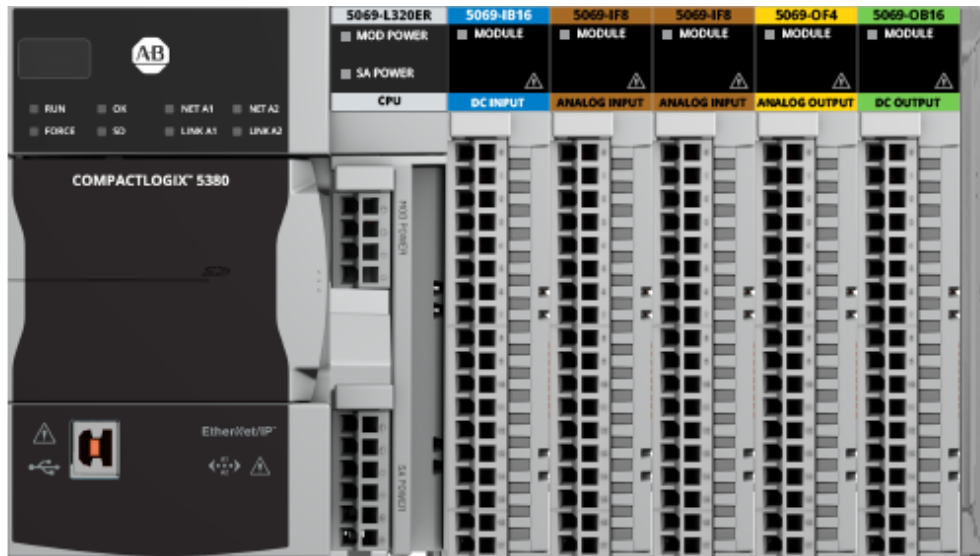
4.1.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.2 Platform 'D-002-FOUR S 10-1-2007-r001'

4.2.1 Graphics:



4.2.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	560 mA
SA Power Remaining:	9440 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.2.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IF8
N/A	5069-RTB18-SCREW
3	5069-IF8
N/A	5069-RTB18-SCREW
4	5069-OF4
N/A	5069-RTB18-SCREW
5	5069-OB16
N/A	5069-RTB18-SCREW

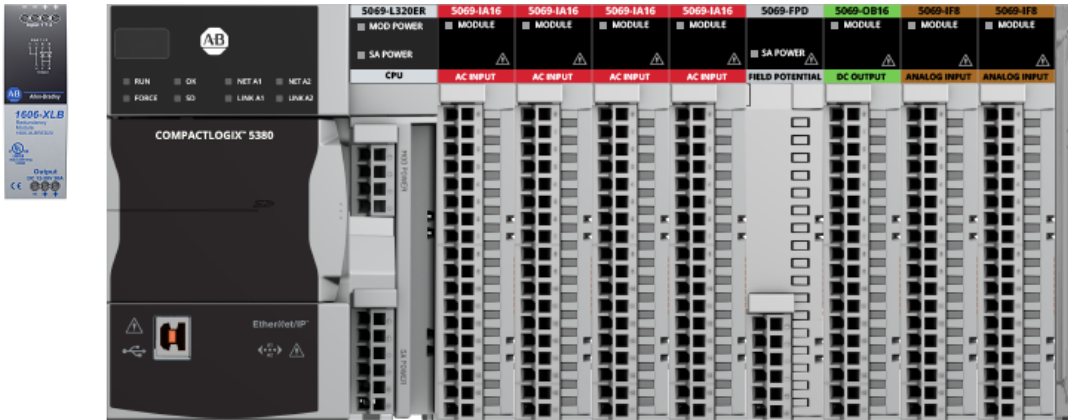
4.2.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.3 Platform 'D-003-87746E4 CONNEMARA - r001'

4.3.1 Graphics:



4.3.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by New 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	13600 mW
Power Remaining:	76400 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L320ER	
MOD Power Used:	975 mA
MOD Power Remaining:	9025 mA
SA Power Used:	970 mA
SA Power Remaining:	9030 mA
5069-FPD	
SA Power Used:	200 mA
SA Power Remaining:	9800 mA

Field Power Information

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	274.00 mm (10.79 inches)
Depth	137.00 mm (5.39 inches)

4.3.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IA16	
N/A	5069-RTB18-SCREW	
2	5069-IA16	
N/A	5069-RTB18-SCREW	
3	5069-IA16	
N/A	5069-RTB18-SCREW	
4	5069-IA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
5	5069-OB16	
N/A	5069-RTB18-SCREW	
6	5069-IF8	
N/A	5069-RTB18-SCREW	
7	5069-IF8	
N/A	5069-RTB18-SCREW	

4.3.3.1 Product Dimension

Units are in mm (Inches)

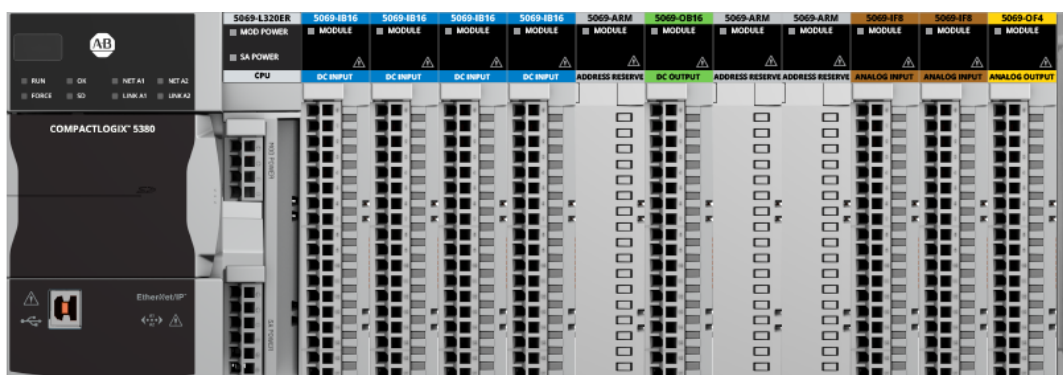
Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

5	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

4.4 Platform 'D-004-CIELO_PS-r001'

4.4.1 Graphics:



4.4.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	1185 mA
MOD Power Remaining:	8815 mA
SA Power Used:	1160 mA
SA Power Remaining:	8840 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	340.00 mm (13.39 inches)
Depth	137.00 mm (5.39 inches)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.4.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IB16	
N/A	5069-RTB18-SCREW	
2	5069-IB16	
N/A	5069-RTB18-SCREW	
3	5069-IB16	
N/A	5069-RTB18-SCREW	
4	5069-IB16	
N/A	5069-RTB18-SCREW	
5	5069-ARM	
6	5069-OB16	
N/A	5069-RTB18-SCREW	
7	5069-ARM	
8	5069-ARM	
9	5069-IF8	
N/A	5069-RTB18-SCREW	
10	5069-IF8	
N/A	5069-RTB18-SCREW	
11	5069-OF4	
N/A	5069-RTB18-SCREW	

4.4.3.1 Product Dimension

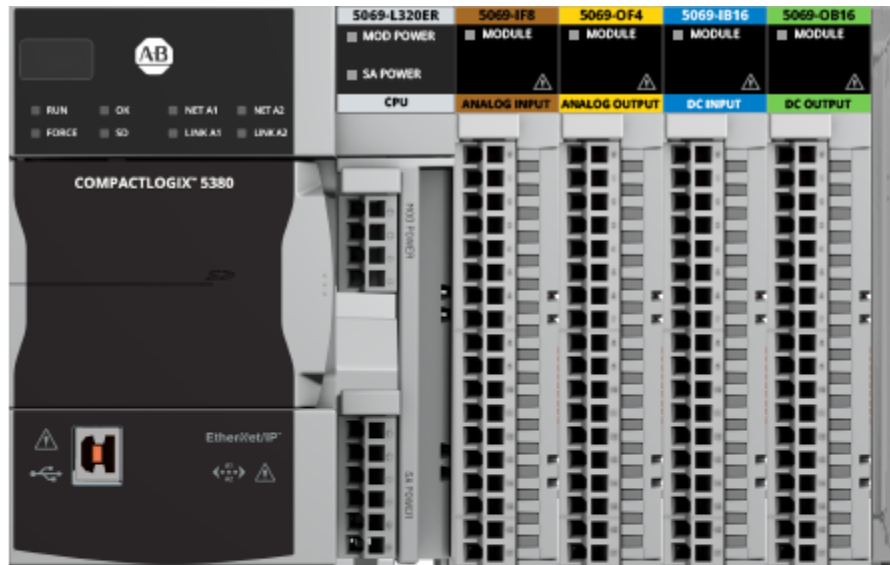
Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
8	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
9	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
10	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
11	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.5 Platform 'D-005-23597_7-r001'

4.5.1 Graphics:



4.5.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	460 mA
SA Power Remaining:	9540 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.5.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IF8
N/A	5069-RTB18-SCREW
2	5069-OF4
N/A	5069-RTB18-SCREW
3	5069-IB16
N/A	5069-RTB18-SCREW
4	5069-OB16
N/A	5069-RTB18-SCREW

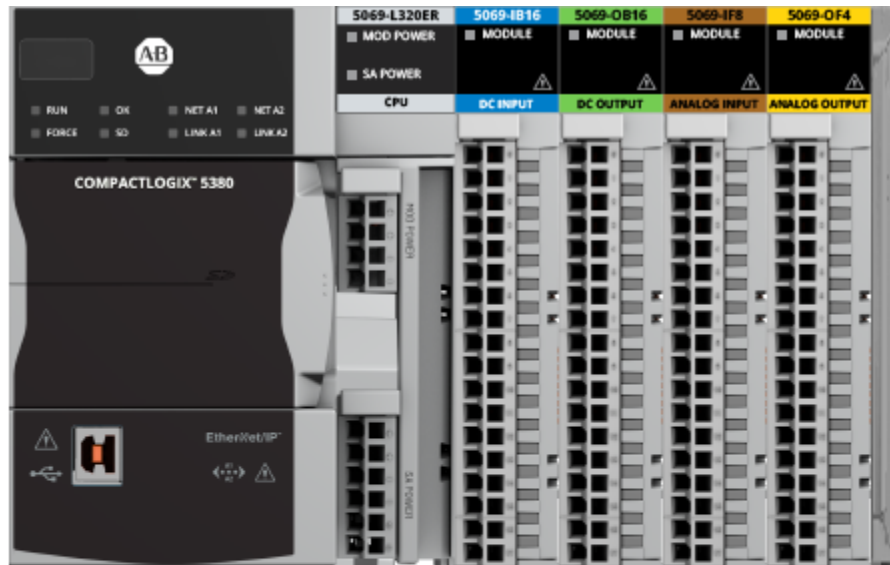
4.5.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.6 Platform 'D-007-GANO_10-9-14-r001'

4.6.1 Graphics:



4.6.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	460 mA
SA Power Remaining:	9540 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.6.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-OB16
N/A	5069-RTB18-SCREW
3	5069-IF8
N/A	5069-RTB18-SCREW
4	5069-OF4
N/A	5069-RTB18-SCREW

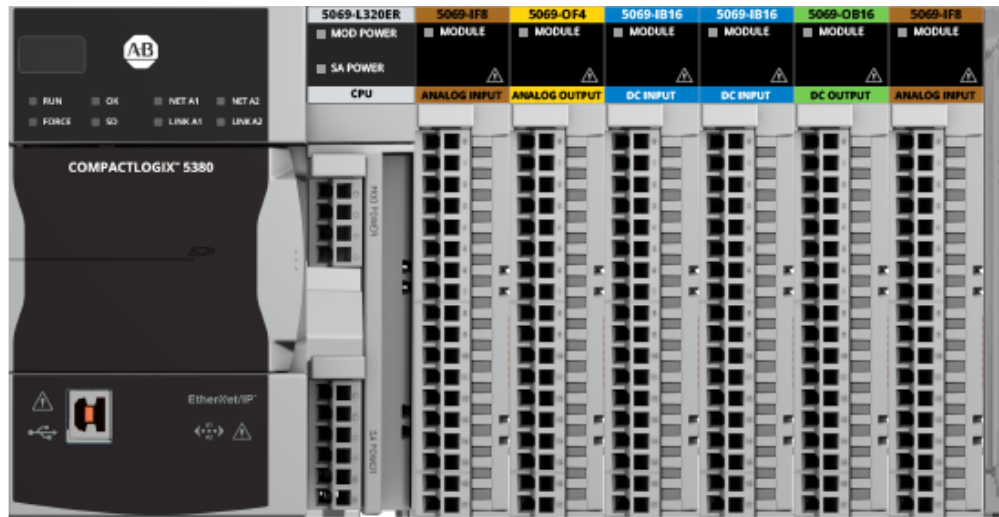
4.6.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.7 Platform 'D-008-GATY-r001'

4.7.1 Graphics:



4.7.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	900 mA
MOD Power Remaining:	9100 mA
SA Power Used:	760 mA
SA Power Remaining:	9240 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	230.00 mm (9.06 inches)
Depth	137.00 mm (5.39 inches)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.7.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IF8	
N/A	5069-RTB18-SCREW	
2	5069-OF4	
N/A	5069-RTB18-SCREW	
3	5069-IB16	
N/A	5069-RTB18-SCREW	
4	5069-IB16	
N/A	5069-RTB18-SCREW	
5	5069-OB16	
N/A	5069-RTB18-SCREW	
6	5069-IF8	
N/A	5069-RTB18-SCREW	

4.7.3.1 Product Dimension

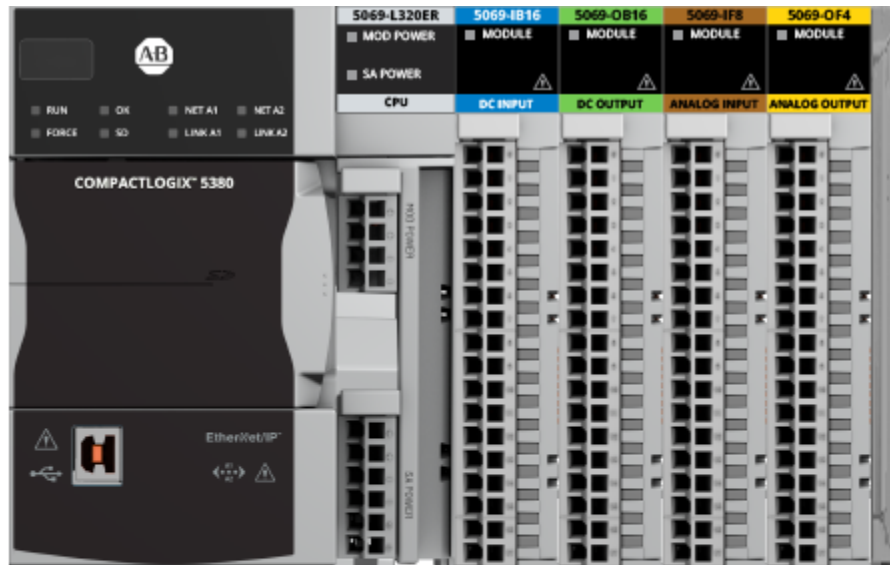
Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.8 Platform 'D-009-23597XU_OAKS1-r001'

4.8.1 Graphics:



4.8.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	460 mA
SA Power Remaining:	9540 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.8.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-OB16
N/A	5069-RTB18-SCREW
3	5069-IF8
N/A	5069-RTB18-SCREW
4	5069-OF4
N/A	5069-RTB18-SCREW

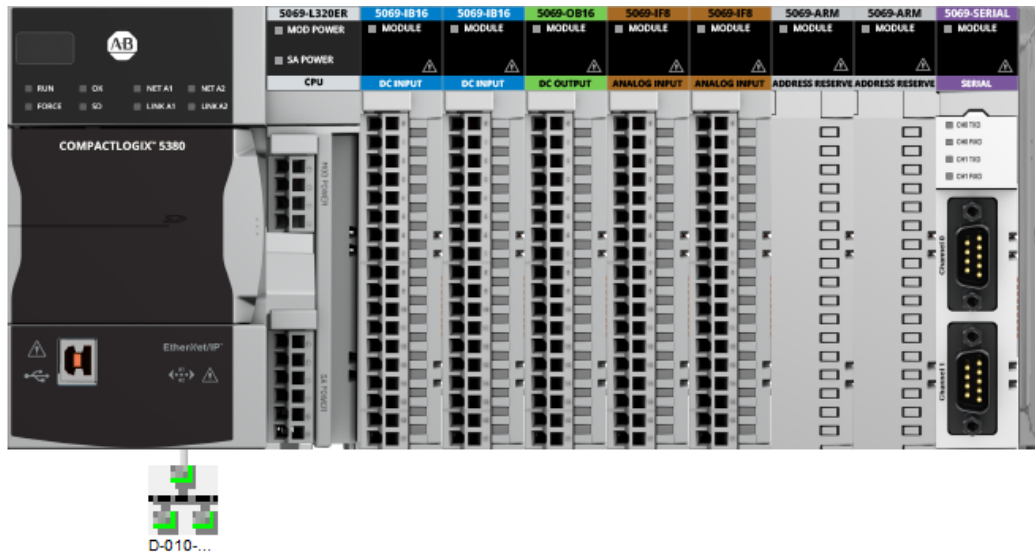
4.8.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.9 Platform 'D-010-MILLER R4_5202015-r001'

4.9.1 Graphics:



4.9.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	1015 mA
MOD Power Remaining:	8985 mA
SA Power Used:	610 mA
SA Power Remaining:	9390 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Network Connectivity

5069-L320ER (slot 0)	Connected to D-010-MILLER R4_5202015-r001/D-010-MILLER (New Switch)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	274.00 mm (10.79 inches)
Depth	137.00 mm (5.39 inches)

4.9.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		connected to network 'D-010-MILLER (New Switch)'
0.1	5069-ECR	not connected
		connected to network 'D-010-MILLER (New Switch)'
N/A	5069-RTB64-SCREW	
1	5069-IB16	
N/A	5069-RTB18-SCREW	
2	5069-IB16	
N/A	5069-RTB18-SCREW	
3	5069-OB16	
N/A	5069-RTB18-SCREW	
4	5069-IF8	
N/A	5069-RTB18-SCREW	
5	5069-IF8	
N/A	5069-RTB18-SCREW	
6	5069-ARM	
7	5069-ARM	
8	5069-SERIAL	not connected
		not connected

4.9.3.1 Product Dimension

Units are in mm (Inches)

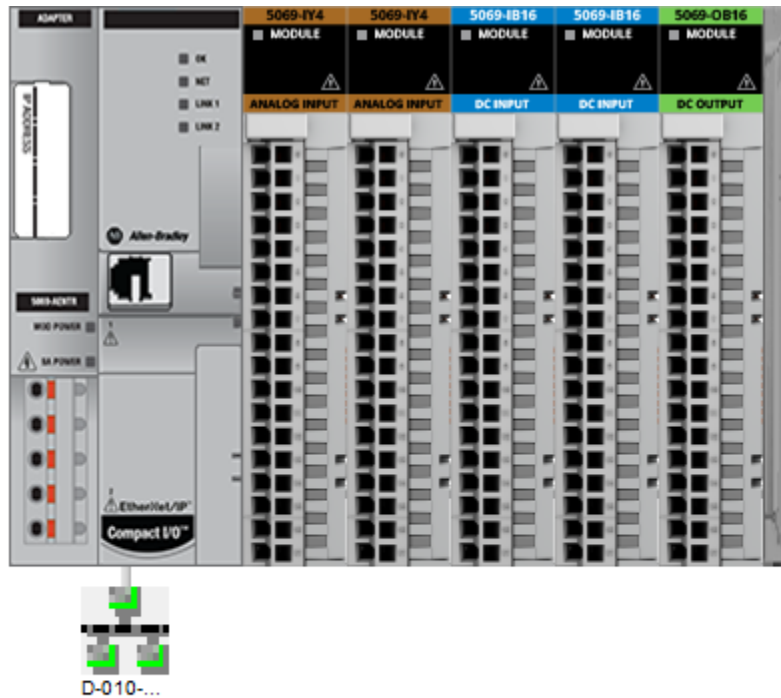
Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

8 5069-SERIAL 144.57(5.69) 22.00(0.87) 105.42(4.15)

4.10 Platform 'D-010-MILLER R4_5202015-RIO-r001'

4.10.1 Graphics:



4.10.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-AENTR	
MOD Power Used:	595 mA
MOD Power Remaining:	9185 mA
SA Power Used:	605 mA
SA Power Remaining:	9345 mA

Field Power Information

Field Power Status:	From Existing Field Power
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

General Settings

Slot 1	
Module Status:	Non-Thermocouple
Slot 2	
Module Status:	Non-Thermocouple

Network Connectivity

5069-AENTR (slot 0)	Connected to D-010-MILLER R4_5202015-r001/D-010-MILLER (New Switch)
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	166.00 mm (6.54 inches)
Depth	105.42 mm (4.15 inches)

4.10.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-AENTR	connected to network 'D-010-MILLER (New Switch)'
0.1	5069-ECR	connected to network 'D-010-MILLER (New Switch)'
N/A	5069-RTB5-SCREW	
1	5069-IY4	
N/A	5069-RTB18-SCREW	
2	5069-IY4	
N/A	5069-RTB18-SCREW	
3	5069-IB16	
N/A	5069-RTB18-SCREW	
4	5069-IB16	
N/A	5069-RTB18-SCREW	
5	5069-OB16	
N/A	5069-RTB18-SCREW	

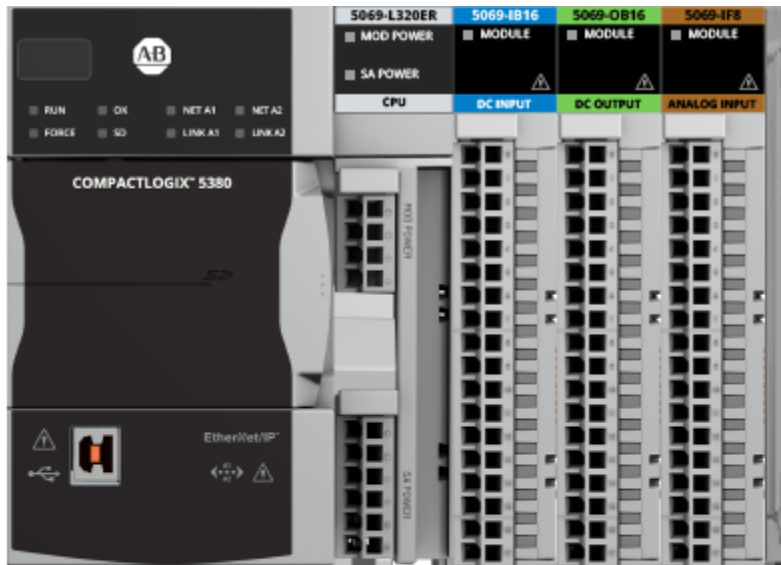
4.10.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-AENTR	138.00(5.43)	56.00(2.20)	105.00(4.13)
1	5069-IY4	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IY4	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.11 Platform 'D-011-23597XU_OAKS3-r001'

4.11.1 Graphics:



4.11.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	675 mA
MOD Power Remaining:	9325 mA
SA Power Used:	310 mA
SA Power Remaining:	9690 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	164.00 mm (6.46 inches)
Depth	137.00 mm (5.39 inches)

4.11.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-OB16
N/A	5069-RTB18-SCREW
3	5069-IF8
N/A	5069-RTB18-SCREW

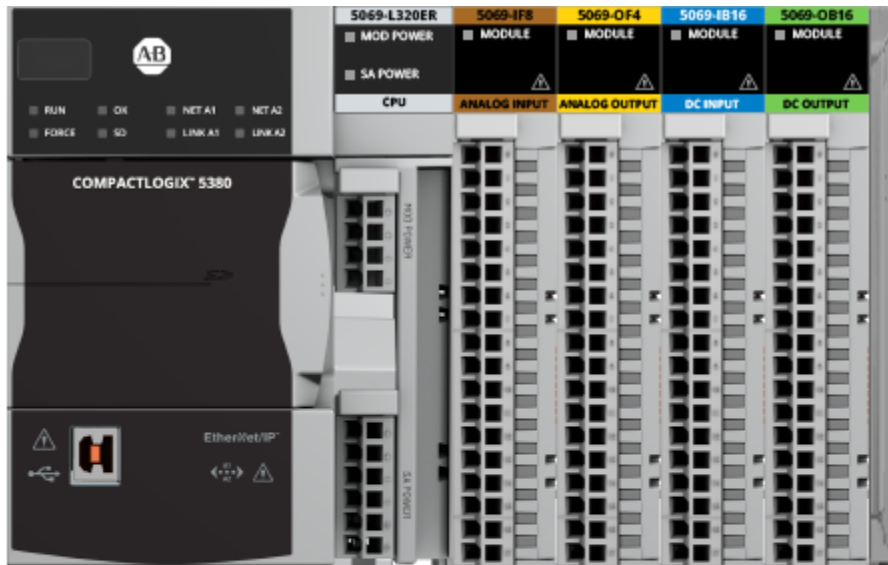
4.11.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.12 Platform 'D-012-PEAY_031016-r001'

4.12.1 Graphics:



4.12.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	460 mA
SA Power Remaining:	9540 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.12.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IF8
N/A	5069-RTB18-SCREW
2	5069-OF4
N/A	5069-RTB18-SCREW
3	5069-IB16
N/A	5069-RTB18-SCREW
4	5069-OB16
N/A	5069-RTB18-SCREW

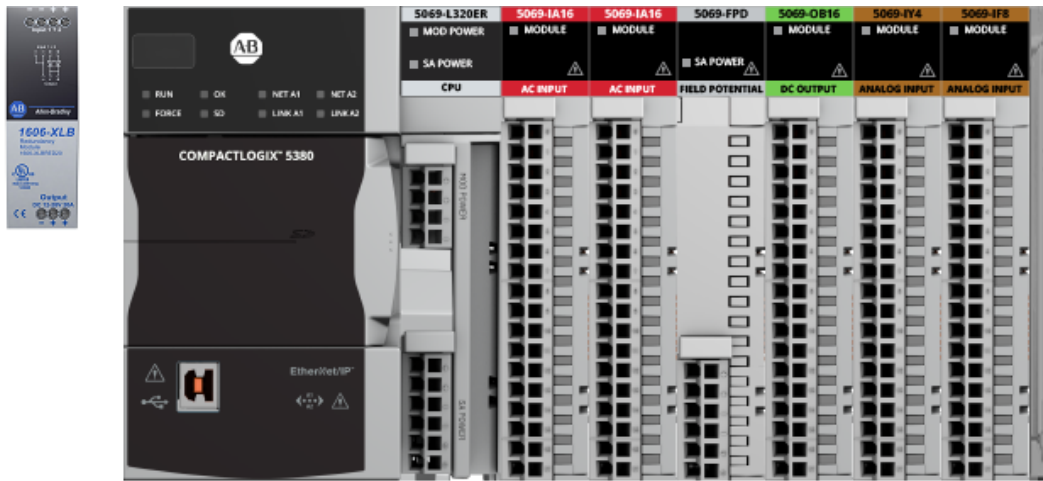
4.12.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.13 Platform 'D-013-SFVPS-r001'

4.13.1 Graphics:



4.13.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by New 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	13600 mW
Power Remaining:	76400 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	490 mA
SA Power Remaining:	9510 mA
5069-FPD	
SA Power Used:	200 mA
SA Power Remaining:	9800 mA

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
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General Settings

Slot 5	
Module Status:	Non-Thermocouple

Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	230.00 mm (9.06 inches)
Depth	137.00 mm (5.39 inches)

4.13.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IA16	
N/A	5069-RTB18-SCREW	
2	5069-IA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
3	5069-OB16	
N/A	5069-RTB18-SCREW	
4	5069-IY4	
N/A	5069-RTB18-SCREW	
5	5069-IF8	
N/A	5069-RTB18-SCREW	

4.13.3.1 Product Dimension Units are in mm (Inches)

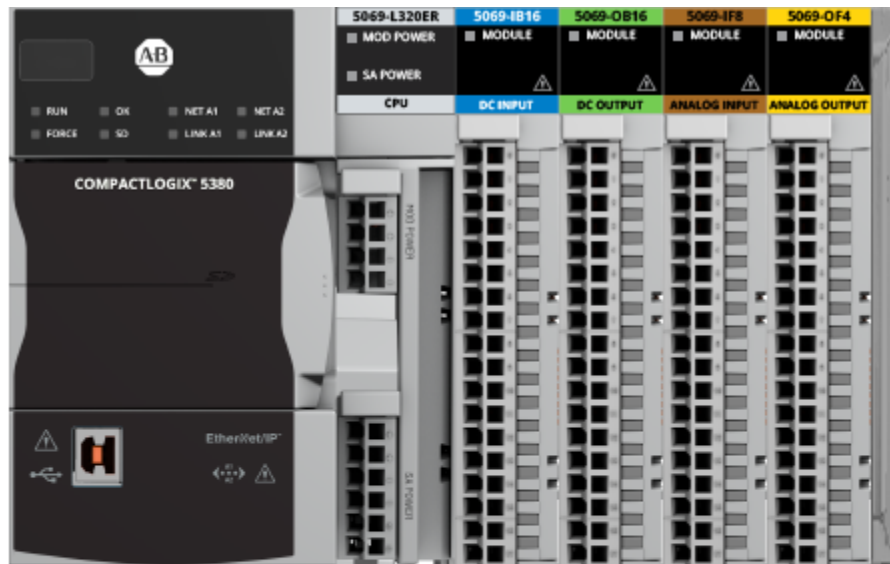
Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IY4	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

4.14 Platform 'D-014-23597_UNITM_09_23_1-r001'

4.14.1 Graphics:



4.14.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	460 mA
SA Power Remaining:	9540 mA

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.14.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-OB16
N/A	5069-RTB18-SCREW
3	5069-IF8
N/A	5069-RTB18-SCREW
4	5069-OF4
N/A	5069-RTB18-SCREW

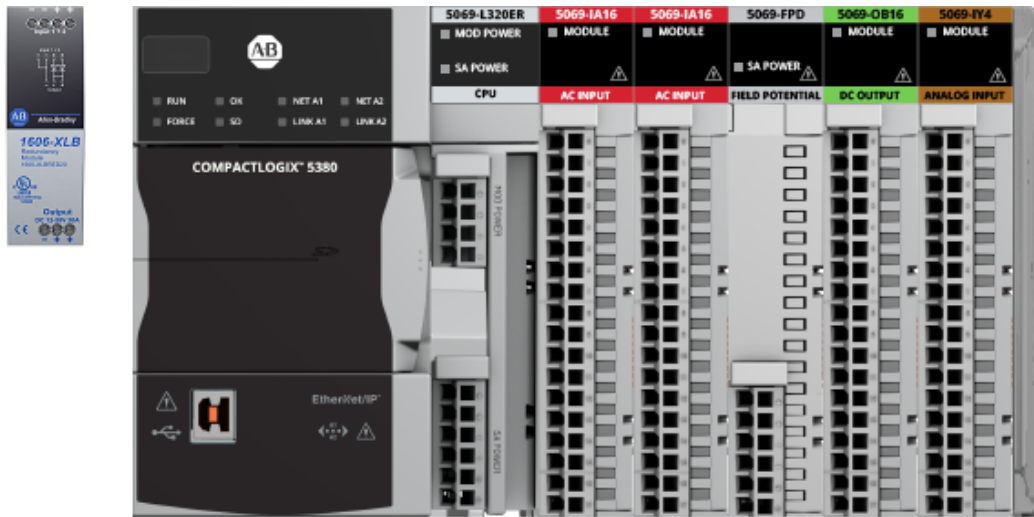
4.14.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.15 Platform 'D-015-Z_BPS-r001'

4.15.1 Graphics:



4.15.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by New 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	8000 mW
Power Remaining:	82000 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	490 mA
SA Power Remaining:	9510 mA
5069-FPD	

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

SA Power Used:	100 mA
SA Power Remaining:	9900 mA

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
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General Settings

Slot 5	
Module Status:	Non-Thermocouple

Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.15.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IA16	
N/A	5069-RTB18-SCREW	
2	5069-IA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
3	5069-OB16	
N/A	5069-RTB18-SCREW	
4	5069-IY4	
N/A	5069-RTB18-SCREW	

4.15.3.1 Product Dimension Units are in mm (Inches)

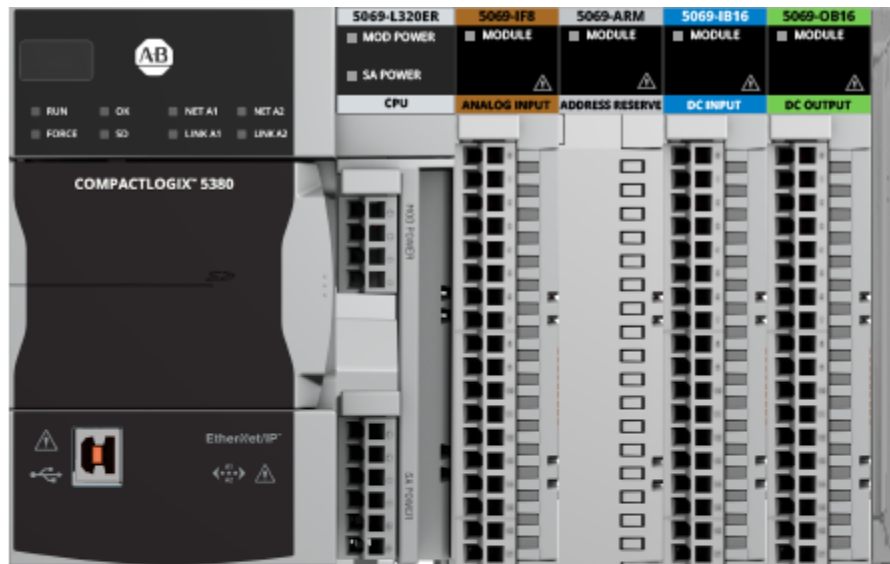
Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IY4	144.57(5.69)	22.00(0.87)	105.42(4.15)

4.16 Platform 'D-016-23597_VDLF_R1-r001'

4.16.1 Graphics:



4.16.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	720 mA
MOD Power Remaining:	9280 mA
SA Power Used:	310 mA
SA Power Remaining:	9690 mA

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.16.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IF8
N/A	5069-RTB18-SCREW
2	5069-ARM
3	5069-IB16
N/A	5069-RTB18-SCREW
4	5069-OB16
N/A	5069-RTB18-SCREW

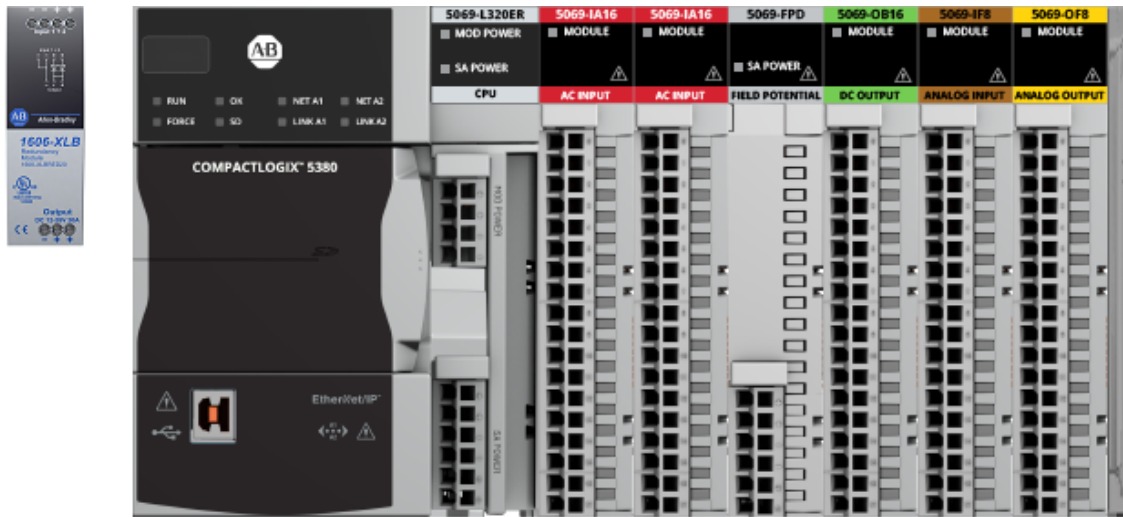
4.16.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.17 Platform 'D-017-VP_RWPS-r001'

4.17.1 Graphics:



4.17.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by New 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	18400 mW
Power Remaining:	71600 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	490 mA
SA Power Remaining:	9510 mA
5069-FPD	

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

SA Power Used:	350 mA
SA Power Remaining:	9650 mA

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	230.00 mm (9.06 inches)
Depth	137.00 mm (5.39 inches)

4.17.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IA16	
N/A	5069-RTB18-SCREW	
2	5069-IA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
3	5069-OB16	
N/A	5069-RTB18-SCREW	
4	5069-IF8	
N/A	5069-RTB18-SCREW	
5	5069-OF8	
N/A	5069-RTB18-SCREW	

4.17.3.1 Product Dimension Units are in mm (Inches)

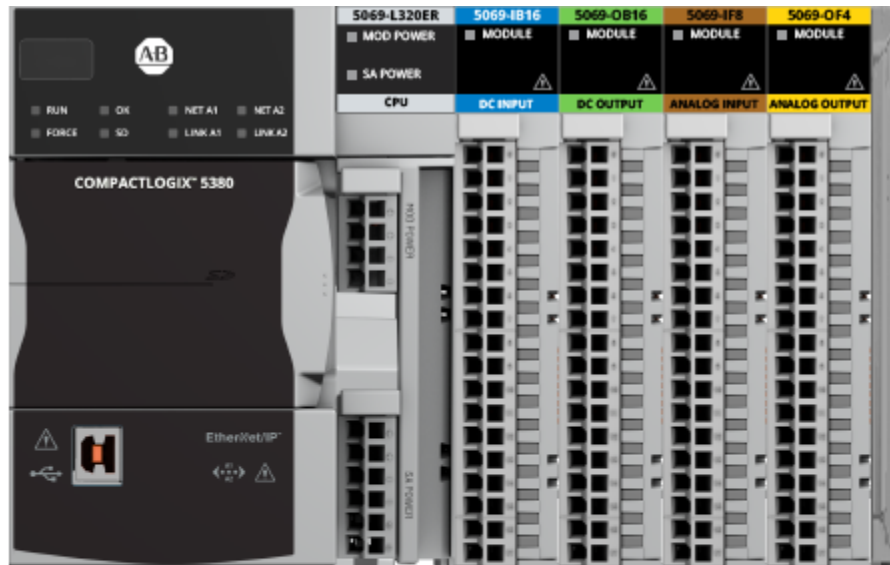
Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

5 5069-OF8 144.57(5.69) 22.00(0.87) 105.42(4.15)

4.18 Platform 'D-018-23597_ZORRO-r001'

4.18.1 Graphics:



4.18.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	460 mA
SA Power Remaining:	9540 mA

Field Power Information

Field Power Status:	From Existing Field Power
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.18.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-OB16
N/A	5069-RTB18-SCREW
3	5069-IF8
N/A	5069-RTB18-SCREW
4	5069-OF4
N/A	5069-RTB18-SCREW

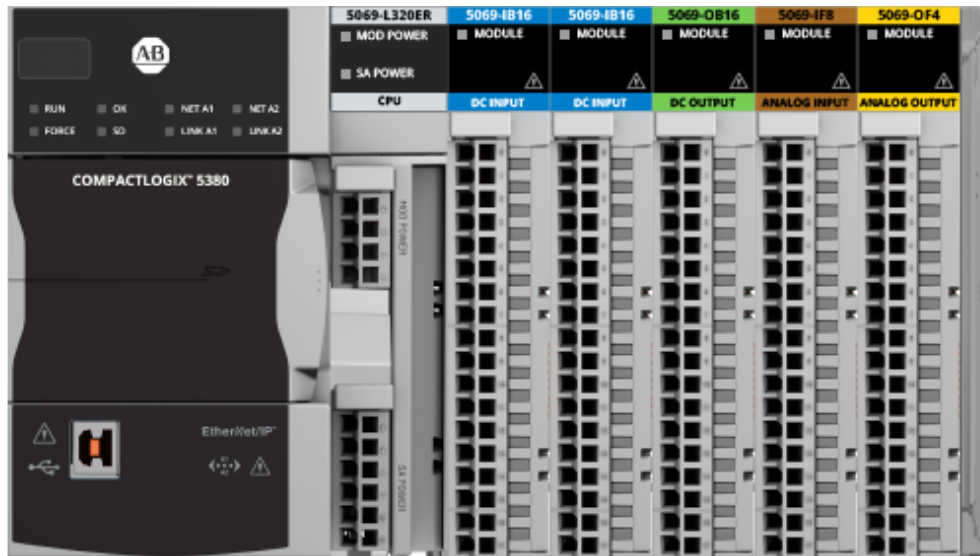
4.18.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.19 Platform '4S-103-AA_SPS-r001'

4.19.1 Graphics:



4.19.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	660 mA
SA Power Remaining:	9340 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.19.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IB16
N/A	5069-RTB18-SCREW
3	5069-OB16
N/A	5069-RTB18-SCREW
4	5069-IF8
N/A	5069-RTB18-SCREW
5	5069-OF4
N/A	5069-RTB18-SCREW

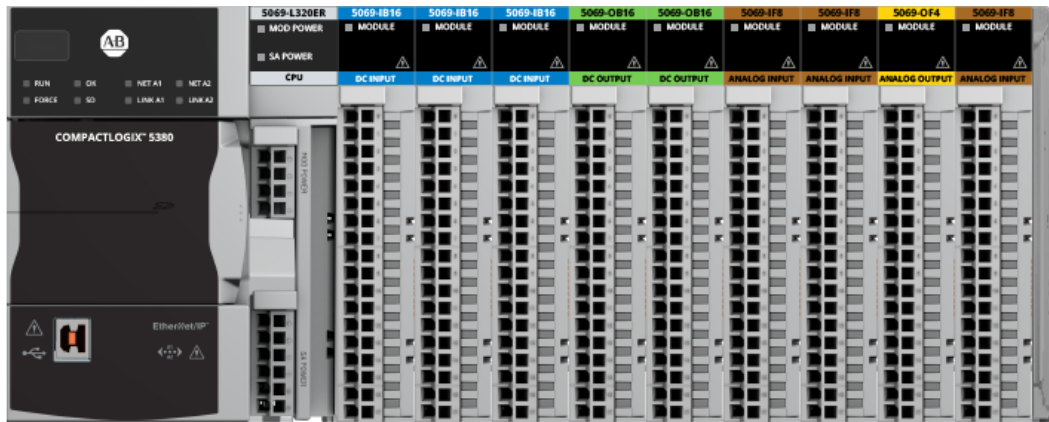
4.19.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.20 Platform '4S-104-BLOWER_PLC-r001'

4.20.1 Graphics:



4.20.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	1125 mA
MOD Power Remaining:	8875 mA
SA Power Used:	1060 mA
SA Power Remaining:	8940 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	296.00 mm (11.65 inches)
Depth	137.00 mm (5.39 inches)

4.20.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IB16
N/A	5069-RTB18-SCREW
3	5069-IB16
N/A	5069-RTB18-SCREW
4	5069-OB16
N/A	5069-RTB18-SCREW
5	5069-OB16
N/A	5069-RTB18-SCREW
6	5069-IF8
N/A	5069-RTB18-SCREW
7	5069-IF8
N/A	5069-RTB18-SCREW
8	5069-OF4
N/A	5069-RTB18-SCREW
9	5069-IF8
N/A	5069-RTB18-SCREW

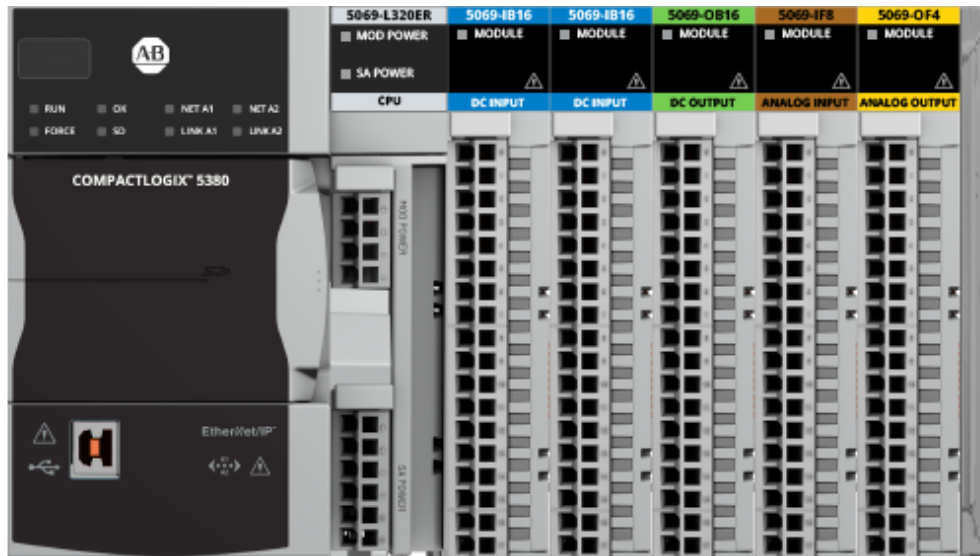
4.20.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
8	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
9	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.21 Platform '4S-105-CDS_SPS1-r001'

4.21.1 Graphics:



4.21.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	660 mA
SA Power Remaining:	9340 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.21.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IB16
N/A	5069-RTB18-SCREW
3	5069-OB16
N/A	5069-RTB18-SCREW
4	5069-IF8
N/A	5069-RTB18-SCREW
5	5069-OF4
N/A	5069-RTB18-SCREW

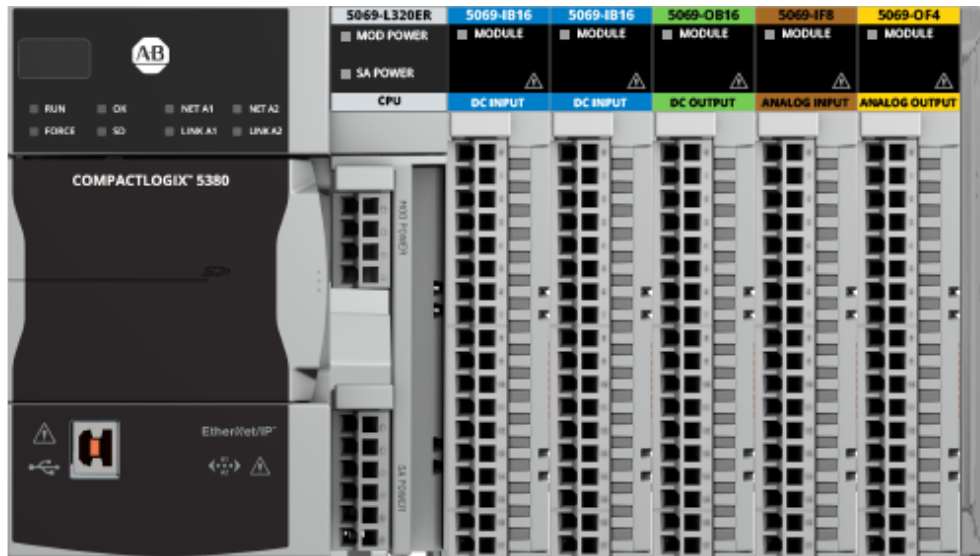
4.21.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.22 Platform '4S-106-CDS_SPS2-r001'

4.22.1 Graphics:



4.22.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	660 mA
SA Power Remaining:	9340 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.22.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IB16
N/A	5069-RTB18-SCREW
3	5069-OB16
N/A	5069-RTB18-SCREW
4	5069-IF8
N/A	5069-RTB18-SCREW
5	5069-OF4
N/A	5069-RTB18-SCREW

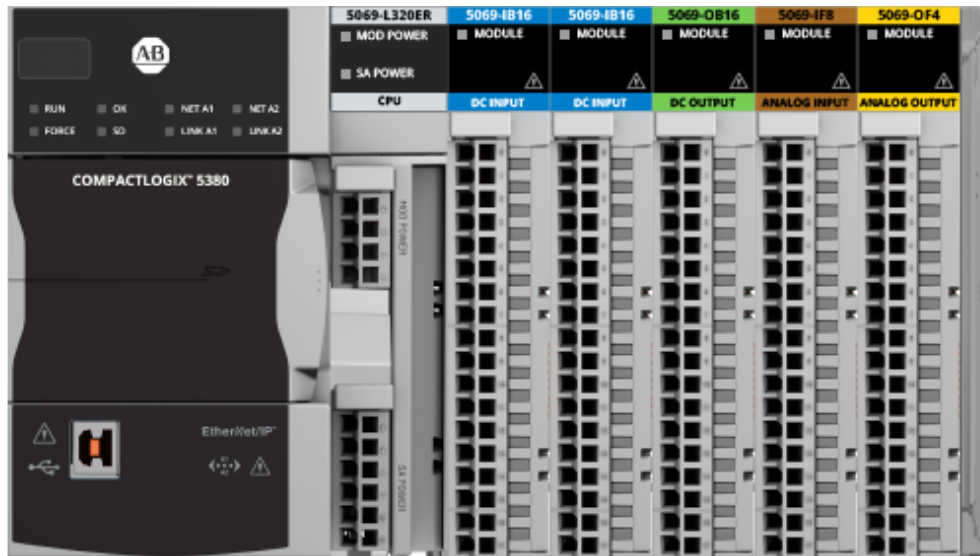
4.22.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.23 Platform '4S-107-CSP_SPS1-r001'

4.23.1 Graphics:



4.23.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	660 mA
SA Power Remaining:	9340 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.23.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IB16
N/A	5069-RTB18-SCREW
3	5069-OB16
N/A	5069-RTB18-SCREW
4	5069-IF8
N/A	5069-RTB18-SCREW
5	5069-OF4
N/A	5069-RTB18-SCREW

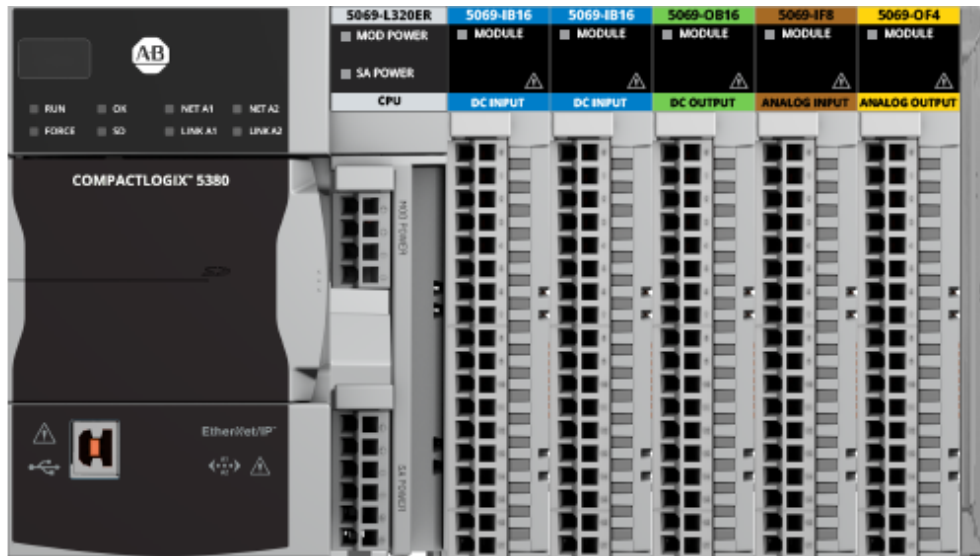
4.23.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.24 Platform '4S-108-CSP_SPS2-r001'

4.24.1 Graphics:



4.24.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	660 mA
SA Power Remaining:	9340 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.24.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IB16	
N/A	5069-RTB18-SCREW	
2	5069-IB16	
N/A	5069-RTB18-SCREW	
3	5069-OB16	
N/A	5069-RTB18-SCREW	
4	5069-IF8	
N/A	5069-RTB18-SCREW	
5	5069-OF4	
N/A	5069-RTB18-SCREW	

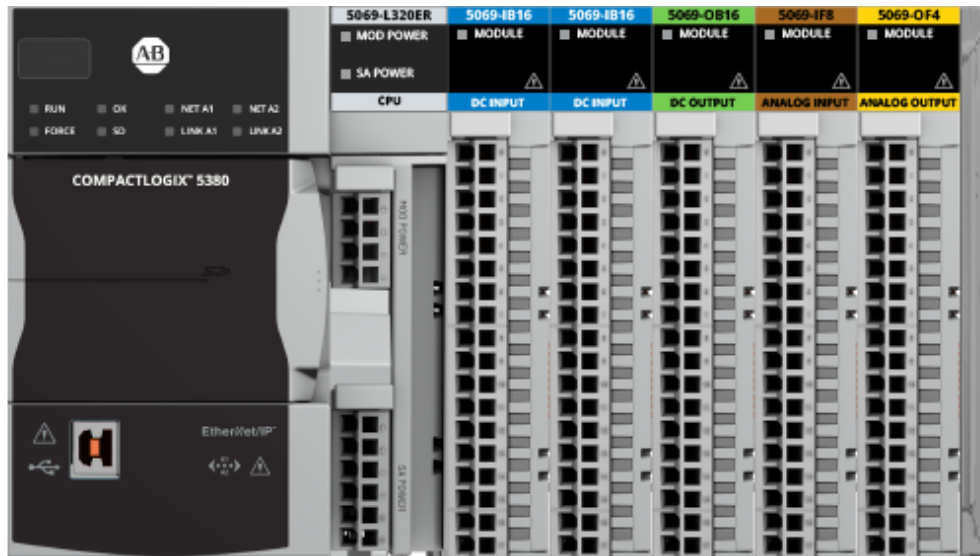
4.24.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.25 Platform '4S-109-CSP_SPS3-r001'

4.25.1 Graphics:



4.25.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	660 mA
SA Power Remaining:	9340 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.25.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IB16	
N/A	5069-RTB18-SCREW	
2	5069-IB16	
N/A	5069-RTB18-SCREW	
3	5069-OB16	
N/A	5069-RTB18-SCREW	
4	5069-IF8	
N/A	5069-RTB18-SCREW	
5	5069-OF4	
N/A	5069-RTB18-SCREW	

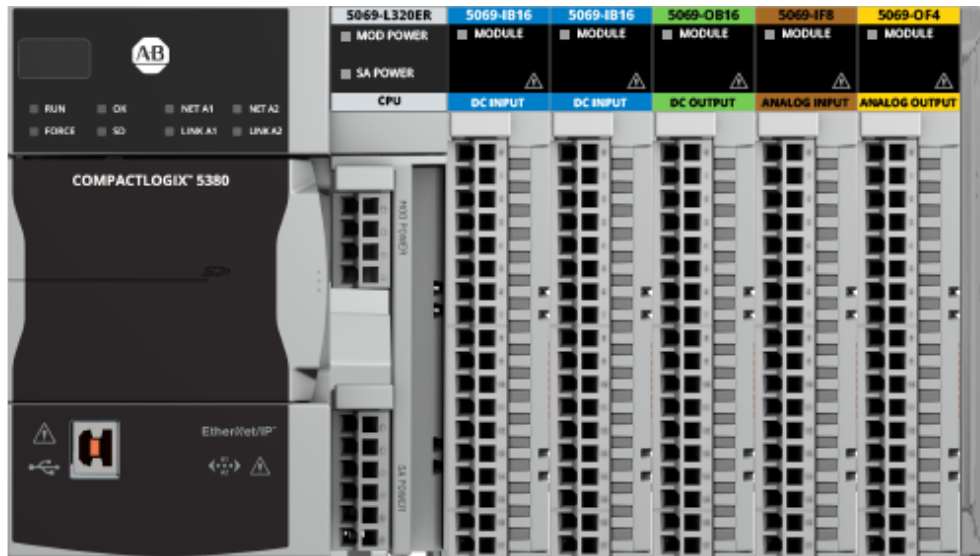
4.25.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.26 Platform '4S-110-CSP_SPS4-r001'

4.26.1 Graphics:



4.26.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	825 mA
MOD Power Remaining:	9175 mA
SA Power Used:	660 mA
SA Power Remaining:	9340 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.26.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IB16
N/A	5069-RTB18-SCREW
3	5069-OB16
N/A	5069-RTB18-SCREW
4	5069-IF8
N/A	5069-RTB18-SCREW
5	5069-OF4
N/A	5069-RTB18-SCREW

4.26.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.27 Platform '4S-111-DELDIOS_SPS-r001'

4.27.1 Graphics:



4.27.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	1050 mA
MOD Power Remaining:	8950 mA
SA Power Used:	1260 mA
SA Power Remaining:	8740 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Network Connectivity

5069-L320ER (slot 0)	Connected to 4S-111-DELDIOS_SPS-r001/4S-111-DELDIOS (Existing Switch)
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	274.00 mm (10.79 inches)
Depth	137.00 mm (5.39 inches)

4.27.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected connected to network '4S-111-DELDIOS (Existing Switch)'
0.1	5069-ECR	not connected connected to network '4S-111-DELDIOS (Existing Switch)'
N/A	5069-RTB64-SCREW	
1	5069-IB16	
N/A	5069-RTB18-SCREW	
2	5069-IB16	
N/A	5069-RTB18-SCREW	
3	5069-IB16	
N/A	5069-RTB18-SCREW	
4	5069-IB16	
N/A	5069-RTB18-SCREW	
5	5069-IB16	
N/A	5069-RTB18-SCREW	
6	5069-OB16	
N/A	5069-RTB18-SCREW	
7	5069-IF8	
N/A	5069-RTB18-SCREW	
8	5069-OF4	
N/A	5069-RTB18-SCREW	

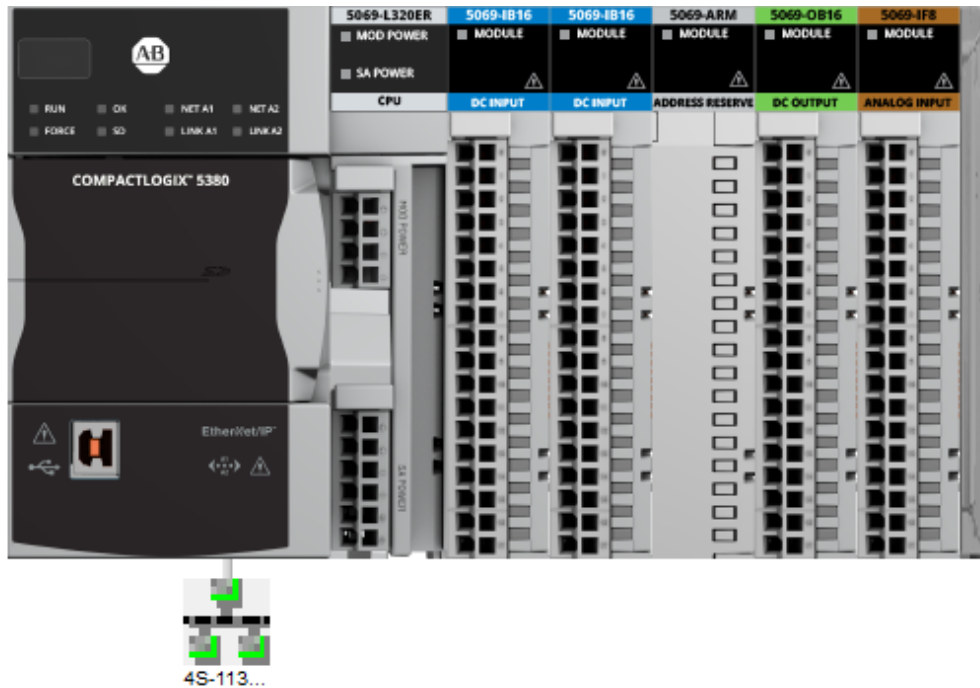
4.27.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
8	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.28 Platform '4S-113-FIRE STATION SPS-r001'

4.28.1 Graphics:



4.28.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	795 mA
MOD Power Remaining:	9205 mA
SA Power Used:	510 mA
SA Power Remaining:	9490 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Network Connectivity

5069-L320ER (slot 0)	Connected to 4S-113-FIRE STATION
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

	SPS-r001/4S-113-FIRE STN (Existing Switch)
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	208.00 mm (8.19 inches)
Depth	137.00 mm (5.39 inches)

4.28.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	connected to network '4S-113-FIRE STN (Existing Switch)'

not connected

0.1	5069-ECR	connected to network '4S-113-FIRE STN (Existing Switch)'
-----	----------	--

not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IB16
N/A	5069-RTB18-SCREW
3	5069-ARM
4	5069-OB16
N/A	5069-RTB18-SCREW
5	5069-IF8
N/A	5069-RTB18-SCREW

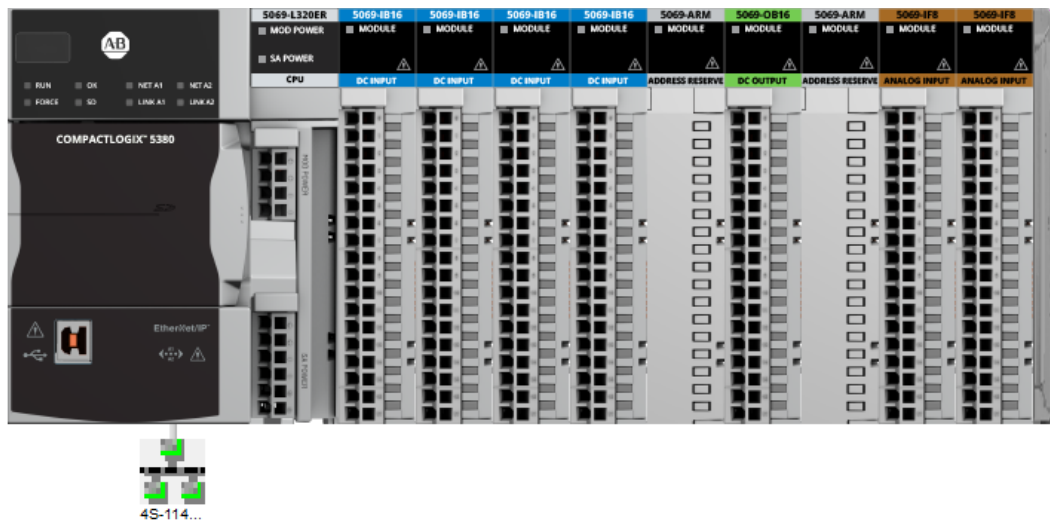
4.28.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.29 Platform '4S-114-MIDPOINT_SPS-r001'

4.29.1 Graphics:



4.29.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	1065 mA
MOD Power Remaining:	8935 mA
SA Power Used:	1010 mA
SA Power Remaining:	8990 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Network Connectivity

5069-L320ER (slot 0)	Connected to 4S-114-MIDPOINT_SPS-r001/4S-114-MIDPOINT (Existing Switch)
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	296.00 mm (11.65 inches)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Depth	137.00 mm (5.39 inches)
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4.29.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected connected to network '4S-114-MIDPOINT (Existing Switch)'
0.1	5069-ECR	not connected connected to network '4S-114-MIDPOINT (Existing Switch)'
N/A	5069-RTB64-SCREW	
1	5069-IB16	
N/A	5069-RTB18-SCREW	
2	5069-IB16	
N/A	5069-RTB18-SCREW	
3	5069-IB16	
N/A	5069-RTB18-SCREW	
4	5069-IB16	
N/A	5069-RTB18-SCREW	
5	5069-ARM	
6	5069-OB16	
N/A	5069-RTB18-SCREW	
7	5069-ARM	
8	5069-IF8	
N/A	5069-RTB18-SCREW	
9	5069-IF8	
N/A	5069-RTB18-SCREW	

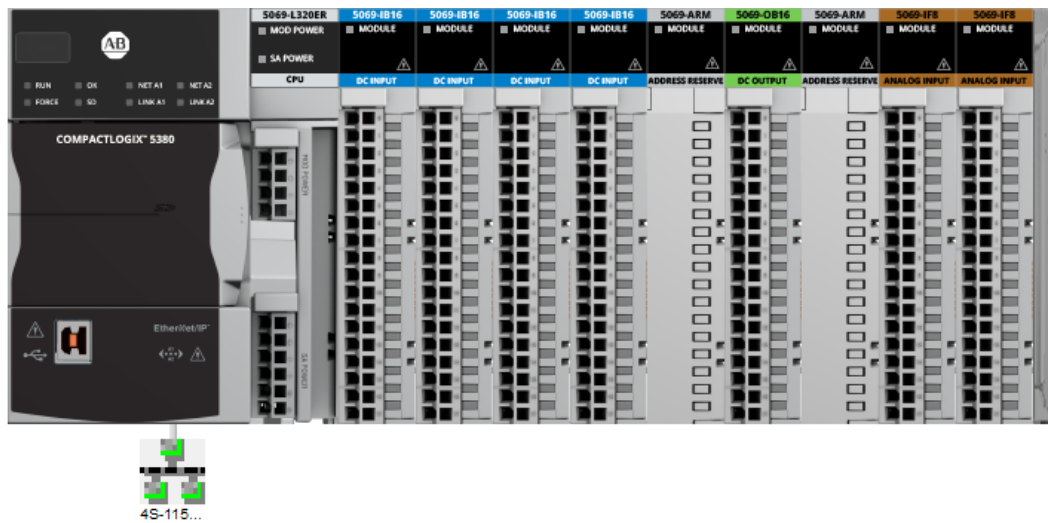
4.29.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
8	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
9	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.30 Platform '4S-115-NHD3_SPS-r001'

4.30.1 Graphics:



4.30.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	1065 mA
MOD Power Remaining:	8935 mA
SA Power Used:	1010 mA
SA Power Remaining:	8990 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Network Connectivity

5069-L320ER (slot 0)	Connected to 4S-115-NHD3_SPS-r001/4S-115-NHD3 (Existing Switch)
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	296.00 mm (11.65 inches)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Depth	137.00 mm (5.39 inches)
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4.30.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected connected to network '4S-115-NHD3 (Existing Switch)'
0.1	5069-ECR	not connected connected to network '4S-115-NHD3 (Existing Switch)'
N/A	5069-RTB64-SCREW	
1	5069-IB16	
N/A	5069-RTB18-SCREW	
2	5069-IB16	
N/A	5069-RTB18-SCREW	
3	5069-IB16	
N/A	5069-RTB18-SCREW	
4	5069-IB16	
N/A	5069-RTB18-SCREW	
5	5069-ARM	
6	5069-OB16	
N/A	5069-RTB18-SCREW	
7	5069-ARM	
8	5069-IF8	
N/A	5069-RTB18-SCREW	
9	5069-IF8	
N/A	5069-RTB18-SCREW	

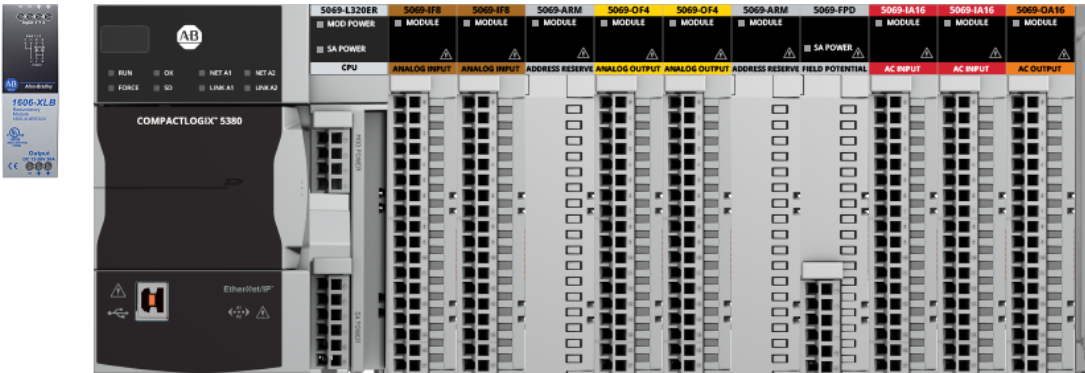
4.30.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
8	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
9	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.31 Platform '4S-118-PLC_3-r001'

4.31.1 Graphics:



4.31.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by New 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	28480 mW
Power Remaining:	61520 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L320ER	
MOD Power Used:	1090 mA
MOD Power Remaining:	8910 mA
SA Power Used:	510 mA
SA Power Remaining:	9490 mA
5069-FPD	
SA Power Used:	4480 mA
SA Power Remaining:	5520 mA

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	318.00 mm (12.52 inches)
Depth	137.00 mm (5.39 inches)

4.31.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IF8	
N/A	5069-RTB18-SCREW	
2	5069-IF8	
N/A	5069-RTB18-SCREW	
3	5069-ARM	
4	5069-OF4	
N/A	5069-RTB18-SCREW	
5	5069-OF4	
N/A	5069-RTB18-SCREW	
6	5069-ARM	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
7	5069-IA16	
N/A	5069-RTB18-SCREW	
8	5069-IA16	
N/A	5069-RTB18-SCREW	
9	5069-OA16	
N/A	5069-RTB18-SCREW	

4.31.3.1 Product Dimension Units are in mm (Inches)

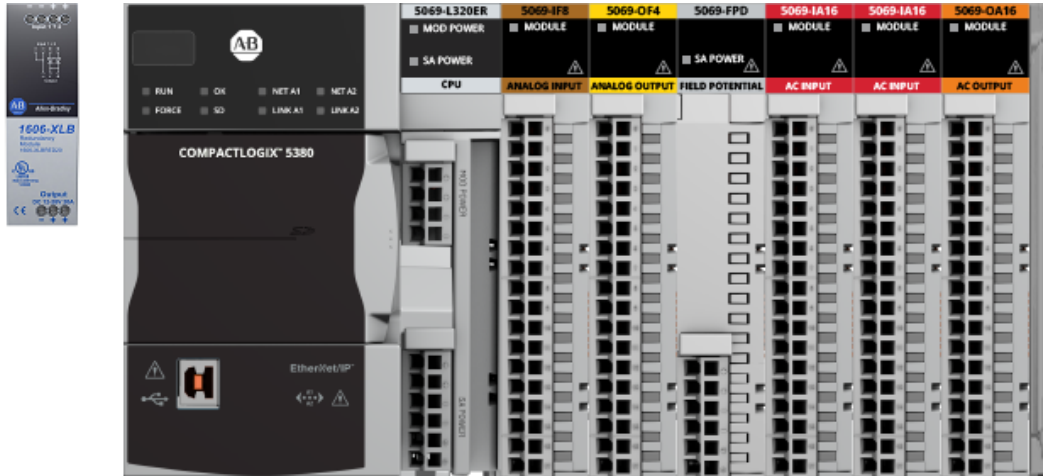
Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

6	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
8	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
9	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)

4.32 Platform '4S-119-PLC_4-r001'

4.32.1 Graphics:



4.32.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by New 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	12800 mW
Power Remaining:	77200 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L320ER	
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

MOD Power Used:	850 mA
MOD Power Remaining:	9150 mA
SA Power Used:	260 mA
SA Power Remaining:	9740 mA
5069-FPD	
SA Power Used:	4480 mA
SA Power Remaining:	5520 mA

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	230.00 mm (9.06 inches)
Depth	137.00 mm (5.39 inches)

4.32.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IF8	
N/A	5069-RTB18-SCREW	
2	5069-OF4	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
3	5069-IA16	
N/A	5069-RTB18-SCREW	
4	5069-IA16	
N/A	5069-RTB18-SCREW	
5	5069-OA16	
N/A	5069-RTB18-SCREW	

4.32.3.1 Product Dimension Units are in mm (Inches)

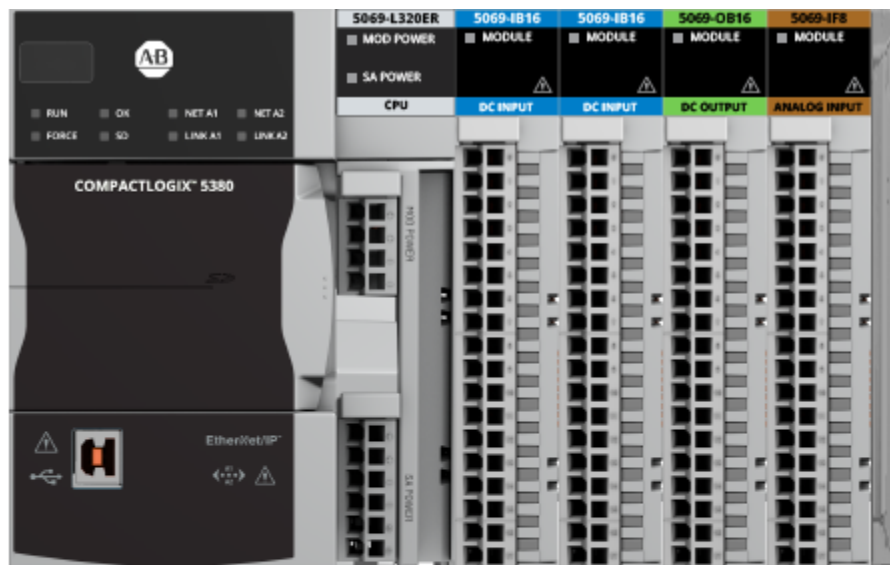
Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)

4.33 Platform '4S-120-SLNAH_SPS1-r001'

4.33.1 Graphics:



4.33.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

MOD Power Remaining:	9250 mA
SA Power Used:	510 mA
SA Power Remaining:	9490 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.33.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IB16	
N/A	5069-RTB18-SCREW	
2	5069-IB16	
N/A	5069-RTB18-SCREW	
3	5069-OB16	
N/A	5069-RTB18-SCREW	
4	5069-IF8	
N/A	5069-RTB18-SCREW	

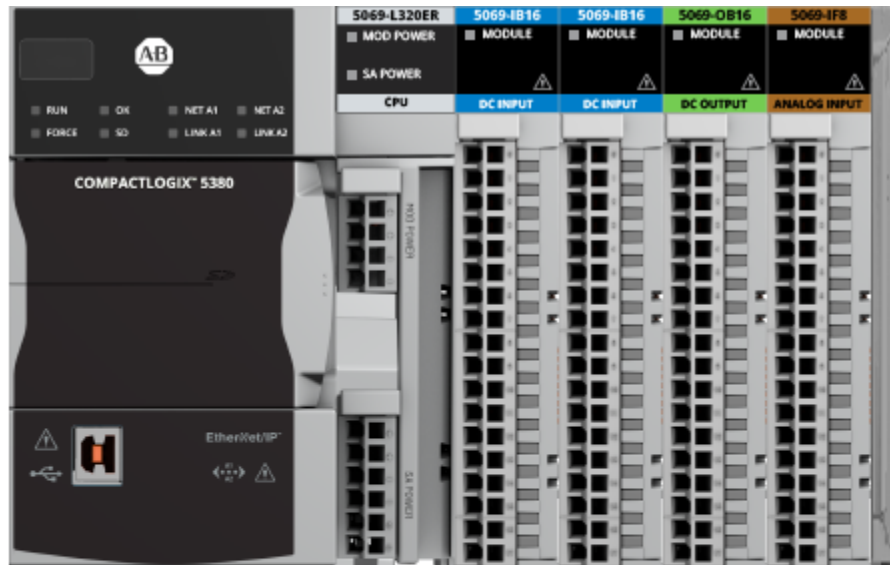
4.33.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.34 Platform '4S-121-AO_SPS-r001'

4.34.1 Graphics:



4.34.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	From Existing Control Power

Backplane Power Information

5069-L320ER	
MOD Power Used:	750 mA
MOD Power Remaining:	9250 mA
SA Power Used:	510 mA
SA Power Remaining:	9490 mA

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

Width	186.00 mm (7.32 inches)
Depth	137.00 mm (5.39 inches)

4.34.3 Layout Information:

Slot #	Catalog #	Additional Information
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected

N/A	5069-RTB64-SCREW
1	5069-IB16
N/A	5069-RTB18-SCREW
2	5069-IB16
N/A	5069-RTB18-SCREW
3	5069-OB16
N/A	5069-RTB18-SCREW
4	5069-IF8
N/A	5069-RTB18-SCREW

4.34.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OB16	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.35 Platform '4S-111-DELDIOS (New OIT)'

4.35.1 Graphics:



4.35.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
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Field Power Information

Field Power Status:	Not Supported
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Network Connectivity

2711P-T10C21D8S	Connected to 4S-111-DELDIOS_SPS-r001/4S-111-DELDIOS (Existing Switch)
-----------------	---

Dimension Details (2711P-T10C21D8S)

Height	224.00 mm (8.82 inches)
Width	269.00 mm (10.59 inches)
NOTE:	**Panel cutout dimensions are displayed**

4.35.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	2711P-T10C21D8S	

4.35.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.36 Platform '4S-113-FIRE STN (New OIT)'

4.36.1 Graphics:



4.36.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
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Field Power Information

Field Power Status:	Not Supported
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Network Connectivity

2711P-T10C21D8S	Connected to 4S-113-FIRE STATION SPS-r001/4S-113-FIRE STN (Existing Switch)
-----------------	---

Dimension Details (2711P-T10C21D8S)

Height	224.00 mm (8.82 inches)
Width	269.00 mm (10.59 inches)
NOTE:	**Panel cutout dimensions are displayed**

4.36.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	2711P-T10C21D8S	

4.36.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.37 Platform '4S-114-MIDPOINT (New OIT)'

4.37.1 Graphics:



4.37.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
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Field Power Information

Field Power Status:	Not Supported
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Network Connectivity

2711P-T10C21D8S	Connected to 4S-114-MIDPOINT_SPS-r001/4S-114-MIDPOINT (Existing Switch)
-----------------	---

Dimension Details (2711P-T10C21D8S)

Height	224.00 mm (8.82 inches)
Width	269.00 mm (10.59 inches)
NOTE:	**Panel cutout dimensions are displayed**

4.37.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	2711P-T10C21D8S	

4.37.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
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APPENDIX 17000 - B.2 TYPE1 CONVERSIONS

4.38 Platform '4S-115-NHD3 (New OIT)'

4.38.1 Graphics:



4.38.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
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Field Power Information

Field Power Status:	Not Supported
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Network Connectivity

2711P-T10C21D8S	Connected to 4S-115-NHD3_SPS-r001/4S-115-NHD3 (Existing Switch)
-----------------	---

Dimension Details (2711P-T10C21D8S)

Height	224.00 mm (8.82 inches)
Width	269.00 mm (10.59 inches)
NOTE:	**Panel cutout dimensions are displayed**

4.38.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	2711P-T10C21D8S	

4.38.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
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APPENDIX 17000-B

APPENDIX B.2

TYPE 2 – COMPACTLOGIX UPGRADES WITH ENTRELEC HARNESSES SUMMARY

Facility Name	Category	Function	Existing PLC	PLC Power Supply Type	Upgraded PLC Supplied by Contractor
PLC 2A	4S-116	Main Plant Control & Monitoring	SLC 1747-L553	120VAC	5069-L340ER
PLC 2B	4S-117	Main Plant Control & Monitoring	SLC 1747-L553	120VAC	5069-L340ER

1 Overview of Project 'Type2___CmpctLog_EntHarness_Rev2'

1.1 Project's hardware platforms list

This Project contains the following Hardware platforms:

<i>HW Platform Type</i>	<i>HW Platform Name</i>
5069 Compact I/O	4S-116-PLC_2A-r001
5069 Compact I/O	4S-117-PLC_2A-r001

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

2 Bill of Materials

2.1 Consolidated BOM

Qty	Catalog #	Description
2	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
2	5069-L340ER	CompactLogix 5380 Controller, 4MB, 31 I/Os, 90 nodes, Standard
2	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
10	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
10	LAF300/UNI/SUBD25/422/UL	Entelelec (Interfast) Connector for 5096-IF8
45	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
10	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
10	LAF300/UNI/SUBD9/420/UL	Entelelec (Interfast) Connector for 5096-OF4
17	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
10	5069-FPD	5069 Compact I/O Field Potential Distributor Module
10	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
18	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
18	LAF300/UNI/OMN20/418/UL	Entelelec (Interfast) Connector for 5096-IA16
7	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
7	LAF300/UNI/OMN20/418/UL	Entelelec (Interfast) Connector for 5096-OA16
64	700-HLT1U1	INTERFACE MODULE, 110VAC & 125VDC, 50/60HZ

2.2 Control Panel BOM's

Qty	Catalog #	Description
		Hardware
		4S-116-PLC_2A-r001
1	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
1	5069-L340ER	CompactLogix 5380 Controller, 4MB, 31 I/Os, 90 nodes, Standard
1	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
1	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
5	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
5	LAF300/UNI/SUBD25/422/UL	Entelelec (Interfast) Connector for 5096-IF8
23	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
6	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
6	LAF300/UNI/SUBD9/420/UL	Entelelec (Interfast) Connector for 5096-OF4
8	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
5	5069-FPD	5069 Compact I/O Field Potential Distributor Module
5	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
9	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
9	LAF300/UNI/OMN20/418/UL	Entelelec (Interfast) Connector for 5096-IA16
3	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
3	LAF300/UNI/OMN20/418/UL	Entelelec (Interfast) Connector for 5096-OA16
		4S-117-PLC_2A-r001
1	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

1	5069-L340ER	CompactLogix 5380 Controller, 4MB, 31 I/Os, 90 nodes, Standard
1	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
1	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
5	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
5	LAF300/UNI/SUBD25/422/UL	Entrelec (Interfast) Connector for 5096-IF8
22	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
9	5069-ARM	5069 Compact I/O Address Reserve Module, occupy one slot address.
4	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
4	LAF300/UNI/SUBD9/420/UL	Entrelec (Interfast) Connector for 5096-OF4
5	5069-FPD	5069 Compact I/O Field Potential Distributor Module
5	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
9	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
9	LAF300/UNI/OMN20/418/UL	Entrelec (Interfast) Connector for 5096-IA16
4	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
4	LAF300/UNI/OMN20/418/UL	Entrelec (Interfast) Connector for 5096-OA16
		CYA
		Output Devices
64	700-HLT1U1	INTERFACE MODULE, 110VAC &125VDC, 50/60HZ

3 Hardware Platforms

3.1 Platform '4S-116-PLC_2A-r001'

3.1.1 Graphics:



3.1.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by new 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	82720 mW
Power Remaining:	7280 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L340ER	
MOD Power Used:	2610 mA
MOD Power Remaining:	7390 mA
SA Power Used:	510 mA
SA Power Remaining:	9490 mA
5069-FPD	
SA Power Used:	4720 mA
SA Power Remaining:	5280 mA
5069-FPD	
SA Power Used:	500 mA
SA Power Remaining:	9500 mA
5069-FPD	
SA Power Used:	4720 mA
SA Power Remaining:	5280 mA
5069-FPD	
SA Power Used:	400 mA
SA Power Remaining:	9600 mA

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

5069-FPD	
SA Power Used:	4720 mA
SA Power Remaining:	5280 mA

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	890.00 mm (35.04 inches)
Depth	137.00 mm (5.39 inches)

3.1.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L340ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IF8	
N/A	5069-RTB18-SCREW	
2	5069-IF8	
N/A	5069-RTB18-SCREW	
3	5069-OF4	
N/A	5069-RTB18-SCREW	
4	5069-OF4	
N/A	5069-RTB18-SCREW	
5	5069-ARM	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
6	5069-IA16	
N/A	5069-RTB18-SCREW	
7	5069-IA16	
N/A	5069-RTB18-SCREW	
8	5069-IA16	
N/A	5069-RTB18-SCREW	
9	5069-OA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

N/A	5069-RTB6-SCREW	
10	5069-IF8	
N/A	5069-RTB18-SCREW	
11	5069-IF8	
N/A	5069-RTB18-SCREW	
12	5069-OF4	
N/A	5069-RTB18-SCREW	
13	5069-OF4	
N/A	5069-RTB18-SCREW	
14	5069-ARM	
N/A	5069-FPD	not connected

N/A	5069-RTB6-SCREW	
15	5069-IA16	
N/A	5069-RTB18-SCREW	
16	5069-IA16	
N/A	5069-RTB18-SCREW	
17	5069-IA16	
N/A	5069-RTB18-SCREW	
18	5069-ARM	
19	5069-OA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected

N/A	5069-RTB6-SCREW	
20	5069-IF8	
N/A	5069-RTB18-SCREW	
21	5069-ARM	
22	5069-OF4	
N/A	5069-RTB18-SCREW	
23	5069-OF4	
N/A	5069-RTB18-SCREW	
24	5069-ARM	
N/A	5069-FPD	not connected

N/A	5069-RTB6-SCREW	
25	5069-IA16	
N/A	5069-RTB18-SCREW	
26	5069-IA16	
N/A	5069-RTB18-SCREW	
27	5069-IA16	
N/A	5069-RTB18-SCREW	
28	5069-ARM	
29	5069-OA16	
N/A	5069-RTB18-SCREW	
30	5069-ARM	

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

31 5069-ARM

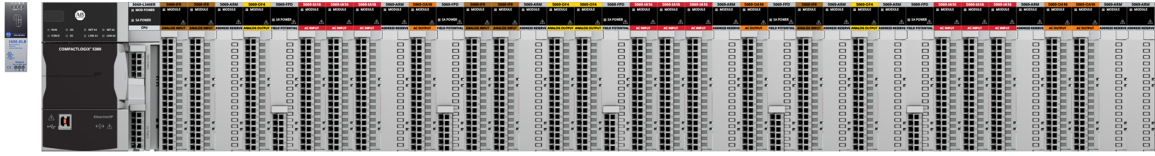
3.1.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)
0	5069-L340ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
8	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
9	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
10	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
11	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
12	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
13	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
14	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
15	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
16	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
17	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
18	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
19	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
20	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
21	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
22	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
23	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
24	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
25	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
26	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
27	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
28	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
29	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
30	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
31	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

3.2 Platform '4S-117-PLC_2A-r001'

3.2.1 Graphics:



3.2.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by new 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	69760 mW
Power Remaining:	20240 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L340ER	
MOD Power Used:	2605 mA
MOD Power Remaining:	7395 mA
SA Power Used:	360 mA
SA Power Remaining:	9640 mA
5069-FPD	
SA Power Used:	4720 mA
SA Power Remaining:	5280 mA
5069-FPD	
SA Power Used:	500 mA
SA Power Remaining:	9500 mA
5069-FPD	
SA Power Used:	4720 mA
SA Power Remaining:	5280 mA
5069-FPD	
SA Power Used:	250 mA
SA Power Remaining:	9750 mA
5069-FPD	
SA Power Used:	8720 mA
SA Power Remaining:	1280 mA

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	890.00 mm (35.04 inches)
Depth	137.00 mm (5.39 inches)

3.2.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L340ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IF8	
N/A	5069-RTB18-SCREW	
2	5069-IF8	
N/A	5069-RTB18-SCREW	
3	5069-ARM	
4	5069-OF4	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
5	5069-IA16	
N/A	5069-RTB18-SCREW	
6	5069-IA16	
N/A	5069-RTB18-SCREW	
7	5069-IA16	
N/A	5069-RTB18-SCREW	
8	5069-ARM	
9	5069-OA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
10	5069-IF8	
N/A	5069-RTB18-SCREW	
11	5069-IF8	
N/A	5069-RTB18-SCREW	

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

12	5069-ARM	
13	5069-OF4	
N/A	5069-RTB18-SCREW	
14	5069-OF4	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
15	5069-IA16	
N/A	5069-RTB18-SCREW	
16	5069-IA16	
N/A	5069-RTB18-SCREW	
17	5069-IA16	
N/A	5069-RTB18-SCREW	
18	5069-ARM	
19	5069-OA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
20	5069-IF8	
N/A	5069-RTB18-SCREW	
21	5069-ARM	
22	5069-OF4	
N/A	5069-RTB18-SCREW	
23	5069-ARM	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
24	5069-IA16	
N/A	5069-RTB18-SCREW	
25	5069-IA16	
N/A	5069-RTB18-SCREW	
26	5069-IA16	
N/A	5069-RTB18-SCREW	
27	5069-ARM	
28	5069-OA16	
N/A	5069-RTB18-SCREW	
29	5069-OA16	
N/A	5069-RTB18-SCREW	
30	5069-ARM	
31	5069-ARM	

3.2.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)

APPENDIX 17000 - B.2 TYPE2 CONVERSIONS

0	5069-L340ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
6	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
7	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
8	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
9	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
10	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
11	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
12	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
13	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
14	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
15	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
16	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
17	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
18	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
19	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
20	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
21	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
22	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)
23	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
24	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
25	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
26	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
27	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
28	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
29	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
30	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)
31	5069-ARM	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000-B

APPENDIX B.2

TYPE 3 – CONTROLLOGIX UPGRADES WITH RETERMINATION

Facility Name	Category	Function	Existing	PLC Power Supply Type	Upgraded PLC Supplied by Contractor
FILTERS PLC	4S-112	US Water Filters PLC	SLC 1747-L551	120VAC	1756-L83E
Energy Recovery Turb. Remote IO #1	M-201	ERT-1 (RIO)	SLC 1747-ASB Remote IO	24VDC	1756-EN2T Remote IO
Energy Recovery Turb. Remote IO #2	M-202	ERT-2 (RIO)	SLC 1747-ASB Remote IO	24VDC	1756-EN2T Remote IO
Energy Recovery Turb. Control	M-203	ERT Control	SLC 1747-552	24VDC	1756-L83E
Inst. & Control Panel #2	M-204	ICP-2	SLC 1747-553	120VAC	1756-EN2T Remote IO to CC-MBR
Inst. & Control Panel #3	M-205	ICP-3	SLC 1747-553	120VAC	1756-EN2T Remote IO to CC-MBR
Ammonia Feed Facility	M-206	AFIF	SLC 1747-551	24VDC	1756-L83E

1 Overview of Project 'Type3___CtrlLogix_ReTerm_Rev3'

1.1 Project's hardware platforms list

This Project contains the following Hardware platforms:

HW Platform Type	HW Platform Name
ControlLogix	4S-112-4S_RANCH_RSF-r001
ControlLogix	M201-ERT RIO1-r001
ControlLogix	M202-ERT RIO2-r001
ControlLogix	M203-ERT-r001
ControlLogix	M-204-ICP-2-R1-r001
ControlLogix	M-204-ICP-2-R2-r001
ControlLogix	M-205-ICP-3-R1-r001
ControlLogix	M-205-ICP-3-R2-r001
ControlLogix	M-206-AFIF-r001

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

2 Bill of Materials

2.1 Consolidated BOM

Qty	Catalog #	Description
5	1756-A13	1756 Chassis 13 slots
5	1756-PA75	85-265V AC Power Supply (5V @ 13 Amp)
3	1756-L83E	Logix5580E Controller With 10 Mbytes Memory
20	1756-IA16	79-132 VAC Input 16 Pts (20 Pin)
37	1756-TBNH	20 Position Nema Screw Clamp Block
22	1756-OX8I	N.O./N.C. Isolated Relay Output 8 Pts (36 Pin)
45	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
13	1756-IF8I	Analog Input Module, 8 Isolated Points, Current Sourcing and Voltage, 36 Pin
4	1756-A10	1756 Chassis 10 slots
4	1756-PB75	19.2 - 32V DC Power Supply (5V @ 13 Amp)
7	1756-EN2T	EtherNet 10-100M Bridge Module
2	1756-IRT8I	RTD / Ohms / Thermocouple / mV Input Module, 8 Individually Configurable Isolated Points, 36 Pin
11	1756-IB16	10-31 VDC Input 16 Pts (20 Pin)
6	1756-OB16E	10-31 VDC Elec Fused Output 16 Pts (20 Pin)
8	1756-OF8I	Analog Output Module, 8 Isolated Points, Current and Voltage, 36 Pin
0	Generic 8-port Managed Switch	Generic 8-port Managed Switch (SUPPLIED BY OWNER)
0	F5E10-10M2Y	Panduit Fiber Patchcord: Duplex Zipcord Multimode 50 micron (OM2) ,LC Male / LC Male, 1.6mm diameter, 2-Conductor, Orange Riser, 2 meters (SUPPLIED BY OWNER)
As Needed	1585J-M4TBJM-2	Patchcord: RJ45 Male / RJ45 Male, 4-Conductor, Teal TPE, Flex Rated, 2 meters (6.56 feet), Cat 5e
1	Generic 8-port Unmanaged Switch	Generic 8-port Unmanaged Switch
64	700-HLT1U1	INTERFACE MODULE, 110VAC &125VDC, 50/60HZ

2.2 Control Panel BOM's

Qty	Catalog #	Description
		Networks
		ICP2_ICP3_RIO Ring : M-204-ICP-2 (Existing – SUPPLIED BY OWNER)
1	Generic 8-port Managed Switch	Generic 8-port Managed Switch (Existing)
1	F5E10-10M2Y	Panduit Fiber Patchcord: Duplex Zipcord Multimode 50 micron (OM2) ,LC Male / LC Male, 1.6mm diameter, 2-Conductor, Orange Riser, 2 meters
2	1585J-M4TBJM-2	Patchcord: RJ45 Male / RJ45 Male, 4-Conductor, Teal TPE, Flex Rated, 2 meters (6.56 feet), Cat 5e
		ICP2_ICP3_RIO Ring : M-205-ICP-3 (Existing -SUPPLIED BY OWNER)
1	Generic 8-port Managed Switch	Generic 8-port Managed Switch (Existing)
1	F5E10-10M2Y	Panduit Fiber Patchcord: Duplex Zipcord Multimode 50 micron (OM2) ,LC Male / LC Male, 1.6mm diameter, 2-Conductor, Orange Riser, 2 meters
2	1585J-M4TBJM-2	Patchcord: RJ45 Male / RJ45 Male, 4-Conductor, Teal TPE, Flex Rated, 2 meters (6.56 feet), Cat 5e
		ICP2_ICP3_RIO Ring : CC-MBR (Existing – SUPPLIED BY OWNER)
1	Generic 8-port Managed Switch	Generic 8-port Managed Switch (Existing)
1	F5E10-10M2Y	Panduit Fiber Patchcord: Duplex Zipcord Multimode 50 micron (OM2) ,LC Male / LC Male, 1.6mm diameter, 2-Conductor, Orange Riser, 2 meters

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

		ERT_RIO : M203-ERT (New Switch)
1	Generic 8-port Unmanaged Switch	Generic 8-port Unmanaged Switch
3	1585J-M4TBJM-2	Patchcord: RJ45 Male / RJ45 Male, 4-Conductor, Teal TPE, Flex Rated, 2 meters (6.56 feet), Cat 5e
		Hardware
		4S-112-4S_RANCH_RSf-r001
1	1756-A13	1756 Chassis 13 slots
1	1756-PA75	85-265V AC Power Supply (5V @ 13 Amp)
1	1756-L83E	Logix5580E Controller With 10 Mbytes Memory
4	1756-IA16	79-132 VAC Input 16 Pts (20 Pin)
4	1756-TBNH	20 Position NemA Screw Clamp Block
7	1756-0X8I	N.O./N.C. Isolated Relay Output 8 Pts (36 Pin)
8	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
1	1756-IF8I	Analog Input Module, 8 Isolated Points, Current Sourcing and Voltage, 36 Pin
		M201-ERT RIO1-r001
1	1756-A10	1756 Chassis 10 slots
1	1756-PB75	19.2 - 32V DC Power Supply (5V @ 13 Amp)
1	1756-EN2T	EtherNet 10-100M Bridge Module
1	1756-IF8I	Analog Input Module, 8 Isolated Points, Current Sourcing and Voltage, 36 Pin
2	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
1	1756-IRT8I	RTD / Ohms / Thermocouple / mV Input Module, 8 Individually Configurable Isolated Points, 36 Pin
3	1756-IB16	10-31 VDC Input 16 Pts (20 Pin)
5	1756-TBNH	20 Position NemA Screw Clamp Block
2	1756-OB16E	10-31 VDC Elec Fused Output 16 Pts (20 Pin)
		M202-ERT RIO2-r001
1	1756-A10	1756 Chassis 10 slots
1	1756-PB75	19.2 - 32V DC Power Supply (5V @ 13 Amp)
1	1756-EN2T	EtherNet 10-100M Bridge Module
1	1756-IF8I	Analog Input Module, 8 Isolated Points, Current Sourcing and Voltage, 36 Pin
2	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
1	1756-IRT8I	RTD / Ohms / Thermocouple / mV Input Module, 8 Individually Configurable Isolated Points, 36 Pin
3	1756-IB16	10-31 VDC Input 16 Pts (20 Pin)
5	1756-TBNH	20 Position NemA Screw Clamp Block
2	1756-OB16E	10-31 VDC Elec Fused Output 16 Pts (20 Pin)
		M203-ERT-r001
1	1756-A10	1756 Chassis 10 slots
1	1756-PB75	19.2 - 32V DC Power Supply (5V @ 13 Amp)
1	1756-L83E	Logix5580E Controller With 10 Mbytes Memory
1	1756-EN2T	EtherNet 10-100M Bridge Module
1	1756-IF8I	Analog Input Module, 8 Isolated Points, Current Sourcing and Voltage, 36 Pin
2	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
1	1756-OF8I	Analog Output Module, 8 Isolated Points, Current and Voltage, 36 Pin
2	1756-IB16	10-31 VDC Input 16 Pts (20 Pin)
4	1756-TBNH	20 Position NemA Screw Clamp Block

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

2	1756-OB16E	10-31 VDC Elec Fused Output 16 Pts (20 Pin)
		M-204-ICP-2-R1-r001
1	1756-A13	1756 Chassis 13 slots
1	1756-PA75	85-265V AC Power Supply (5V @ 13 Amp)
1	1756-EN2T	EtherNet 10-100M Bridge Module
3	1756-IF8I	Analog Input Module, 8 Isolated Points, Current Sourcing and Voltage, 36 Pin
6	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
3	1756-OF8I	Analog Output Module, 8 Isolated Points, Current and Voltage, 36 Pin
		M-204-ICP-2-R2-r001
1	1756-A13	1756 Chassis 13 slots
1	1756-PA75	85-265V AC Power Supply (5V @ 13 Amp)
1	1756-EN2T	EtherNet 10-100M Bridge Module
6	1756-IA16	79-132 VAC Input 16 Pts (20 Pin)
6	1756-TBNH	20 Position NemA Screw Clamp Block
5	1756-OX8I	N.O./N.C. Isolated Relay Output 8 Pts (36 Pin)
5	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
		M-205-ICP-3-R1-r001
1	1756-A13	1756 Chassis 13 slots
1	1756-PA75	85-265V AC Power Supply (5V @ 13 Amp)
1	1756-EN2T	EtherNet 10-100M Bridge Module
3	1756-IF8I	Analog Input Module, 8 Isolated Points, Current Sourcing and Voltage, 36 Pin
7	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
3	1756-OF8I	Analog Output Module, 8 Isolated Points, Current and Voltage, 36 Pin
1	1756-OX8I	N.O./N.C. Isolated Relay Output 8 Pts (36 Pin)
5	1756-IA16	79-132 VAC Input 16 Pts (20 Pin)
5	1756-TBNH	20 Position NemA Screw Clamp Block
		M-205-ICP-3-R2-r001
1	1756-A13	1756 Chassis 13 slots
1	1756-PA75	85-265V AC Power Supply (5V @ 13 Amp)
1	1756-EN2T	EtherNet 10-100M Bridge Module
5	1756-IA16	79-132 VAC Input 16 Pts (20 Pin)
5	1756-TBNH	20 Position NemA Screw Clamp Block
7	1756-OX8I	N.O./N.C. Isolated Relay Output 8 Pts (36 Pin)
7	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
		M-206-AFIF-r001
1	1756-A10	1756 Chassis 10 slots
1	1756-PB75	19.2 - 32V DC Power Supply (5V @ 13 Amp)
1	1756-L83E	Logix5580E Controller With 10 Mbytes Memory
3	1756-IB16	10-31 VDC Input 16 Pts (20 Pin)
3	1756-TBNH	20 Position NemA Screw Clamp Block
2	1756-OX8I	N.O./N.C. Isolated Relay Output 8 Pts (36 Pin)
6	1756-TBCH	36 Pin Screw Clamp Block With Standard Housing
3	1756-IF8I	Analog Input Module, 8 Isolated Points, Current Sourcing and Voltage, 36 Pin
1	1756-OF8I	Analog Output Module, 8 Isolated Points, Current and Voltage, 36 Pin
		CYA

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

		Output Devices
64	700-HLT1U1	INTERFACE MODULE, 110VAC &125VDC, 50/60HZ

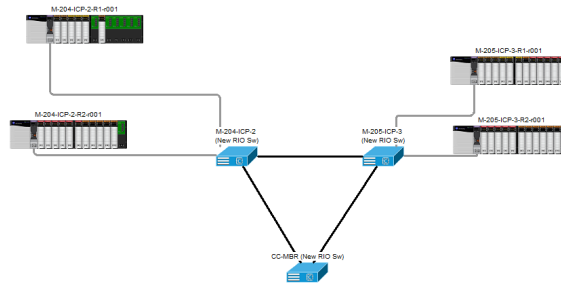
3 Network Details

3.1 Network 'ICP2_ICP3_RIO Ring - EXISTING'

3.1.1 EtherNet/IP network status : Ok

3.1.2 Graphics:

Zone: Network



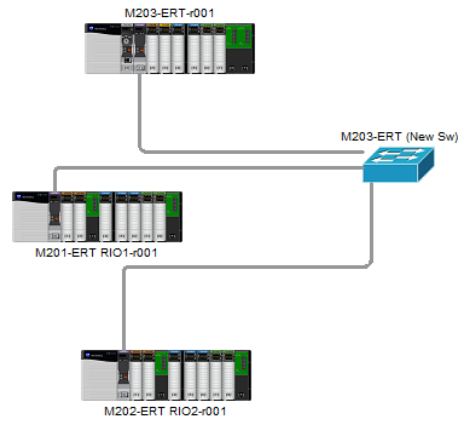
APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

3.2 Network 'ERT_RIO'

3.2.1 EtherNet/IP network status : Ok

3.2.2 Graphics:

Zone: Network

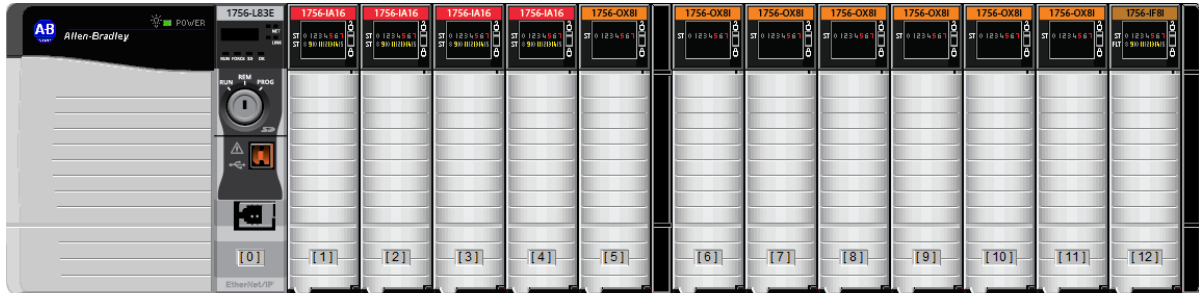


APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4 Hardware Platforms

4.1 Platform '4S-112-4S_RANCH_RSF-r001'

4.1.1 Graphics:



4.1.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
-----------------------	-----------------------------

Backplane Power Information

Power Supply:	1756-PA75
5V Used:	2520 mA
5V Remaining:	10480 mA
24V Used:	1108 mA
24V Remaining:	1692 mA
Power Used:	32390 mW
Power Remaining:	42610 mW

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (1756-A13)

Height	169.00 mm (6.65 inches)
Width	588.00 mm (23.15 inches)
Depth	145.00 mm (5.71 inches)

4.1.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1756-A13	
N/A	1756-PA75	

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

0	1756-L83E	not connected
1	1756-IA16	
1.1	1756-TBNH	
2	1756-IA16	
2.1	1756-TBNH	
3	1756-IA16	
3.1	1756-TBNH	
4	1756-IA16	
4.1	1756-TBNH	
5	1756-OX8I	
5.1	1756-TBCH	
6	1756-OX8I	
6.1	1756-TBCH	
7	1756-OX8I	
7.1	1756-TBCH	
8	1756-OX8I	
8.1	1756-TBCH	
9	1756-OX8I	
9.1	1756-TBCH	
10	1756-OX8I	
10.1	1756-TBCH	
11	1756-OX8I	
11.1	1756-TBCH	
12	1756-IF8I	
	1756-TBCH	

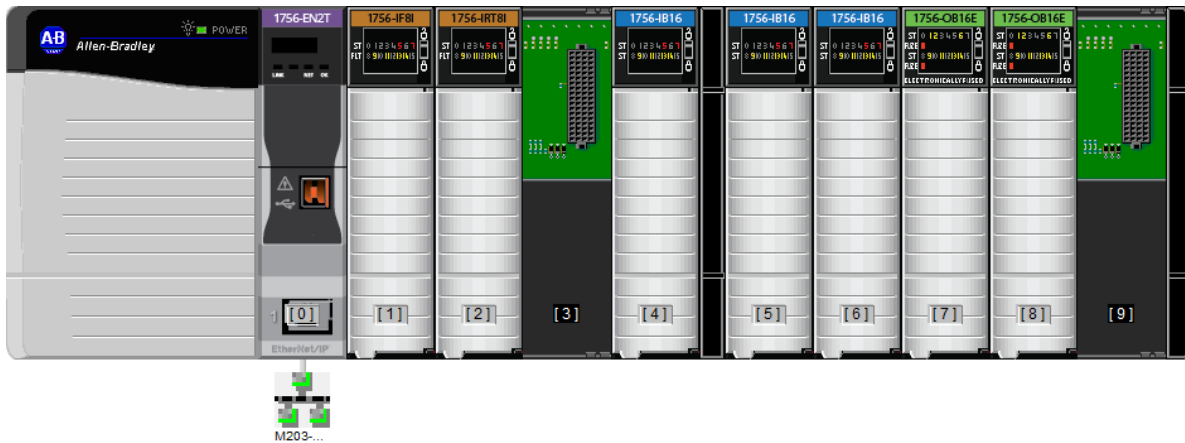
4.1.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1756-A13	169.00(6.65)	502.00(19.76)	145.00(5.71)
N/A	1756-PA75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-L83E	145.80(5.74)	34.60(1.36)	137.80(5.43)
1	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
2	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
3	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
4	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
5	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
6	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
7	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
8	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
9	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
10	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
11	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
12	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.2 Platform 'M201-ERT RIO1-r001'

4.2.1 Graphics:



4.2.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
-----------------------	-----------------------------

Backplane Power Information

Power Supply:	1756-PB75
5V Used:	2200 mA
5V Remaining:	10800 mA
24V Used:	563 mA
24V Remaining:	2237 mA
Power Used:	16620 mW
Power Remaining:	58380 mW

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (1756-A10)

Height	169.00 mm (6.65 inches)
Width	483.00 mm (19.02 inches)
Depth	145.00 mm (5.71 inches)

Network Connectivity

1756-EN2T (slot 0)	Connected to ERT_RIO/M203-ERT (New Switch)
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4.2.3 Layout Information:

Slot #	Catalog #	Additional Information
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APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

N/A	1756-A10	
N/A	1756-PB75	
0	1756-EN2T	connected to network 'M203-ERT (New Switch)'
1	1756-IF8I	
	1756-TBCH	
2	1756-IRT8I	
	1756-TBCH	
4	1756-IB16	
4.1	1756-TBNH	
5	1756-IB16	
5.1	1756-TBNH	
6	1756-IB16	
6.1	1756-TBNH	
7	1756-OB16E	
7.1	1756-TBNH	
8	1756-OB16E	
8.1	1756-TBNH	

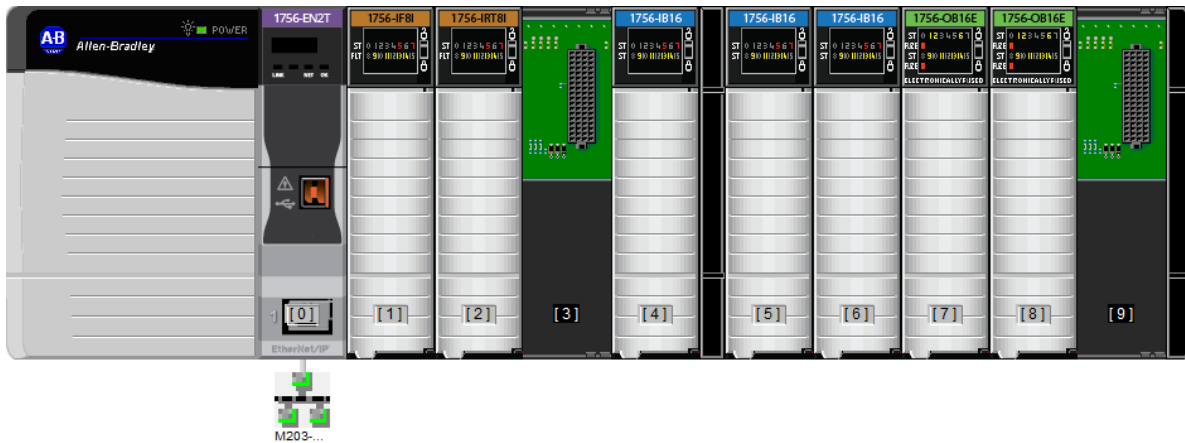
4.2.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1756-A10	169.00(6.65)	397.00(15.63)	145.00(5.71)
N/A	1756-PB75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-EN2T	144.50(5.69)	34.62(1.36)	143.76(5.66)
1	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
2	1756-IRT8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
4	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
5	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
6	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
7	1756-OB16E	144.50(5.69)	34.60(1.36)	143.80(5.66)
8	1756-OB16E	144.50(5.69)	34.60(1.36)	143.80(5.66)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.3 Platform 'M202-ERT RIO2-r001'

4.3.1 Graphics:



4.3.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
-----------------------	-----------------------------

Backplane Power Information

Power Supply:	1756-PB75
5V Used:	2200 mA
5V Remaining:	10800 mA
24V Used:	563 mA
24V Remaining:	2237 mA
Power Used:	16620 mW
Power Remaining:	58380 mW

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (1756-A10)

Height	169.00 mm (6.65 inches)
Width	483.00 mm (19.02 inches)
Depth	145.00 mm (5.71 inches)

Network Connectivity

1756-EN2T (slot 0)	Connected to ERT_RIO/M203-ERT (New Switch)
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4.3.3 Layout Information:

Slot #	Catalog #	Additional Information
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APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

N/A	1756-A10	
N/A	1756-PB75	
0	1756-EN2T	connected to network 'M203-ERT (New Switch)'
1	1756-IF8I	
	1756-TBCH	
2	1756-IRT8I	
	1756-TBCH	
4	1756-IB16	
4.1	1756-TBNH	
5	1756-IB16	
5.1	1756-TBNH	
6	1756-IB16	
6.1	1756-TBNH	
7	1756-OB16E	
7.1	1756-TBNH	
8	1756-OB16E	
8.1	1756-TBNH	

4.3.3.1 Product Dimension

Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1756-A10	169.00(6.65)	397.00(15.63)	145.00(5.71)
N/A	1756-PB75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-EN2T	144.50(5.69)	34.62(1.36)	143.76(5.66)
1	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
2	1756-IRT8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
4	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
5	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
6	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
7	1756-OB16E	144.50(5.69)	34.60(1.36)	143.80(5.66)
8	1756-OB16E	144.50(5.69)	34.60(1.36)	143.80(5.66)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.4 Platform 'M203-ERT-r001'

4.4.1 Graphics:



4.4.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
-----------------------	-----------------------------

Backplane Power Information

Power Supply:	1756-PB75
5V Used:	3300 mA
5V Remaining:	9700 mA
24V Used:	796 mA
24V Remaining:	2004 mA
Power Used:	22960 mW
Power Remaining:	52040 mW

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (1756-A10)

Height	169.00 mm (6.65 inches)
Width	483.00 mm (19.02 inches)
Depth	145.00 mm (5.71 inches)

Network Connectivity

1756-EN2T (slot 1)	Connected to ERT_RIO/M203-ERT (New Switch)
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APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.4.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1756-A10	
N/A	1756-PB75	
0	1756-L83E	not connected
1	1756-EN2T	connected to network 'M203-ERT (New Switch)'
2	1756-IF8I	
	1756-TBCH	
3	1756-OF8I	
3.1	1756-TBCH	
4	1756-IB16	
4.1	1756-TBNH	
5	1756-IB16	
5.1	1756-TBNH	
6	1756-OB16E	
6.1	1756-TBNH	
7	1756-OB16E	
7.1	1756-TBNH	

4.4.3.1 Product Dimension

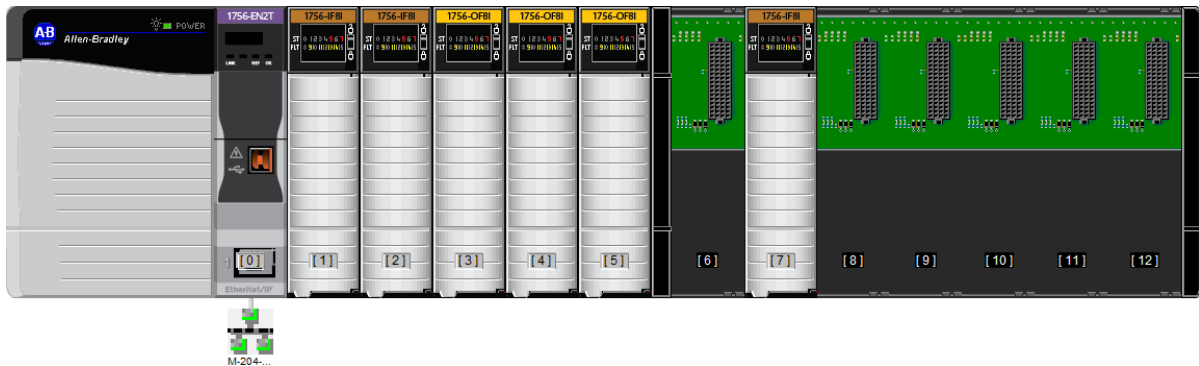
Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1756-A10	169.00(6.65)	397.00(15.63)	145.00(5.71)
N/A	1756-PB75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-L83E	145.80(5.74)	34.60(1.36)	137.80(5.43)
1	1756-EN2T	144.50(5.69)	34.62(1.36)	143.76(5.66)
2	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
3	1756-OF8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
4	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
5	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
6	1756-OB16E	144.50(5.69)	34.60(1.36)	143.80(5.66)
7	1756-OB16E	144.50(5.69)	34.60(1.36)	143.80(5.66)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.5 Platform 'M-204-ICP-2-R1-r001'

4.5.1 Graphics:



4.5.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
-----------------------	-----------------------------

Backplane Power Information

Power Supply:	1756-PA75
5V Used:	2200 mA
5V Remaining:	10800 mA
24V Used:	2358 mA
24V Remaining:	442 mA
Power Used:	31600 mW
Power Remaining:	43400 mW

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (1756-A13)

Height	169.00 mm (6.65 inches)
Width	588.00 mm (23.15 inches)
Depth	145.00 mm (5.71 inches)

Network Connectivity

1756-EN2T (slot 0)	Connected to ICP2_ICP3_RIO Ring/M-204-ICP-2 (Existing RIO Switch)
--------------------	---

4.5.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1756-A13	
N/A	1756-PA75	

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

0	1756-EN2T	connected to network 'M-204-ICP-2 (Existing RIO Switch)'
1	1756-IF8I	
	1756-TBCH	
2	1756-IF8I	
	1756-TBCH	
3	1756-OF8I	
3.1	1756-TBCH	
4	1756-OF8I	
4.1	1756-TBCH	
5	1756-OF8I	
5.1	1756-TBCH	
7	1756-IF8I	
	1756-TBCH	

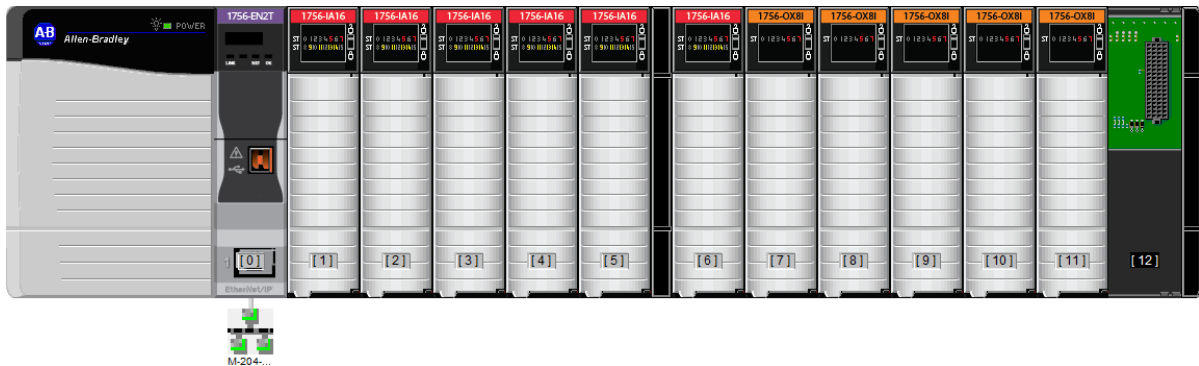
4.5.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1756-A13	169.00(6.65)	502.00(19.76)	145.00(5.71)
N/A	1756-PA75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-EN2T	144.50(5.69)	34.62(1.36)	143.76(5.66)
1	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
2	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
3	1756-OF8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
4	1756-OF8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
5	1756-OF8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
7	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.6 Platform 'M-204-ICP-2-R2-r001'

4.6.1 Graphics:



4.6.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
-----------------------	-----------------------------

Backplane Power Information

Power Supply:	1756-PA75
5V Used:	2130 mA
5V Remaining:	10870 mA
24V Used:	515 mA
24V Remaining:	2285 mA
Power Used:	22030 mW
Power Remaining:	52970 mW

Field Power Information

Field Power Status:	From Existing Field Power
---------------------	---------------------------

Dimension Details (1756-A13)

Height	169.00 mm (6.65 inches)
Width	588.00 mm (23.15 inches)
Depth	145.00 mm (5.71 inches)

Network Connectivity

1756-EN2T (slot 0)	Connected to ICP2_ICP3_RIO Ring/M-204-ICP-2 (Existing RIO Switch)
--------------------	---

4.6.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1756-A13	
N/A	1756-PA75	

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

0	1756-EN2T	connected to network 'M-204-ICP-2 (Existing RIO Switch)'
1	1756-IA16	
1.1	1756-TBNH	
2	1756-IA16	
2.1	1756-TBNH	
3	1756-IA16	
3.1	1756-TBNH	
4	1756-IA16	
4.1	1756-TBNH	
5	1756-IA16	
5.1	1756-TBNH	
6	1756-IA16	
6.1	1756-TBNH	
7	1756-OX8I	
7.1	1756-TBCH	
8	1756-OX8I	
8.1	1756-TBCH	
9	1756-OX8I	
9.1	1756-TBCH	
10	1756-OX8I	
10.1	1756-TBCH	
11	1756-OX8I	
11.1	1756-TBCH	

4.6.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1756-A13	169.00(6.65)	502.00(19.76)	145.00(5.71)
N/A	1756-PA75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-EN2T	144.50(5.69)	34.62(1.36)	143.76(5.66)
1	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
2	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
3	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
4	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
5	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
6	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
7	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
8	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
9	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
10	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
11	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.7 Platform 'M-205-ICP-3-R1-r001'

4.7.1 Graphics:



4.7.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
-----------------------	-----------------------------

Backplane Power Information

Power Supply:	1756-PA75
5V Used:	2825 mA
5V Remaining:	10175 mA
24V Used:	2468 mA
24V Remaining:	332 mA
Power Used:	37410 mW
Power Remaining:	37590 mW

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (1756-A13)

Height	169.00 mm (6.65 inches)
Width	588.00 mm (23.15 inches)
Depth	145.00 mm (5.71 inches)

Network Connectivity

1756-EN2T (slot 0)	Connected to ICP2_ICP3_RIO Ring/M-205-ICP-3 (Existing RIO Switch)
--------------------	---

4.7.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1756-A13	
N/A	1756-PA75	

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

0	1756-EN2T	connected to network 'M-205-ICP-3 (Existing RIO Switch)'
1	1756-IF8I	
	1756-TBCH	
2	1756-IF8I	
	1756-TBCH	
3	1756-IF8I	
	1756-TBCH	
4	1756-OF8I	
4.1	1756-TBCH	
5	1756-OF8I	
5.1	1756-TBCH	
6	1756-OF8I	
6.1	1756-TBCH	
7	1756-OF8I	
7.1	1756-TBCH	
8	1756-IA16	
8.1	1756-TBNH	
9	1756-IA16	
9.1	1756-TBNH	
10	1756-IA16	
10.1	1756-TBNH	
11	1756-IA16	
11.1	1756-TBNH	
12	1756-IA16	
12.1	1756-TBNH	

4.7.3.1 Product Dimension Units are in mm (Inches)

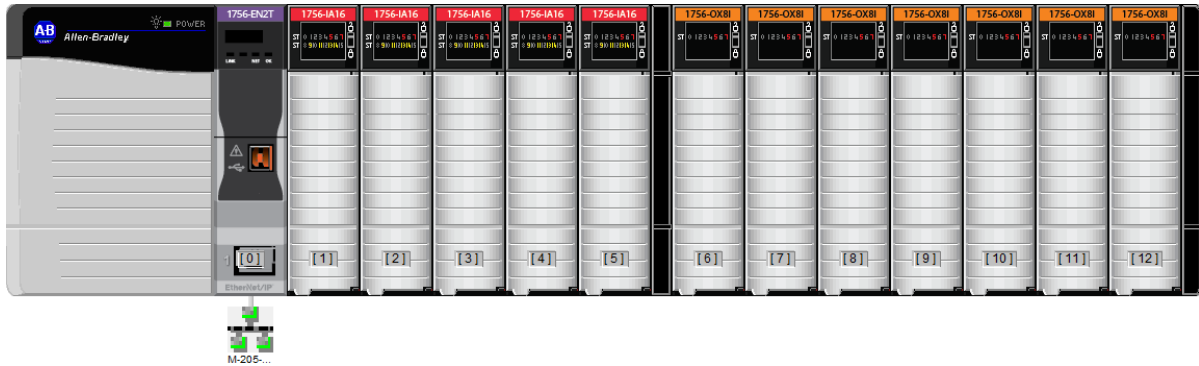
Slot #	Catalog #	Height	Width	Depth
N/A	1756-A13	169.00(6.65)	502.00(19.76)	145.00(5.71)
N/A	1756-PA75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-EN2T	144.50(5.69)	34.62(1.36)	143.76(5.66)
1	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
2	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
3	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
4	1756-OF8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
5	1756-OF8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
6	1756-OF8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
7	1756-OF8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
8	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
9	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
10	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

11	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
12	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)

4.8 Platform 'M-205-ICP-3-R2-r001'

4.8.1 Graphics:



4.8.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
-----------------------	-----------------------------

Backplane Power Information

Power Supply:	1756-PA75
5V Used:	2225 mA
5V Remaining:	10775 mA
24V Used:	713 mA
24V Remaining:	2087 mA
Power Used:	27270 mW
Power Remaining:	47730 mW

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (1756-A13)

Height	169.00 mm (6.65 inches)
Width	588.00 mm (23.15 inches)
Depth	145.00 mm (5.71 inches)

Network Connectivity

1756-EN2T (slot 0)	Connected to ICP2_ICP3_RIO Ring/M-205-ICP-3 (Existing RIO Switch)
--------------------	---

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.8.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1756-A13	
N/A	1756-PA75	
0	1756-EN2T	connected to network 'M-205-ICP-3 (Existing RIO Switch)'
1	1756-IA16	
1.1	1756-TBNH	
2	1756-IA16	
2.1	1756-TBNH	
3	1756-IA16	
3.1	1756-TBNH	
4	1756-IA16	
4.1	1756-TBNH	
5	1756-IA16	
5.1	1756-TBNH	
6	1756-OX8I	
6.1	1756-TBCH	
7	1756-OX8I	
7.1	1756-TBCH	
8	1756-OX8I	
8.1	1756-TBCH	
9	1756-OX8I	
9.1	1756-TBCH	
10	1756-OX8I	
10.1	1756-TBCH	
11	1756-OX8I	
11.1	1756-TBCH	
12	1756-OX8I	
12.1	1756-TBCH	

4.8.3.1 Product Dimension

Units are in mm (Inches)

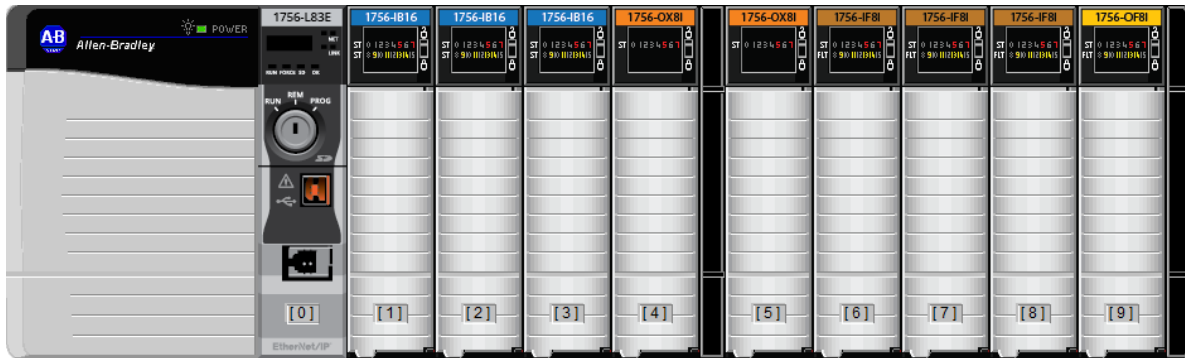
Slot #	Catalog #	Height	Width	Depth
N/A	1756-A13	169.00(6.65)	502.00(19.76)	145.00(5.71)
N/A	1756-PA75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-EN2T	144.50(5.69)	34.62(1.36)	143.76(5.66)
1	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
2	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
3	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
4	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
5	1756-IA16	144.50(5.69)	34.60(1.36)	143.80(5.66)
6	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
7	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
8	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
9	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

10	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
11	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
12	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)

4.9 Platform 'M-206-AFIF-r001'

4.9.1 Graphics:



4.9.2 Performance Data:

Control Power Information

Control Power Status:	From Existing Control Power
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Backplane Power Information

Power Supply:	1756-PB75
5V Used:	2500 mA
5V Remaining:	10500 mA
24V Used:	1791 mA
24V Remaining:	1009 mA
Power Used:	30100 mW
Power Remaining:	44900 mW

Field Power Information

Field Power Status:	From Existing Field Power
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Dimension Details (1756-A10)

Height	169.00 mm (6.65 inches)
Width	483.00 mm (19.02 inches)
Depth	145.00 mm (5.71 inches)

APPENDIX 17000 - B.2 TYPE3 CONVERSIONS

4.9.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1756-A10	
N/A	1756-PB75	
0	1756-L83E	not connected
1	1756-IB16	
1.1	1756-TBNH	
2	1756-IB16	
2.1	1756-TBNH	
3	1756-IB16	
3.1	1756-TBNH	
4	1756-OX8I	
4.1	1756-TBCH	
5	1756-OX8I	
5.1	1756-TBCH	
6	1756-IF8I	
	1756-TBCH	
7	1756-IF8I	
	1756-TBCH	
8	1756-IF8I	
	1756-TBCH	
9	1756-OF8I	
9.1	1756-TBCH	

4.9.3.1 Product Dimension

Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1756-A10	169.00(6.65)	397.00(15.63)	145.00(5.71)
N/A	1756-PB75	140.00(5.51)	112.00(4.41)	145.00(5.71)
0	1756-L83E	145.80(5.74)	34.60(1.36)	137.80(5.43)
1	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
2	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
3	1756-IB16	145.00(5.71)	35.00(1.38)	140.00(5.51)
4	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
5	1756-OX8I	144.50(5.69)	34.60(1.36)	143.80(5.66)
6	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
7	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)
8	1756-IF8I	NA	NA	NA
	1756-TBCH	117.00(4.61)	34.53(1.36)	48.52(1.91)

APPENDIX 17000-B

APPENDIX B.2

TYPE 4 – MICROLOGIX TO COMPACTLOGIX WITH RETERMINATION SUMMARY

Facility Name	Category	Function	Existing		Upgraded PLC Supplied by Contractor
HW SCRUBBER PLC	4S-101	Headworks Odor Control	Bulletin 1766	120VAC	5069-L320ER
SDW SCRUBBER PLC	4S-102	Solids Processing Odor Control	Bulletin 1766	120VAC	5069-L320ER

1 Overview of Project 'Type4___Micro2CmpctLog'

1.1 Project's hardware platforms list

This Project contains the following Hardware platforms:

<i>HW Platform Type</i>	<i>HW Platform Name</i>
5069 Compact I/O	4S-101-OMWD_HW_SCRUBBER-r001
5069 Compact I/O	4S-102-OMWD_SDW_SCRUBBER-r001

APPENDIX 17000 - B.2 TYPE4 CONVERSIONS

2 Bill of Materials

2.1 Consolidated BOM

Qty	Catalog #	Description
2	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
2	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
2	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
4	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
10	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
2	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
2	5069-FPD	5069 Compact I/O Field Potential Distributor Module
2	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
2	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
2	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state

2.2 Control Panel BOM

Qty	Catalog #	Description
		Hardware
		4S-101-OMWD_HW_SCRUBBER-r001
1	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
1	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
1	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
1	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
2	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
5	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
1	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
1	5069-FPD	5069 Compact I/O Field Potential Distributor Module
1	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
1	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state
		4S-102-OMWD_SDW_SCRUBBER-r001
1	1606-XLB90E	1606 XLB Power Supply 90W, 24VDC, 3.8A, screw in
1	5069-L320ER	CompactLogix 5380 Controller, 2MB, 16 I/Os, 40 nodes, Standard
1	5069-ECR	Includes (1) 5069-ECR: 5069 End cap
1	5069-RTB64-SCREW	Power terminal RTB kit for CompactLogix 5380 Controllers and 5069-AEN2TR. Contains both 4 and 6 pin Screw type RTB
2	5069-IA16	5069 Compact I/O 16 channels AC input modules, supporting both 120 & 240 VAC signals
5	5069-RTB18-SCREW	5069 Compact I/O 18 pins Screw type terminal block kit
1	5069-OA16	5069 Compact I/O 16 channels AC output module supporting both 120 & 240VAC output.
1	5069-FPD	5069 Compact I/O Field Potential Distributor Module

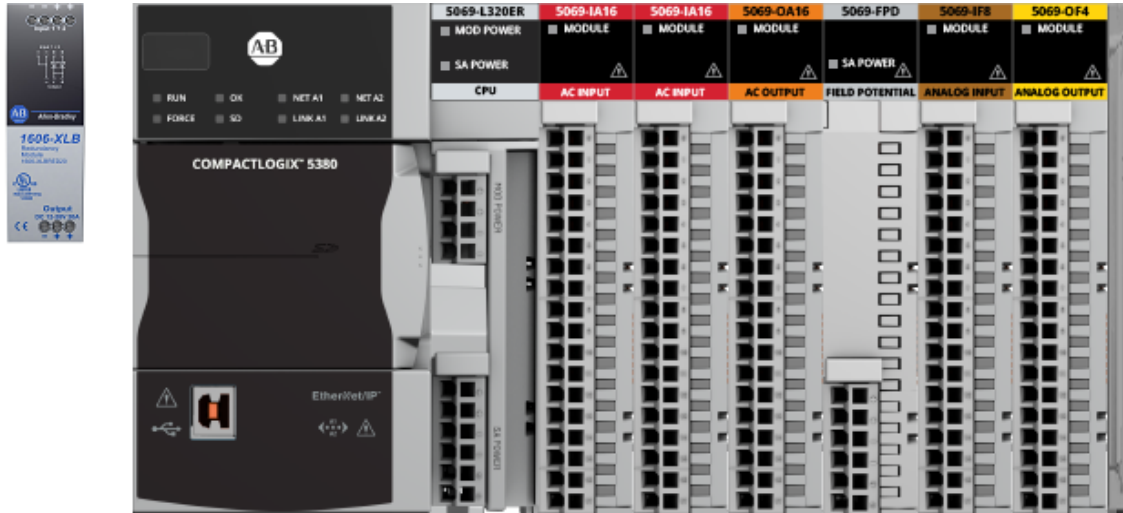
APPENDIX 17000 - B.2 TYPE4 CONVERSIONS

1	5069-RTB6-SCREW	5069 Compact I/O 6 pin Screw type RTB packed kit
1	5069-IF8	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module, 16 bit resolution, 1ms channel update rate, analog scaling
1	5069-OF4	5069 Compact I/O 4 Channel Voltage/Current Analog Output Module, 16 bit resolution, 1ms channel update rate, forcing, analog scaling, hold last state

3 Hardware Platforms

3.1 Platform '4S-101-OMWD_HW_SCRUBBER-r001'

3.1.1 Graphics:



3.1.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by New 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	12800 mW
Power Remaining:	77200 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

Backplane Power Information

5069-L320ER	
MOD Power Used:	850 mA
MOD Power Remaining:	9150 mA
SA Power Used:	4490 mA

APPENDIX 17000 - B.2 TYPE4 CONVERSIONS

SA Power Remaining:	5510 mA
5069-FPD	
SA Power Used:	250 mA
SA Power Remaining:	9750 mA

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
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Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	230.00 mm (9.06 inches)
Depth	137.00 mm (5.39 inches)

3.1.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IA16	
N/A	5069-RTB18-SCREW	
2	5069-IA16	
N/A	5069-RTB18-SCREW	
3	5069-OA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
4	5069-IF8	
N/A	5069-RTB18-SCREW	
5	5069-OF4	
N/A	5069-RTB18-SCREW	

3.1.3.1 Product Dimension

Units are in mm (Inches)

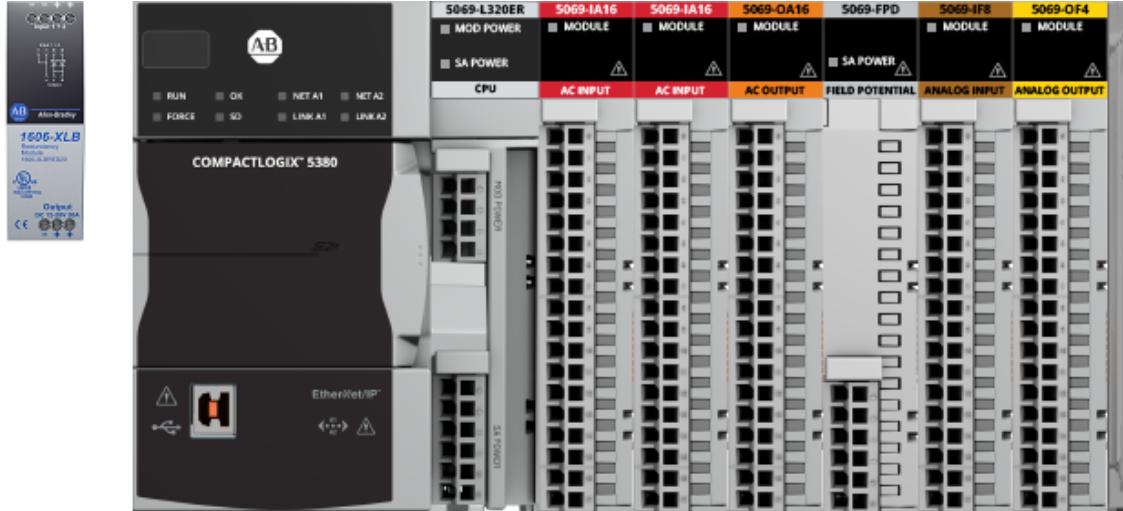
Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000 - B.2 TYPE4 CONVERSIONS

3	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

3.2 Platform '4S-102-OMWD_SDW_SCRUBBER-r001'

3.2.1 Graphics:



3.2.2 Performance Data:

Control Power Information

Power Info	
Control Power Status:	Satisfied by New 1606-XLB90E
Power Supply:	1606-XLB90E
Power Used:	12800 mW
Power Remaining:	77200 mW
Dimension Details (1606-XLB90E)	
Height	90.00 mm (3.54 inches)
Width	36.00 mm (1.42 inches)
Depth	91.00 mm (3.58 inches)

APPENDIX 17000 - B.2 TYPE4 CONVERSIONS

Backplane Power Information

5069-L320ER	
MOD Power Used:	850 mA
MOD Power Remaining:	9150 mA
SA Power Used:	4490 mA
SA Power Remaining:	5510 mA
5069-FPD	
SA Power Used:	250 mA
SA Power Remaining:	9750 mA

Field Power Information

Field Power Status:	Satisfied by Existing Field Power
---------------------	-----------------------------------

Dimension Details (5069 Chassis)

Height	144.57 mm (5.69 inches)
Width	230.00 mm (9.06 inches)
Depth	137.00 mm (5.39 inches)

3.2.3 Layout Information:

Slot #	Catalog #	Additional Information
N/A	1606-XLB90E	
0	5069-L320ER	not connected
		not connected
0.1	5069-ECR	not connected
		not connected
N/A	5069-RTB64-SCREW	
1	5069-IA16	
N/A	5069-RTB18-SCREW	
2	5069-IA16	
N/A	5069-RTB18-SCREW	
3	5069-OA16	
N/A	5069-RTB18-SCREW	
N/A	5069-FPD	not connected
N/A	5069-RTB6-SCREW	
4	5069-IF8	
N/A	5069-RTB18-SCREW	
5	5069-OF4	
N/A	5069-RTB18-SCREW	

APPENDIX 17000 - B.2 TYPE4 CONVERSIONS

3.2.3.1 Product Dimension Units are in mm (Inches)

Slot #	Catalog #	Height	Width	Depth
N/A	1606-XLB90E	90.00(3.54)	36.00(1.42)	91.00(3.58)
0	5069-L320ER	138.00(5.43)	98.00(3.86)	137.00(5.39)
1	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
2	5069-IA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
3	5069-OA16	144.57(5.69)	22.00(0.87)	105.42(4.15)
N/A	5069-FPD	144.57(5.69)	22.00(0.87)	105.42(4.15)
4	5069-IF8	144.57(5.69)	22.00(0.87)	105.42(4.15)
5	5069-OF4	144.57(5.69)	22.00(0.87)	105.42(4.15)

APPENDIX 17000-C OPERATOR INTERFACE UPGRADES

OPERATOR INTERFACE UPGRADES

	Function	ID	Existing OIT Type	OIT Upgrade Supplied by Contractor
4S-1	PS	D-002	Obsolete OIT Manufacturer	Remove and Refinish. Plug holes for the thru-the-door circuit breaker, (3) Selector Switches, OIT and any unused/abandoned conduit entrances
Connemara	PS	D-003	PanelView 600	Remove & Refinish Panel Front
Cielo	PS	D-004	PanelView 1000	Remove & Refinish Panel Front
Gano	OIT	D-007	PanelView Plus 600	Remove & Refinish Panel Front
Miller	Reservoir/ Hydro	D-010	PanelView Plus 600	Remove & Refinish Panel Front
Sante Fe Valley	Reservoir/ PS	D-013	PanelView 600	Remove & Refinish Panel Front
Unit Z	PS	D-015	PanelView Plus 1000	Remove & Refinish Panel Front
Village Park	PS	D-017	PanelView Plus 1000	Remove & Refinish Panel Front
Del Dios	SPS	4S-111	PanelView Plus 1000	PanelView Plus 7 Standard 10 Terminal
Fire Station	SPS	4S-113	PanelView Plus 1000	PanelView Plus 7 Standard 10 Terminal
Midpoint	SPS	4S-114	PanelView Plus 1000	PanelView Plus 7 Standard 10 Terminal
Neighborhood #3	SPS	4S-115	PanelView Plus 1000	PanelView Plus 7 Standard 10 Terminal
McCollom ERT	ERT Control	M-201,202,203	Red Lion G310	Upgrade per Canyon Hydro Sole Source Scope

	Function	ID	Existing OIT Type	OIT Upgrade Supplied by Contractor
McCullom WTP	ICP-3	M-205	Phoenix Contact D23U/A20/I22/R12/M50/ OS31/ D00/T00/EP0/EP0/S00/ N00	Upgrade to latest Hardware and Ignition Compatible. <u>DISTRICT SCOPE</u>
HW Scrubber	Headwork s Odor Control	4S-101	PanelView 600	Remove & Refinish Panel Front
SDW Scrubber	Solids Process Odor Control	4S-102	PanelView 600	Remove & Refinish Panel Front
Filters	Filters Control	4S-116	DTAM Micro	Remove & Refinish Panel Front

APPENDIX 17000-D 1746 SLC TO 5069 COMPACTLOGIX IO CONVERSION

1746 SLC TO 5069 COMPACTLOGIX IO CONVERSION

Existing 1746 Module	Supplied by Contractor			
	5069 IO Conversion	5069 IO Terminal Base	Interposing Relay	Entrelec Harness Type 2 (PLC 2A and 2B Only 4SWRF)
1746-IN16	5069-IB16	5069-RTB18- SCREW	N/A	N/A
1746-IA16	5069-IA16	5069-RTB18- SCREW	N/A	LAF300/UNI/OMN20/418/UL
1746-OW16	5069-OB16	5069-RTB18- SCREW	700-HLT1U24	N/A
1746-NI4	5069-IY4	5069-RTB18- SCREW	N/A	N/A
1746-NI8	5069-IF8	5069-RTB18- SCREW	N/A	LAF300/UNI/SUBD25/422/UL
1746-NO8I	5069-OF8	5069-RTB18- SCREW	N/A	N/A
1746-OX8	5069-OB16	5069-RTB18- SCREW	700-HLT1U24	N/A
1746-IB16	5069-IB16	5069-RTB18- SCREW	N/A	N/A
1746-NO4I	5069-OF4	5069-RTB18- SCREW	N/A	LAF300/UNI/SUBD9/420/UL
1746sc- INI4	5069-IF8	5069-RTB18- SCREW	N/A	N/A
1746-OA16	5069-OA16	5069-RTB18- SCREW	N/A	LAF300/UNI/OMN20/418/UL
1746-IB16	5069-IB16	5069-RTB18- SCREW	N/A	N/A
1746-NR4	5069-IY4	5069-RTB18- SCREW	N/A	N/A

APPENDIX 17000-E 1746 SLC TO 1756 CONTROLLOGIX IO CONVERSION

1746 SLC TO 1756 CONTROLLOGIX IO CONVERSION

Existing 1746 Module	Supplied by Contractor			
	1756 IO Conversion	1756 IO Terminal Base	Interposing Relay	Entrelec Harness Type (if needed)
1746-IN16	1756-IB16	1756-TBNH	N/A	N/A
1746-IA16	1756-IA16	1756-TBNH	N/A	N/A
1746-NI4	1756-IF8I	1756-TBCH	N/A	N/A
1746-NI8	1756-IF8I	1756-TBCH	N/A	N/A
1746-OX8	1756-OX8I	1756-TBCH	N/A	N/A
1746-IB16	1756-IB16	1756-TBNH	N/A	N/A
1746-OB16	1756-OB16E	1756-TBNH	N/A	N/A
1746-NO4I	1756-OF8I	1756-TBCH	N/A	N/A

APPENDIX 17000-F 1766 MICROLOGIX TO 5069 COMPACTLOGIX IO CONVERSION

1766 MICROLOGIX TO 5069 COMPACTLOGIX IO CONVERSION

Existing 1766 Module	Supplied by Contractor		
	5069 IO Conversion	5069 IO Terminal Base	Interposing Relay
1766 PLC AC Inputs	5069-IA16	5069-RTB18- SCREW	N/A
1766 PLC AC Outputs	5069-OA16	5069-RTB18- SCREW	N/A
1762-IF4	1756-IF8I	5069-RTB18- SCREW	N/A
1762-OF4	5069-OF4	5069-RTB18- SCREW	N/A

APPENDIX 17000-G IO CONVERSION SPECIAL CONDITIONS

IO CONVERSION SPECIAL CONDITIONS

Appendix G.1 – IO Conversion Mitigation and Special Conditions – 5069 CompactLogix IO

Appendix G.2 – IO Conversion Mitigation Special Conditions – 1756 Control IO

Appendix G.1 – IO Conversion Mitigation and Special Conditions – 5069 CompactLogix IO

	IO Conversion Exceptions			
Legacy SLC IO	5069 IO	Description	Conversion Exception	Mitigation
1746-IN16	5069-IB16	Digital Input Module	Previous 1746-IN16 support both 24VDC and 24VAC. 5069 and 1756 only support 24VDC	All OMWD systems only contain 24VDC Input. No VAC requirement
1746-IF4 1746-IF8	5069-IF8	Analog Input	Previous 1746-IF8 only support differential input (no single-ended inputs)	Wire all analog inputs as differential inputs. Connect commons where necessary
1746-OX8 1746-OW16	5069-OB16	Digital Output Module	5069 does not support isolated dry contact outputs.	Install 700-HLT1U24 interposing relays for 5069-OB16

Appendix G.2 – IO Conversion Mitigation Special Conditions – 1756 Control IO

	IO Conversion Exceptions			
Legacy SLC IO	1756 IO	Description	Conversion Exception	Mitigation
1746-IN16	1756-IB16	Digital Input Module	Previous 1746-IN16 support both 24VDC and 24VAC. 5069 and 1756 only support 24VDC	All OMWD systems only contain 24VDC Input. No VAC requirement
1746-IF4 1746-IF8	N/A	Analog Input	Previous 1746-IF8 only support differential input (no single-ended inputs)	Wire all analog inputs as differential inputs. Connect commons where necessary
1746-OX8 1746-OW16	1756-OX8I	Digital Output Module	5069 does not support isolated dry contact outputs.	Install 700-HLT1U24 interposing relays for 5069-OB16

APPENDIX 17000-H LOCAL AND REMOTE IO UPGRADES

LOCAL AND REMOTE IO UPGRADES

Appendix H.1 – 1746 to 5069 Local and Remote IO Adapter Conversions

Appendix H.2 – 1746 to 5069 Local and Remote IO Adapter Conversions

Appendix H.1 1746 to 5069 Local and Remote IO Adapter Conversions

	Existing SLC 1746	New 5069 PLC/Module Supplied by Contractor	Location
1746 Local IO Extensions	Local IO Rack Extensions Exist on PLC 2A & 2B at 4SWRF. Qty 3 -1746-A10 Chassis Connected via Ribbon Cable	5069-L340ER (31 Local IO Modules Max)	4S-116 PLC 2A (WRF) 4S-117 PLC 2B (WRF)
1747-SN	SLC Remote IO Scanner Module	5069-L340ER (2 nd Ethernet Port)	D-010 Miller Res
1747-ASB	SLC Remote IO Adapter Module	5069-AENTR	D-010 Miller Res

Appendix H.2 1746 to 1756 Local and Remote IO Adapter Conversions

	Existing SLC 1746 Legacy	New 5069 PLC/Module Supplied by Contractor	Location
1746 PLC and Local IO Extensions	SLC 1747-L553 /w Local IO Rack Extensions Exist on PLC ICP2 and ICP3 at DCMWTP. Qty 2 -1746-A13 Chassis (Ea.) Connected via Ribbon Cable	1756-EN2T With Fiber Ring Switch (NTron or equivalent)	M-ICP2 PLC 2A (DCMWTP) M-ICP3 PLC 2B (DCMWTP)
1747-SN	SLC Remote IO Scanner Module	1756-EN2T	M-203 ERT (DCMWTP)
1747-ASB	SLC Remote IO Adapter Module	1756-EN2T	M-201 ERT RIO #1 (DCMWTP) M-202 ERT RIO #2 (DCMWTP)

APPENDIX 17000-I PLC POWER SYSTEM UPGRADES

PLC POWER SYSTEM UPGRADES

Appendix I.1 – CompactLogix 5069 Power System Upgrades

Appendix I.2 – ControlLogix 1756 Power System Upgrades

Appendix I.1 - CompactLogix 5069 Power System Upgrades

	Description	Existing Power Source	Upgraded Power Source Supplied By Contractor
PLC Chassis Power To Module (MOD) Power Conversions	<p>System-side power that is required to operate to 5069 IO system and controllers is provided through the MOD power RTB and passed across the MOD power bus.</p>	<p>1766 MicroLogix 120VAC Source</p> <p>1747-P2, P3 and P4 (24VDC and 120VAC) SLC Chassis Power Supply</p>	<p>For Existing AC Powered PLC's - New DIN RAIL Mounted Allen-Bradley 1606-XLB90E Power Supply to Provide MOD Power for the desired 5069 DIN rail mounted controller and IO system.</p> <p>For Existing DC Powered PLC's – Re-use the existing DC Power Source as MOD Power Source Provide MOD Power for the desired 5069 DIN rail mounted controller and IO system.</p>
IO Loop Power To CompactLogix Sensor Actuator (SA) Power Conversions	<p>Field-side power that is used to power field-side devices, SA power is provided through the SA power RTB and passed across the SA power bus.</p> <p>The first component in the system, this is the CompactLogix 5069 PLC for the Adapter (5069-AENTR) establishes a SA Power Bus (i.e. 24VDC or 120VAC).</p> <p>A DIN Rail Mounted CompactLogix IO system can have multiple SA power buses by using the 5069-FPD Field Potential Distributor to establish a new SA power bus.</p>	<p>Various 24VDC Power Supplies, Wiring and Fusing</p>	<p>1) Re-use IO Loop Power Source where possible</p> <p>Else,</p> <p>2) Fusing, terminal blocks and wiring for SA Source to be upsized and provided as needed by Contractor for total 24VDC and/or 120VAC SA Bus Load.</p>

	Description	Existing Power Source	Upgraded Power Source Supplied By Contractor
	SA power buses are isolated from each other.		
IO Loop Power To CompactLogix Local Actuator (LA) Power Conversions	Field-side power that some Compact 5000 I/O modules use instead of SA power. Modules that use LA power do not use SA power. They only pass SA power to the next to the next I/O module in the system. You must install modules that use LA Power on an SA Power bus with the same module type. In the case of TYPE 1 conversion, the 5069-OB16 specifically uses LA Power	Various 24VDC Power Supplies, Wiring and Fusing	1) Re-use IO Loop Power Source where possible Else, 2) Fusing, terminal blocks and wiring for LA Source to be upsized and provided as needed by Contractor for 24VDC LA Bus Load.

Appendix I.2 ControlLogix 1756 Power System Upgrades

	Existing Power Source	Upgraded Power Source Supplied By Contractor
Chassis Power	1747-P2 and P4 (120VAC) SLC Chassis Power Supply	1756-PA75 (120VAC 75W Power Supply)
Chassis Power	1747-P3 (24VDC) SLC Chassis Power Supply	1756-PB75 (120VAC 75W Power Supply)
IO Loop Power	Various 24VDC Power Supplies, Wiring and Fusing	Various 24VDC Power Supplies, Wiring and Fusing to be Re-Used

APPENDIX 17000-J ETHERNET REMOTE IO UPGRADES

ETHERNET REMOTE IO UPGRADES

Existing Control Panel Locations	Qty	Supplied By Contractor		
		New RIO Switch	From Source	To Destination
D-010 Miller	1	Moxa EDS-205 5 Port Unmanaged	CompactLogix L320ER Port 2	5069-AENTR Remote IO Adapter Qty (1)
M-201,202, 203 ERT	1	Moxa EDS-205 5 Port Unmanaged	ControlLogix 1756-EN2T Remote IO Qty (1)	1756-EN2T Remote IO Adapters Qty (2)

APPENDIX 17000-K FIELD SURVEY DATA REPORT AND IO LIST

FIELD SURVEY DATA REPORT AND IO LIST

SEE SEPARATE ATTACHMENT TO BID DOCUMENTS

APPENDIX 17000-L PLC PROGRAMMING MIGRATION

PLC PROGRAMMING MIGRATION

1.0 SLC TO CLX PLC SOFTWARE MIGRATION

1.1 BACKGROUND

The following section provides typical examples of the SLC to CLX PLC software conversion for the OMWD PLC Upgrade Project. It is intended to describe the general software conversion process and approach that are detailed as Technical Guidance and Specifications to the integrator for the OMWD PLC upgrade design package. Smooth and planned conversion of the existing SLC programs to the new Rockwell Automation Logix environment will be essential to ensure successful upgrade of OMWD facilities. Wherever possible, automatic conversion tools shall be used by the integrator, to prevent mis-keys associated with manual conversion. While some manual conversion and programming will be required by the integrator, this should be effort minimized by use of Rockwell Automation migration tools, developing custom scripting tools and following Rockwell Automation's recommended conversion process and procedures.

Rockwell Automation has developed a "Migration Tool" for assisting the conversion of legacy PLC systems, such as SLC 5/05 to CompactLogix. The legacy SLC 5/05 programs were written using RSLogix 500 and only had the capability of code implemented with Ladder Logic. These legacy PLC's also ran using a single thread with the order of operations being the order the programs were called, then left to right and top to bottom execution.

The new development platform, Studio 5000 is a rebranded, more powerful version of RSLogix 5000. Studio 5000 supports multiple threads that can be periodically called by a task, event based, or run as a continuous task. Studio 5000 is compliant with IEC 61131-3 programming standards and supports Ladder Diagram, Instruction List, Function Block Diagram, Sequential Function Chart, and Structured Text.

Since the "Migration Tool" does not fully support the SLC to Logix program without some Conversion Errors to be expected, the following sections describe areas of special consideration for the integrator. This guidance is intended provide standardization and assist in the programing technique that is ultimately applied.

1.1.1 PLC – Converting an RSS file to an ACD File

Software conversion is best done by upgrading the existing RSLogix 500 installed software to version 12, utilizing Rockwell Automation Source program files 12.00.01-RSLogix500-DVD (obtainable from the Rockwell Automation Website).

Once the migration system has been upgraded to V12, V12 can be launched and existing **SLC_PLC_FILES.RSS** files opened, including the following steps:

- Make sure to retain an unaltered copy of all the existing SLC programs in a separate location for future referencing.
- After the SLC_PLC_FILES.RSS file has launched, perform a File, Save As (Figure 1)
- There are several file extensions that can be selected. To start the migration processes from a FILE.RSS type to a FILE.ACD type - select the "Logix Designer Files (*.ACD)" option in the below window.
- The other options that should be selected prior to finishing the "Save As" steps are to select the "Create Alias Tag in Logix for existing SLC Symbols" and "Export file types: Logix". If the option to "Create Alias Tag in Logix for existing SLC Symbols" is not selected the symbol names will be treated as part of the bit/word description.

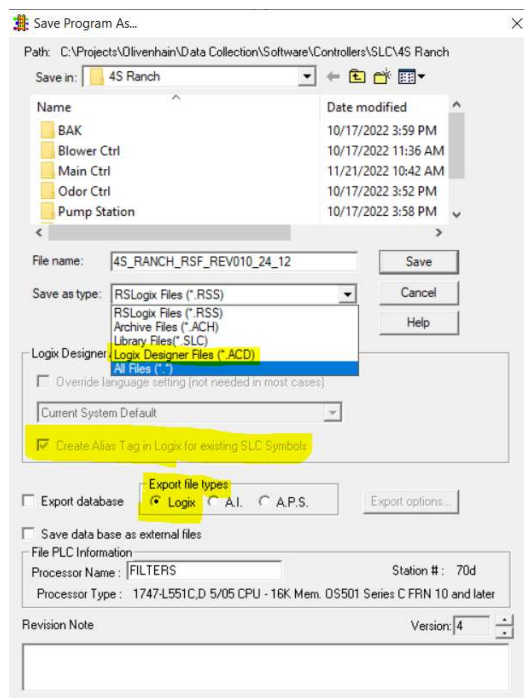


Figure 1 - Save As - Converting to an ACD file type

An example of how the output differs is shown below in Figure 2. In the original code the Symbol will show up with a bright green highlighted background. If the “*Create Alias Tag in Logix for existing SLC Symbols*” is not selected the converted output will appear as the middle example in Figure 2. The last example in Figure 2 shows the properly converted output, with the symbol name bold and in all capitals below the description and above the PLC address.

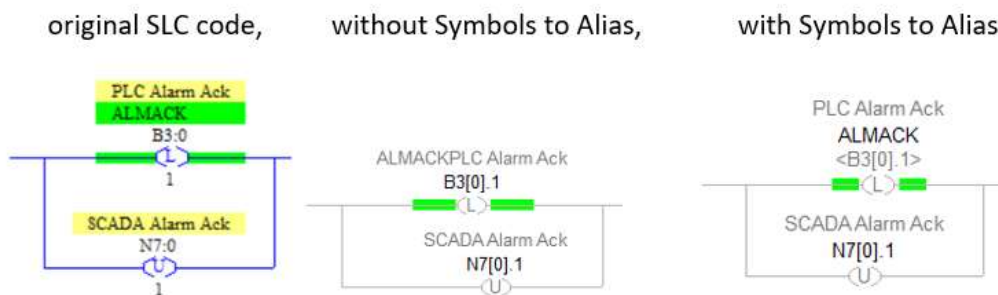


Figure 2 - Symbol Selection – Handling Symbols in the Program

1.2 STUDIO 5000

After Studio 5000 is launched name the project file and saved it, then the Studio 5000 project will be editable. Studio 5000 will rename the individual program names as show below in Figure 3. The migration tool renames the files starting with an Underscore. **Studio 5000 does not allow the program name to start with a number or a special character.** In order to maintain the same look in the converted program, the program files must be renamed. One method to achieve the desired result is to start each file with a “Letter Code followed by the number”. The number code chosen can be the same number as the program file number in the original SLC program. The new files can be renamed using the “Properties” option. As an example, this has been performed below in Figure 4. Studio 5000 will then automatically resort the ladder files after they are renamed.

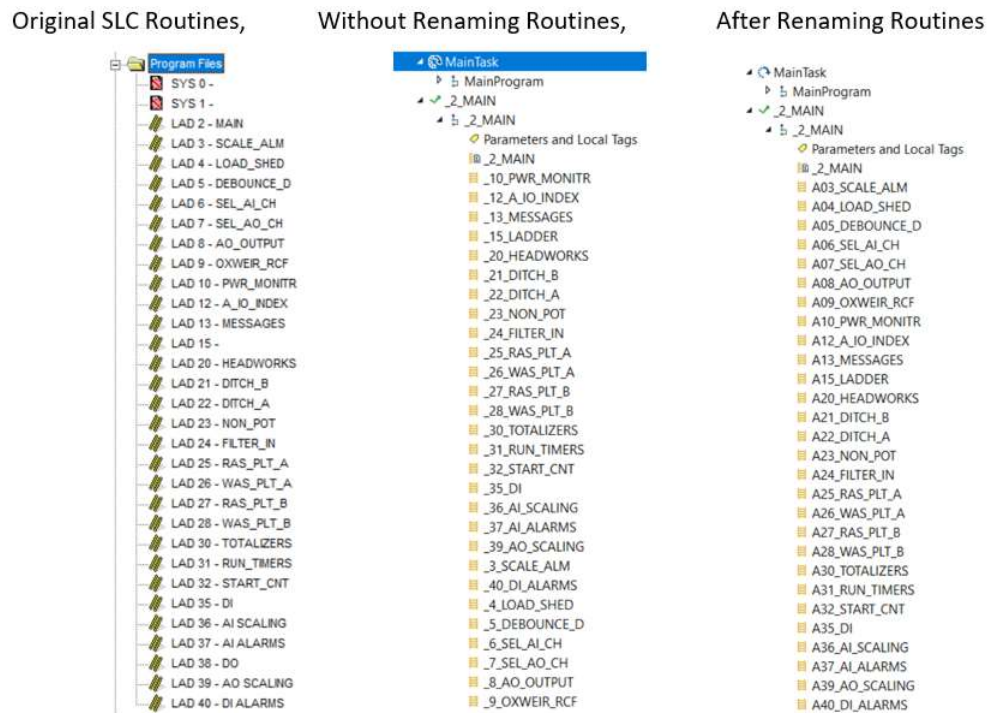


Figure 3 - Renaming Routines

1.2.1 Errors and Warning

After Studio 5000 migrates the program, many errors and warnings will be generated. This section of the PRD explains the common errors found during the conversion. The “Errors” icon is located in the lower left portion of the Studio 5000 interface. After clicking and launching the errors window, errors will be listed such as those shown in Figure 4 below.

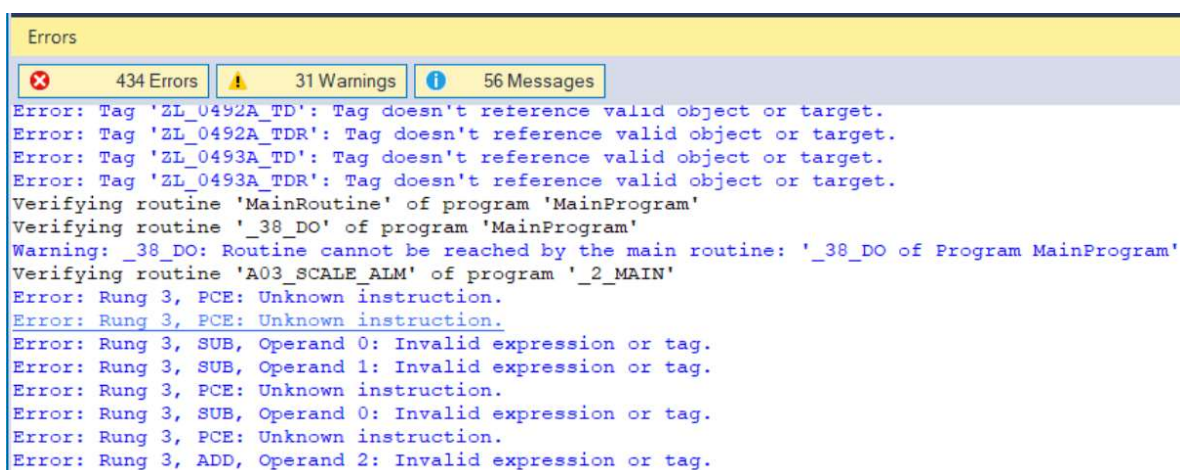


Figure 4 - Typical errors after conversion

The errors can be categorized into two general groups, issues with tags and issues with instructions. Many of the issues with tags will be resolved once the instructions are corrected, with the associated tag updated. NOTE, the PCE (Program Conversion Error) is a Flag used by the conversion utility for marking conversion problems that need

attention. Although the PCE is not technically an error, it will be counted in the overall error total. It is also helpful to be able to search and find a specific error type. Once in the error dialog window, word search can be typed in the upper right portion of this window, and it will filter for errors that contain the search text that is sought.

Known PCEs exist for the following instructions:

- COPY (COP),
- PID control (PID),
- Messages (MSG),
- Timers (TMR), and
- Block Transfer Reads/Writes (BTR/BTW).

Example of the above applicable to this design project will be discussed below.

1.2.1.1 COPY Instructions

The below Figure 5 shows a COP instruction as it originally appeared in the SLC controller and how the error shows up in Studio 5000.

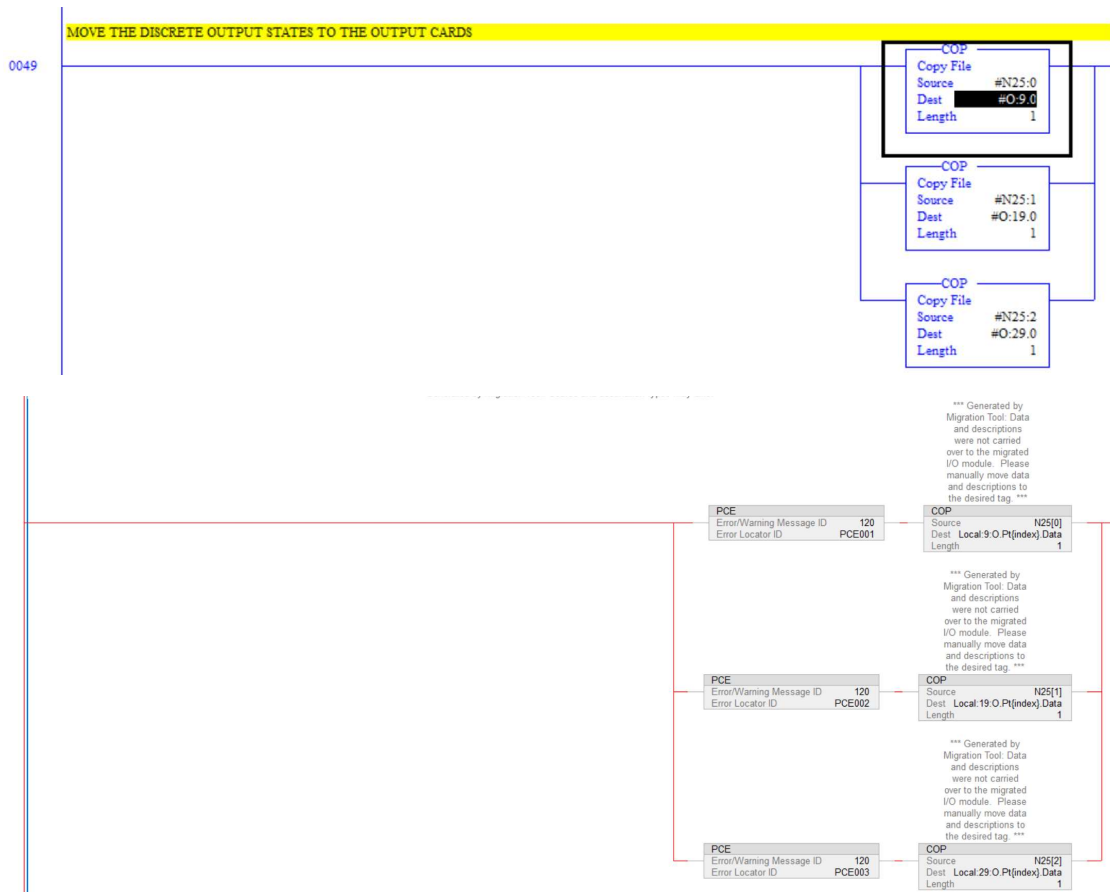


Figure 5 - Copy Instruction Error

The migration program converted the N25:0 file to N25[0] without an issue, however the IO, Local:9:O.Pt{index}.Data was converted to a bit address instead of a word address. This can be corrected by

updating the Local IO tag in the instruction and deleting the PCE flag. The updated COP instruction is shown below in Figure 6.



Figure 6 - Resolved COP Instruction

Also, note the rung comment from the original SLC program was copied and inserted in the above figure for completeness. In the above example, the starting error count was 434 errors. After resolving the issues with the three copy instructions and deleting the PCE flags in front of each copy instruction, the error count dropped down to 428. This illustrates the migration software counts the PCE flags as errors; therefore, the initial error count will be about twice as large as the potential conversion errors that exist.

1.2.1.2 MSG Instructions

Figure 7 below shows a MSG instruction as it originally appeared in the SLC controller and how the error shows up in Studio 5000.



Figure 7 - MSG Instruction Error

In the SLC program instruction above, the message is reading data from another SLC controller (Peer-To-Peer & 500CPU) over an Ethernet network (Local). The Control Block handles the message instruction & control of the message. In the SLC program, the MSG “setup screen” will provide details regarding which Ethernet IP device this message block is communicating with. The “Setup Screen” details are shown below in Figure 8.

To properly resolve this error, a message will need to be setup that can read data out of the other controller that is linked by an Ethernet connection to the IP of the other controller. For security reasons, the IP address below has been masked. The message will also need to get the data from the migrated equivalent of N29:0 in the other controller (N29[0]). Once the data is read, it is to be placed in the N16:0 migration equivalent tag(s) (N16[0]).

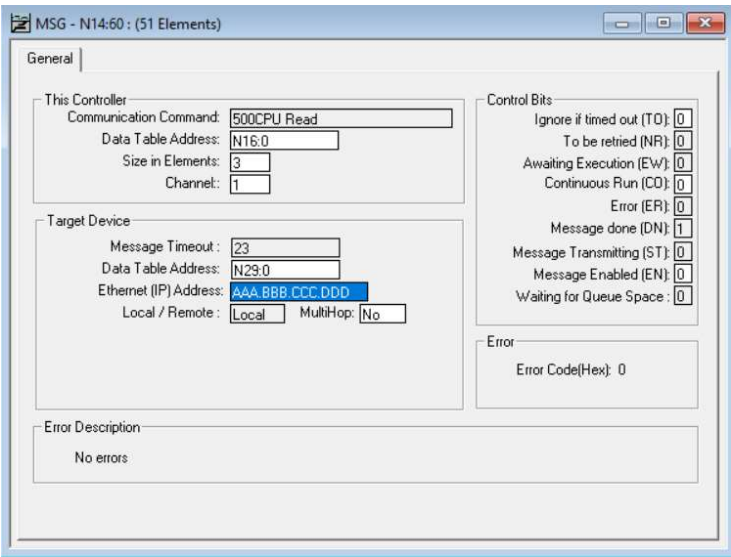


Figure 8 - SLC Message Setup Details

When examining the Studio 500 message configuration there are three tabs under this message instruction that need to be inspected. The first is the “Configuration” tab shown in Figure 9 below.

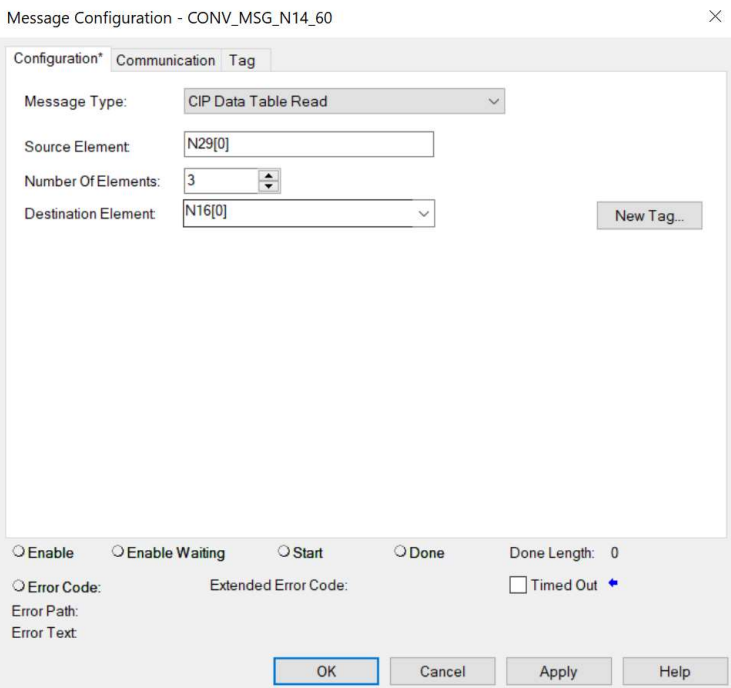


Figure 9 - MSG Configuration Tab

The message was properly translated into an SLC Read type message, but the source element N29:0 will need to be translated to N29[0]. For verification of this address the other controller will need to be inspected after it is converted, but will likely be converted to N29[0] as shown above. The remaining setup items for this tab were correctly translated.

The next item that needs to be verified is the message communication tab. The message communication tab is shown below in Figure 10.

The screenshot shows the 'Message Configuration - CONV_MSG_N14_60' dialog box with the 'Communication' tab selected. The 'Path' field is empty, and the 'Broadcast' dropdown is set to 'Broadcast'. Under 'Communication Method', 'CIP' is selected, and 'Channel' is set to 'A'. 'Destination Link' is set to 0. 'CIP With Source ID' is also selected, and 'Source Link' is set to 0. 'Destination Node' is set to 0 (Octal). There are checkboxes for 'Connected', 'Cache Connections', and 'Large Connection'. At the bottom, there are radio buttons for 'Enable', 'Enable Waiting', 'Start', and 'Done', with 'Done Length' set to 0. There are also checkboxes for 'Error Code', 'Extended Error Code', and 'Timed Out'. The 'Error Path' and 'Error Text' fields are empty. The 'OK' button is highlighted.

Figure 10 - MSG Communication Tab

As seen above, the migration tool will determine the proper path to insert above. In order to properly map this message, the communication network and associated driver (AB-ETH-1) will need to be both up and running. The other controller that is to be communicated with will need to be added to the “Controller Organizer” of this program.

As an example, PLC_2B has been mapped into the “Controller Organizer” window to illustrate the steps required to resolve this message instruction. See Figure 11 below. With the corresponding controller mapped into the “Controller Organizer” window the message can now have the path mapped.

Per Figure 12 below, the Path, PLC_2B is shown under the A1, Ethernet area. This can be selected (or whichever controller is desired, can be selected). The path will then show as below in Figure 13.



Figure 11 - PLC_2B mapped

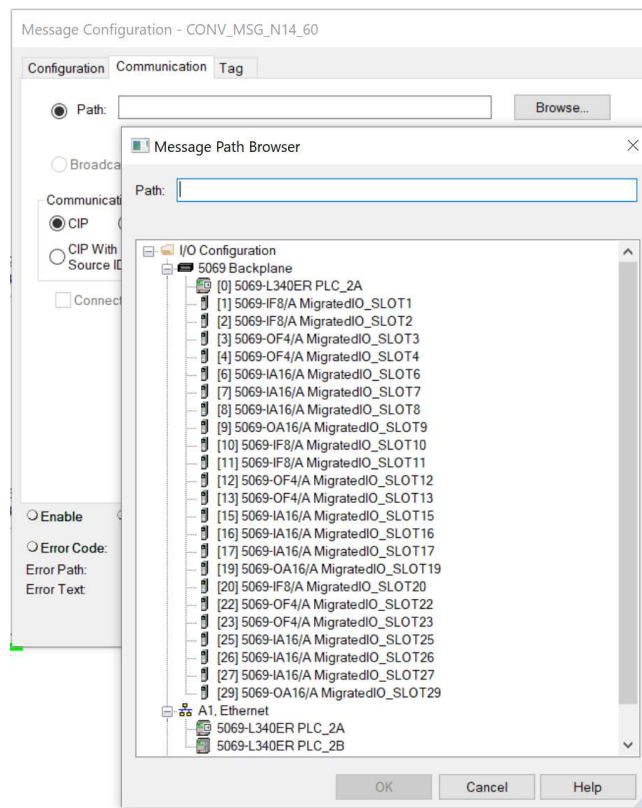


Figure 12 - Setting the MSG Path

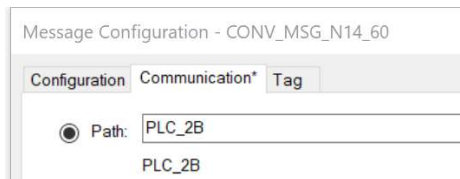


Figure 13 - Controller Path Selected

The final item to be configured to enable the message to properly execute is under the MSG tag tab. This is shown in Figure 14 below. For the purposes of illustration, the data being read was investigated for this message block with the proper description added.

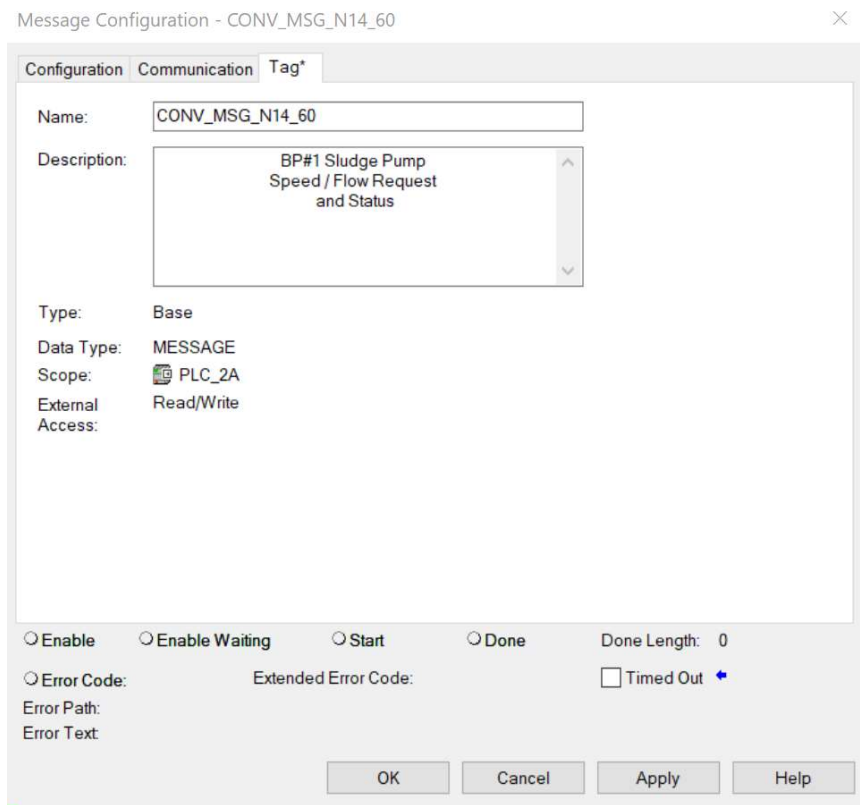


Figure 14 - MSG Tag Tab

The “CONV_MSG_N14_60” message control register was created by the migration software. When viewing the Controller tags with this message block it shows the “CONV_MSG_N14_60” as Data Type “Message” which is what is required for message control. See Figure 15 below.

_2_MAIN - A13_MESSAGES* Controller Tags - PLC_2A(controller) x					
Scope: PLC_2A		Show: All Tags		conv.	
Name	Alias For	Base Tag	Data Type	Description	
▶ CONV_MSG_N14_60			MESSAGE	BP#1 Sludge Pump Speed / Flow Request and Status	

Figure 15 - MSG Control - "Message" Type

The final illustration shows the converted message in Studio 5000.

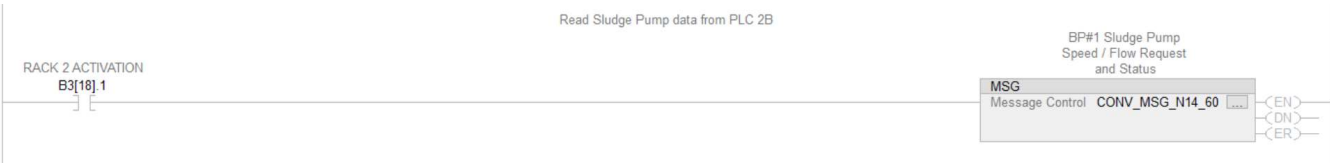


Figure 16 - Resolved MSG Instruction

1.2.1.3 TMR Instructions

Figure 17 below shows a TON (timer) instruction as it originally appeared in the SLC controller and how it converts into Studio 5000.



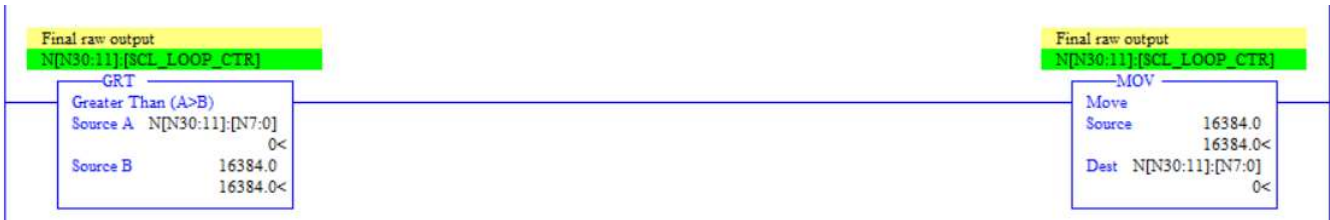
Figure 17 - Timer Instruction Translation

The migration information provided by Rockwell Automation suggests checking all of the timers in the converted program because the time base as changed. The SLC controllers smallest time base is 10ms. The CompactLogix and ControlLogix smallest time base is 1ms. Rockwell Automation suggests reviewing each timer to ensure the correct preset and time base conversion. By default, the newer controllers will choose the smallest time base unit of 1ms.

In the example above, the timer was properly converted from 50*0.01s to 500*0.001s for the Preset. Note, the accumulator was also updated to reflect the time base change.

1.2.1.4 Indirect Addressing

Figure 18 below illustrates use of “Indirect Addressing” as it originally appeared in the SLC controller and how the error shows up in Studio 5000.



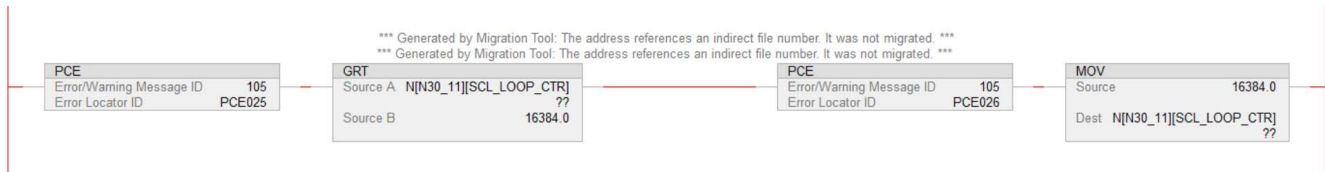


Figure 18 - Indirect Addressing Error

In order to resolve the errors in the above the looping constructs, this section of code would need to be rewritten. An indirect address into a file name is not allowed. Only arrays with multiple members can be indirectly addressed to access a particular element in the array.

In the above example N[N30:11] translates to N111 in the SLC system, where N30:11 has a value of 111 at the N30:11 register, see Figure 20 below. All of the I, O, N, F files in the SLC system were arrays with multiple elements per file. However, when the migration software translated the file names, the indirect addressing of the file name showed up as N[N30_11] which is an invalid file name.

Offset	0	1	2	3	4	5	6
N30:0	0	0	0	0	0	0	0
N30:10	110	111	112	113	114	115	116
N30:20	0	0	0	0	0	0	0
N30:30	0	0	0	0	0	0	0
N30:40	0	0	0	0	0	0	0
N30:50	0	0	0	0	0	0	0
N30:60	10	0	0	0	0	0	0
N30:70	0	0	0	0	0	0	0

N30:11 Radix: Decimal

Figure 19 - File Name Indirect Addressing

In each case where two indirect addresses are being used to access multiple files and various registers within each file, a three-dimensional array could be constructed to hold the parameters of multiple files. It is highly recommended to use custom scripting of the database export file to automatically populate the new array with the values that existed previously. It is further recommended that all of these analog values be verified and validate during the Customer Acceptance Test prior to installation by simulating the input signal and verifying the scaling and alarming are correctly output to the User Interface.

Then the looping construct could increment each array index as required to perform the required calculations. If this were to be written in Structured Text (ST) it may look something the code below.

```

for Index1 := 1 to RackNum do           // Number of Racks to loop through
  for Index2 := 1 to SlotNum do          // Number of Slots to test for analog cards
    for Index3 := 1 to AnalogCh do       // Number of Analog Channel to loop through and configure
      Perform scaling, alarming or any required logic on the new Array.
    end_for;
  end_for;
end_for;

```

Figure 20 – Sample Looping Construct for Array Index

Index1, Index2, Index3 are the pointers into the array. As mentioned above the new array would have the existing scaling, alarming, data etc. that was populated using a script that examines the database export of the SLC program and populates the values accordingly.

1.2.1.5 Invalid Symbol Addresses

During the error investigation of the migration software, it was discovered in the PLC_2A program that certain Symbols were referenced to file names that did not exist. This was captured by investigating errors that were produced during the software migration conversion. For example, tag LAHH_0143B_TD is Aliased to N22[3] in the Studio 5000 controller tags. Below are some screen captures that identify this problem.

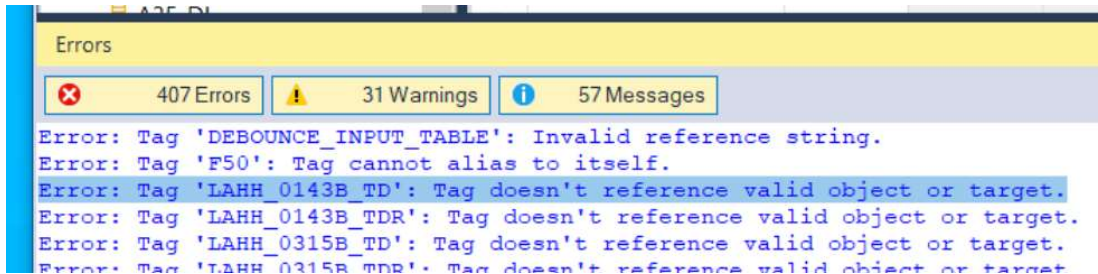


Figure 21 - Symbol Tag Errors

Controller Tags - PLC_2A(controller)					
Scope: PLC_2A		Show: All Tags			
	Name	Alias For	Base Tag	Data Type	Description
✖	LAHH_0143B_TD	N22[3]			
✖	LAHH_0143B_TDR	N23[3]			

Figure 22 - Controller Tag Error

In the above figure the symbol tag from the SLC is “LAHH_0143B_TD” is illustrated. When viewing the SLC Addresses and Symbol Editor, the following will be seen.

Address/Symbol Editor			
3540 DB Entries			
Search Field: Address			
Search For: LAHH_0143B_TD			
Address	Symbol	Scope	Description
N24:0/3	LAHH_0143B_FL	Global	Filtered Latch for Debounce Filtering (internal)
N20:0/3	LAHH_0143B_IB	Global	Unfiltered - GRIT SUMP PUMP HI-HI LEVEL ALARM
N22:3	LAHH_0143B_TD	Global	Time Delay Setpoint for Debounce Filtering
N23:3	LAHH_0143B_TDR	Global	Time Delay Reference for Debounce Filtering
N21:8/5	LAHH_0223B_FIB	Global	PLANT A RECYCLE PUMP 1 - P223
I:25/0	LAHH_0315B_DV	Global	Device - SCUM PIT HIGH LEVEL ALARM
N21:6/0	LAHH_0315B_FIB	Global	Filtered - SCUM PIT HIGH LEVEL ALARM
N24:6/0	LAHH_0315B_FT	Global	Filtered Latch for Debounce Filtering (internal)

Figure 23 - Addresses / Symbol Editor

It should be noted that the symbol “LAHH_0143B_TD” is referenced to file N23, word three N23:3. However, when reviewing the “Data Files” folder in the SLC controller project, N23 does not exist. Instead, there is a file named F23 as is shown below.

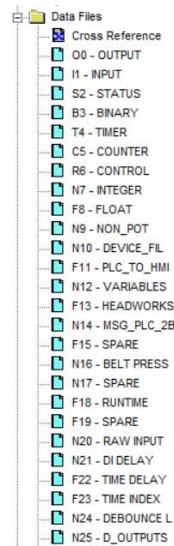


Figure 24 - Symbol Name Tied to Nonexistent File

Since there is only one file number allowed per file type in the SLC controller, the F22 & F23 files are valid files, where the N22 & N23 files do not exist and are invalid. All the converted symbol tags that reference invalid file names can be deleted.

1.2.1.6 Control Configuration and Status

Another area of the converted program that will need attention is with regard to System Status bits. The RSLogix500 programming space allows access to a System File, S2, that gives various information about process scan times, processor mode, time and date, math function scan times, math faults, first scan, etc.

In the Studio 5000 arena, there is no longer an S2 file, but rather an area called “Configuration and Status”. For example, Figure 25 below shows the original code for using the “First Scan” bit to unlatch the Battery Load Test bit. The code slice below this shows how the migration tool translated the “FirstPass” symbol, which does not yield the desired result.

To obtain the desired result, the last rung shows the correct substitution for the System:FirstScan bit.

All internally used “Status” information will need to be verified in the converted code.

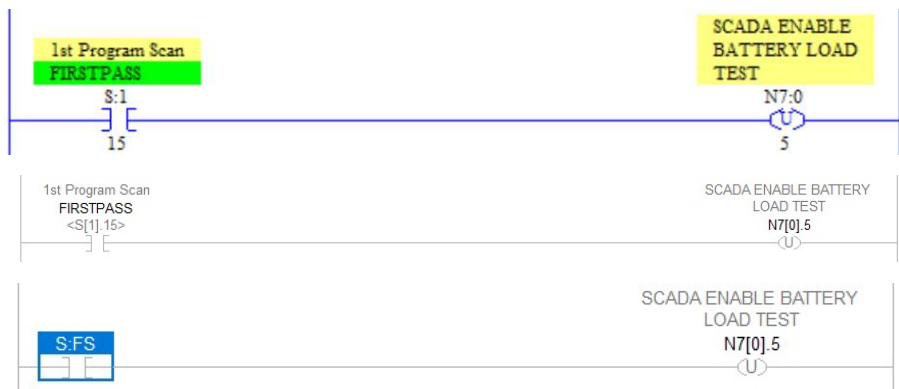


Figure 25 – Status Bit Conversion

1.2.1.7 PID Instructions

The PID control instruction has been improved and enhanced in the Studio 5000 environment. The new PID instruction has many additional parameters that do not translate from an older controller, because they did not exist. In the original SLC controller environment the PID instruction appeared as the following.

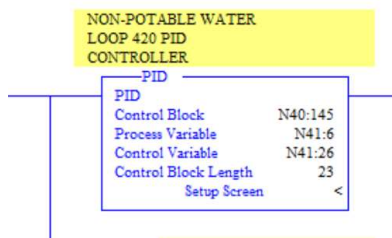


Figure 26 – PID Control Instruction Conversion

The options under the “Setup Screen” are shown below.

Figure 27 – PID Instruction Setup

The terminology such as Control Variable (CV), Process Variable (PV), Controller Gain (Kc, now Kp), Integral Gain, Reset Ti gain (Ti, now Ki), Setpoints (SP) remain generally the same, as the overall control scheme is the same. Some of the differences are bulleted as follows:

- Tieback – Option can be used to bypass the controller output.
- Inhold bit – Hold the last value from the analog input module for bumpless startup purposes.
- The “PID Setup” registers are grouped as part of a “Structure” versus file registers.
- The updated PID can provide feed forward control.
- Various other alarming, flags, scaling, and previous values. A few examples are given:
 - PV alarm high or low
 - Error within deadband
 - Percent scaling constant
 - Previous SP value

When viewing a PID instruction in Studio 5000 software the instruction will appear as the following:

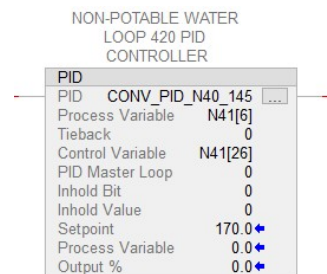


Figure 28 – Converted PID Instruction

When view the new PID Setup parameters there are several windows that need to be checked and configured to ensure proper PID operation. The first window is the “Tuning” window shown below.

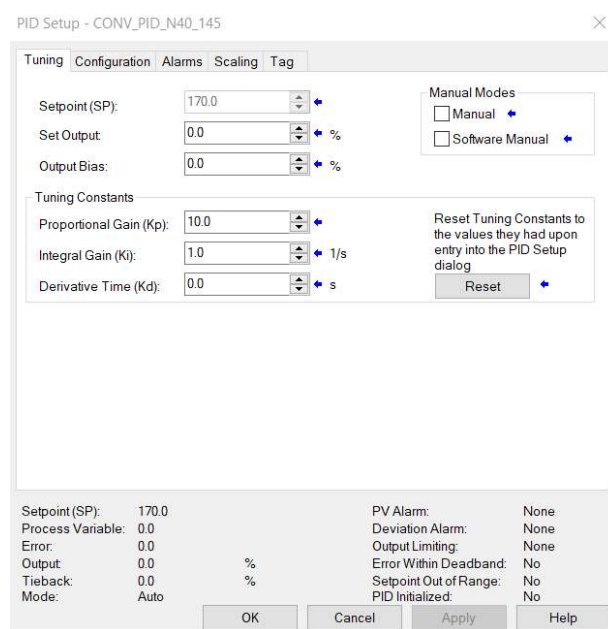


Figure 29 – PID Tuning Window Conversion

As can be seen from the Figure above, the gains from the old PID controller are brought over. However, there are several new parameters that will need consideration.

The next window under the “PID Setup” is the “Configuration” window. This window is shown below. As can be seen, not all the parameters correctly transfer over to the new control. For example, the “Loop Update” in the SLC controller was set to 100 ms, but was translated over to the new controller as 10.0 sec. Also, the way the control action “error” is generated can be reversed using the drop-down menu in this window. Other optional parameter will need consideration such as, No Derivative Smoothing, No Bias Calculation, No Zero Crossing for Deadband, etc.

PID Setup - CONV_PID_N40_145

Tuning Configuration Alarms Scaling Tag

PID Equation: Independent

Control Action: SP - PV

Derivative Of: PV

Loop Update Time: 10.0 secs.

CV High Limit: 100.0 %

CV Low Limit: 0.0 %

Deadband Value: 0.0

☐ No Derivative Smoothing

☐ No Bias Calculation

☐ No Zero Crossing for Deadband

☐ PV Tracking

☐ Cascade Loop

Cascade Type: Slave

Setpoint (SP): 170.0

Process Variable: 0.0

Error: 0.0

Output: 0.0 %

Tieback: 0.0 %

Mode: Auto

PV Alarm: None

Deviation Alarm: None

Output Limiting: None

Error Within Deadband: No

Setpoint Out of Range: No

PID Initialized: No

OK Cancel Apply Help

Figure 30 – PID Setup Window Configuration

The third configuration window deals with alarming. PID alarming is optional and can be configured as needed per the figure below.

PID Setup - CONV_PID_N40_145

Tuning Configuration Alarms Scaling Tag

Process Variable (PV) High: 0.0

Process Variable (PV) Low: 0.0

Process Variable (PV) Deadband: 0.0

Positive Deviation: 0.0

Negative Deviation: 0.0

Deviation Deadband: 0.0

Setpoint (SP): 170.0

Process Variable: 0.0

Error: 0.0

Output: 0.0 %

Tieback: 0.0 %

Mode: Auto

PV Alarm: None

Deviation Alarm: None

Output Limiting: None

Error Within Deadband: No

Setpoint Out of Range: No

PID Initialized: No

OK Cancel Apply Help

Figure 31 – PID Alarming Configuration

The fourth configuration window is labeled as scaling. The scaling configuration window is shown below. As can be seen, the scaling does not properly translate over from the SLC controller. The Control Variable, CV, maximum was

set to 100% in the SLC controller, but is set to 0% after translation. The Process Variable PV will also need to be configured, using the minimum and maximum values from the analog input settings.

PID Setup - CONV_PID_N40_145

Tuning Configuration* Alarms Scaling Tag

Process Variable (PV)

Unscaled Max.: 0.0 Engineering Unit Max.: 0.0

Unscaled Min.: 0.0 Engineering Unit Min.: 0.0

Control Variable (CV)

Max. (at 100 %): 0.0

Min. (at 0 %): 0.0

Tieback

Max. (at 100 %): 0.0

Min. (at 0 %): 0.0

☐ PID Initialized

Setpoint (SP): 170.0

Process Variable: 0.0

Error: 0.0

Output: 0.0 %

Tieback: 0.0 %

Mode: Auto

PV Alarm: None

Deviation Alarm: None

Output Limiting: None

Error Within Deadband: No

Setpoint Out of Range: No

PID Initialized: No

OK Cancel Apply Help

Figure 32 – PID Scaling Configuration

The PID Initialization can be used if scaling constants are changed while the PID is in Run Mode.

Lastly, name and description for the PID instruction will need to be updated. The migrated values are shown below in Figure 33.

PID Setup - CONV_PID_N40_145

Tuning Configuration* Alarms Scaling Tag

Name: CONV_PID_N40_145

Description: NON-POTABLE WATER
LOOP 420 PID
CONTROLLER

Type: Base

Data Type: PID

Scope: PLC_2A

External Access: Read/Write

Setpoint (SP): 170.0

Process Variable: 0.0

Error: 0.0

Output: 0.0 %

Tieback: 0.0 %

Mode: Auto

PV Alarm: None

Deviation Alarm: None

Output Limiting: None

Error Within Deadband: No

Setpoint Out of Range: No

PID Initialized: Yes

OK Cancel Apply Help

Figure 33 – PID Tagging Configuration

After all of the above parameters have been configured for the updated PID control, it is recommended that the new regulator is step tested to verify and validate it elicits the desired response. Also, if additional alarm parameters are added, new tags will need to be configured for the UI to present this data.

1.2.1.8 Analog IO Configuration

The configuration of analog input and outputs have more options in the Studio 5000 environment. In the RSLogic500 environment the advanced configuration options for an analog input from a 1746-NI8 module were as follows.

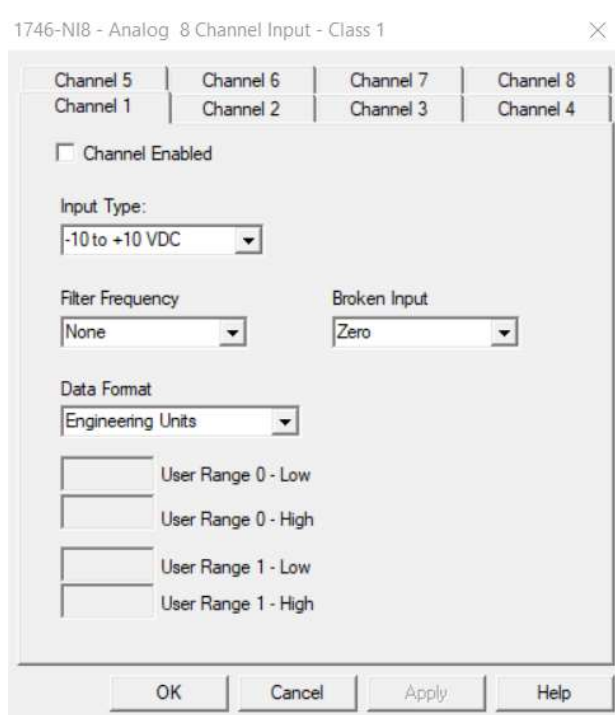


Figure 34 – Analog IO Configuration

Signal type, filtering, broken input options and Data Format options were available. In the Studio 5000 programming environment there are additional configuration options. The module replacement for the 1746-NI8 module is the 5069-IF8 module. At the Channel Level the signal setup yield very similar information, however it is presented in a more compact style as shown below. Signal type, signal range, engineering ranges, digital filtering and alarm are configurable from this window. A faulty channel can also be disabled.

General

Connection

Module Info

Channels*

Ch00

Alarms

Ch01

Alarms

Ch02

Alarms

Ch03

Alarms

Ch04

Alarms

Ch05

Alarms

Ch06

Alarms

Ch07

Alarms

Calibration

Channels

	Channel	Disable Channel	Input Type	Input Range	High Signal	Low Signal	Units	High Engineering	Low Engineering	Units	Digital Filter (ms)	Disable Alarms	Calibration Status
	0	<input type="checkbox"/>	Current	4mA to 20mA	20.0	4.0	mA	100.0	0.0	%	0	<input checked="" type="checkbox"/>	
*	1	<input type="checkbox"/>	Current	0mA to 20mA	20.0	0.0	mA	100.0	0.0	%	0	<input checked="" type="checkbox"/>	
*	2	<input type="checkbox"/>	Voltage	-10V to 10V	10.0	-10.0	V	10.0	-10.0	V	0	<input checked="" type="checkbox"/>	
*	3	<input type="checkbox"/>	Voltage	0V to 5V	5.0	0.0	V	5.0	0.0	V	0	<input checked="" type="checkbox"/>	
*	4	<input type="checkbox"/>	Voltage	0V to 10V	10.0	0.0	V	10.0	0.0	V	0	<input checked="" type="checkbox"/>	
	5	<input type="checkbox"/>	Current	4mA to 20mA	20.0	4.0	mA	100.0	0.0	%	0	<input checked="" type="checkbox"/>	
	6	<input type="checkbox"/>	Current	4mA to 20mA	20.0	4.0	mA	100.0	0.0	%	0	<input checked="" type="checkbox"/>	
	7	<input type="checkbox"/>	Current	4mA to 20mA	20.0	4.0	mA	100.0	0.0	%	0	<input checked="" type="checkbox"/>	

Figure 35 – Analog Channel Configuration

At the individual channel level, the analog input can have engineering units applied, for example PSI is shown below. There is also a notch filtering option based on a frequency. A reference example is shown below.

General

Connection

Module Info

Channels*

Ch00*

Alarms

Ch01

Alarms

Ch02

Alarms

Ch03

Alarms

Ch04

Alarms

Ch05

Alarms

Ch06

Alarms

Ch07

Alarms

Calibration

Ch00

☐ Disable Channel

Input Type:

Current (mA)

Input Range:

4mA to 20mA

Scaling

Engineering Units:

psi

High Signal:

20.0

 mA =

250.0

 psi

Low Signal:

4.0

 mA =

0.0

 psi

Filters

Notch Filter:

60 Hz

Digital Filter:

10

 ms

Diagnostics

☒ Open Wire Detection

Figure 36 – Individual Analog Channel Configuration

Lastly, there are various options for alarming if the “Disable Alarming” option is unselected at the Channel Level configuration. A sample alarm configuration is presented below. NOTE, when the below configuration is applied the same data will show up under the Controller Tags Local:#:C section of the variable.

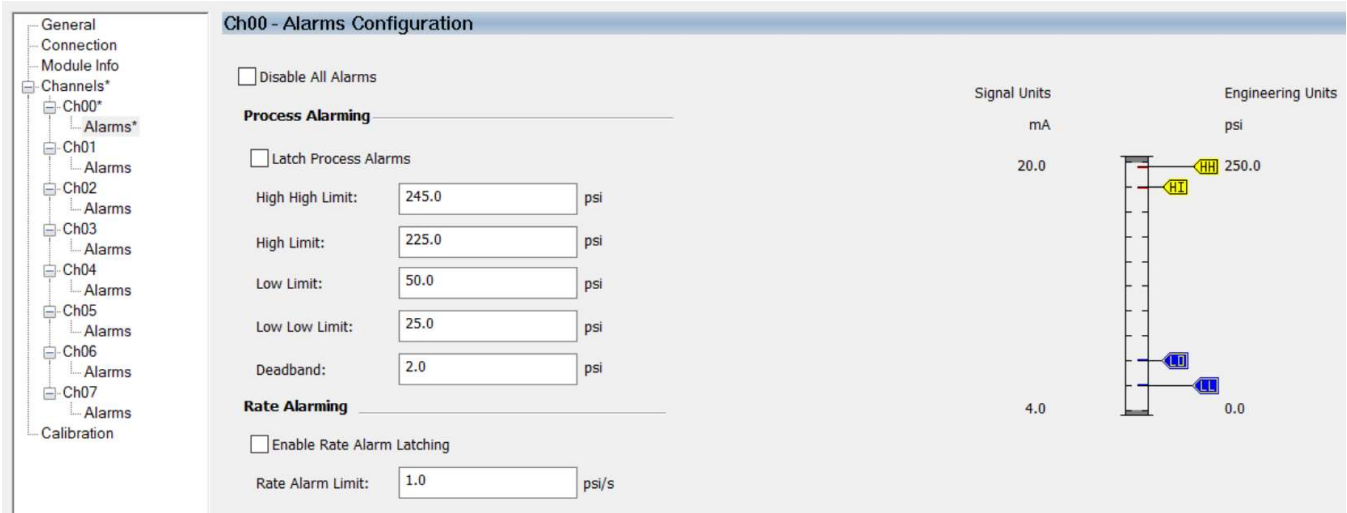


Figure 37 - Analog Alarm Configuration

1.2.1.9 IO Data Buffering and IO Debouncing

With regard to Data Buffering and Debouncing of IO there are several areas in the existing code where IO data is directly mapped (MOV or COP) into a buffer register. For example, the Debounce routine or the Digital Alarm routine map one 16 bit word of digital inputs into a buffer register for later manipulation.

The IO structure in the SLC 500 controllers was such that a 16-bit block of digital inputs could be directly mapped into a 16-bit block using a move or copy instruction. I:6.0 referenced below shows bits 0 through bit 15 laid out in a sequential manor.

Data File I1 (bin) -- INPUT																
Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
I:2.7	0	0	0	0	1	1	0	0	1	1	0	0	1	1	0	1
I:6.0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
I:7.0	0	1	1	1	0	1	0	0	0	0	0	1	1	1	1	1
I:8.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 38 - Legacy SLC Input Data File

Since the SLC arrangement the 16 bits was sequential, it could be moved into a 16-bit N register as shown below. From there, the N register could be manipulated with the actual IO register values being preserved.

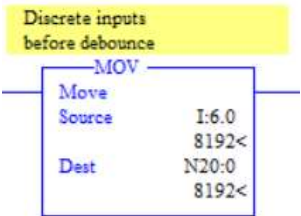


Figure 39 - Legacy SLC Input Buffering Data Before Debounce

The digital IO in the CompactLogix controls is not laid out in the same fashion; therefore, when the migration software attempted to map the above an error was generated. The migration software does recognize there required information is now located at “Local:6:I.Pt{Index}.Data”, where Index goes from 0 through 15. The migrated code is shown below. The data at the Pt##.Data level cannot be indirectly addresses such that the buffer register can be populated using a loop construct.

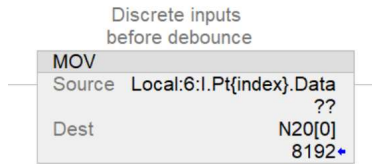


Figure 40 - SLC to ControlLogix Buffer MOV Issue

Since a “Loop Construct” is not available, one method that can be used to move the data into a buffer register is to manually map the data bit by bit into the buffer register. A structured text example of how this can be accomplished is shown below. At the time of the writing, there did not appear to be any automated way to move this data as mentioned above. As such, exceptions from Standard Ladder Logic deviation would be accepted in this case.

```
N20[0].0 := Local:6:I.Pt00.Data;
N20[0].1 := Local:6:I.Pt01.Data;
N20[0].2 := Local:6:I.Pt02.Data;
N20[0].3 := Local:6:I.Pt03.Data;
N20[0].4 := Local:6:I.Pt04.Data;
N20[0].5 := Local:6:I.Pt05.Data;
N20[0].6 := Local:6:I.Pt06.Data;
```

Figure 41 - Proposed IO Buffering in ControlLogix

Handling of Buffering and De-bouncing of Raw Input Data is being further investigated by Tetra Tech. Further recommendations will be forthcoming in detailed design documentation.

1.3 IGNITION

In addition to the software migration required to upgrade the SLC style controllers to the new CompactLogix brand of controllers with the associated IO, the front-end User Interface (UI) will also need to be modified to allow Ignition to communicate with the new controllers.

Per discussions with OMWD the Ignition UI is divided into three main programs: 4S Ranch, Distribution, and McCollom. Some of the data from the various sites is shared across each of the platforms, but the majority of data per platform comes from the respective locations.

An examination of the Ignition database export reveals that each PLC in each location has a unique OPCItemPath association. The first figure, Figure 42, is an example showing the [OPC Item Path] and its corresponding PLC’s for the McCollom facility.

OPCItemPath	Location	Site / PLC
[AFIF]	McCollom	Ammonia Feed Injection Facility
[ERT]	McCollom	McCollom ERT
[GATY]	Distribution	Reservior
[ICP_2]	McCollom	ICP_2
[ICP_3]	McCollom	ICP_3
[MBR]	McCollom	ControlLogix PLC
[PEAY]	Distribution	Reservior / Flow Ctrl
[UnitM]	Distribution	Unit M

Figure 42 - OPC Item Path for McCollom

Similar OPC Item Path connections exist for all other PLC’s in the system.

Continuing with the McCollom facility, specifically data being collected from ICP_2 and ICP_3 the exported database shows the [OPC Item Path] followed by the SLC file and file address. An example of this is shown below in Figure 43

OPCItemPath
[ICP_3]N11:63
[ICP_3]N11:85/0
[ICP_3]N10:10
[ICP_3]I:9/12
[ICP_2]N10:14
[ICP_2]N11:40
[ICP_2]N10:26

Figure 43 - OPC Item Path and file addressing

Using the example above, the converted Ignition database would have the tag addressing reflect the modified file names. See Figure 44 below. It is highly recommended when the Ignition database conversion is taking place to perform a “Find & Replace” method to update and upgrade an individual OPCItemPath and its corresponding file naming and tagging.

OPCItemPath
[ICP_3]N11[63]
[ICP_3]N11[85].0
[ICP_3]N10[10]
[ICP_3]I[9].12
[ICP_2]N10[14]
[ICP_2]N11[40]
[ICP_2]N10[26]

Figure 44 - Ignition data with updated tagging

As seen above, the SLC Legacy file name structure has been somewhat preserved, but updated to reflect the new Studio 5000 tagging methods. At this time, it does not appear necessary to change the OPCItemPath for any of the PLC. As the PLC’s are upgrade, the Ignition database associated with that PLC (OPCItemPath) can be individually updated, then reloaded and tested in Ignition. This will allow for an upgrade cycle that uses a phased approach to the hardware replacement.

As a precautionary note, the network performance for the upgraded system may suffer as a result of this upgrade. The potential efficiency of transferring data in blocks of files, versus having an individual tag per piece of data, may result in reduced Ignition update performance. Depending on the amount of data being transferred through each device after the upgrade, it may be prudent to update all associated network hardware to accommodate this increased traffic. For example, a 10/100 Mbps (Megabits per second) switch may need to be upgrade to a 1/10 Gbps (Gigabits per second) switch to remove any throughput bottlenecks.

1.4 OPERATOR INTERFACE TERMINAL (OIT) – RED LION

There are several OIT that will be updated during this software migration process. The Rockwell Automation OIT’s that will be retained are the PanelView1000’s. The older PanelView600’s are to be replaced.

The Red Lion OIT are to be retained and it is advisable to have the OEM update these terminals.

Updates for all OIT’s will be performed in a similar manor as in the Ignition conversion section. Additional details regarding the conversion processes needed for these machines will be included in the Detailed Specification.

As an example, below, the “Address” under Distribution Unit Z will need to have the tags updated to reflect the address changes inside the PLC’s. It is likely the OPCItemPath, [UNITZ] will be retained, but the associated files shown below (I, N7, N10, F8, etc.) will be updated in accordance with the PLC logic updates.

W
Address
::[UNITZ]I:4/14
::[UNITZ]N7:109/0
::[UNITZ]N10:25/0
::[UNITZ]T4:230.PRE
::[UNITZ]I:4/13
::[UNITZ]N7:108/14
::[UNITZ]N10:24/14
::[UNITZ]T4:229.PRE
::[UNITZ]F8:75
::[UNITZ]N7:103/2
::[UNITZ]N10:19/2
::[UNITZ]T4:106.PRE
::[UNITZ]F8:162
::[UNITZ]N7:103/1
::[UNITZ]N10:19/1

Figure 45 – OIT Tag Mapping Updates

The Red Lion HMI software has many built in drivers to talk to various OEM controllers. For example, when in the Red Lion configuration software, choose the SLC 5/05 controller. Next, under the Protocol menu, by selecting Allen Bradley as the OEM in the Red Lion “Crimson 3.0” software it will automatically show the available drivers for that particular controller. Since the SLC 5/05’s are using an AB-Eth1 driver, the appropriate driver to choose is the “DF1 Master via PCCC/EIP”, see Figure below. This driver allows selection of an “SLC” controller, and insert the correct IP address to communicate with it via Ethernet. The IP address in the SLC needs to match the IP updated in the Red Lion software.

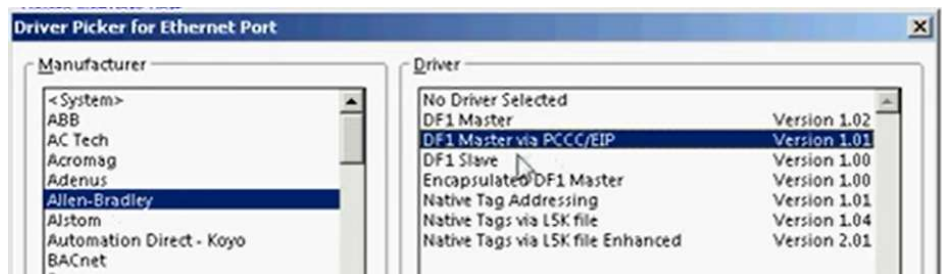


Figure 46 – ERT Red Lion OIT Tag Mapping Updates

After migration and conversion of the RSLogix500 program to the Studio 5000 program the new tags created in the Studio 5000 program will need to be imported into the Red Lion HMI software. Save the Studio 5000 file as an Import/Export L5K file format and import this to the Red Lion software. The Red Lion software give the option to select “Native Tags via L5K File Enhanced” driver. After this file has been import, tags can be browsed and selected for communication with the upgraded project.

1.5 PANELVIEW PLUS 1000 (PV+1000) – UPGRADE TO PV+7 STANDARD TERMINAL

PanelView Plus 7 Standard Terminal (PV+7 ST) are products that are designed to talk to ControlLogix and CompactLogix controllers over EtherNet/IP (10/100Base-T). The PV+7 ST can connect to up to 100 controllers and hold 500 alarms. The PV+7 ST runs on Windows CE OS, and the device can be programmed using FactoryTalk View Machine Edition.

The first step in converting from PanelView Plus 1000 to PanelView Plus 7 Standard Terminal is to use the Rockwell Software Machine Edition (ME) Transfer Utility. The ME Transfer Utility has been included in FactoryTalk View Studio in the later releases. Depending on the version of FactoryTalk View SE you are running, there may be a

patch required to perform this conversion from the PV+1000 to the PV+7 ST. There have been some problems encountered with the ME transfer utility that ships with version 7.0 of FactoryTalk View ME. The ME transfer utility with this version does not recognize a PV+7 Standard Terminal.

If you are running FactoryTalk View SE 7.0 there is a patch available through Rockwell Automation that can be downloaded to correct this issue if you encounter it. The Rockwell Automation website details the steps required to successfully install this patch.

In later version of FactoryTalk View SE the above issue has been resolved. For the purposes of this document, it is assumed the above compatibility issues have been resolved.

To proceed with the conversion, open FactoryTalk View SE and navigate to the PV+1000 application (Machine Edition Applications). See below example of potential choices for this example.

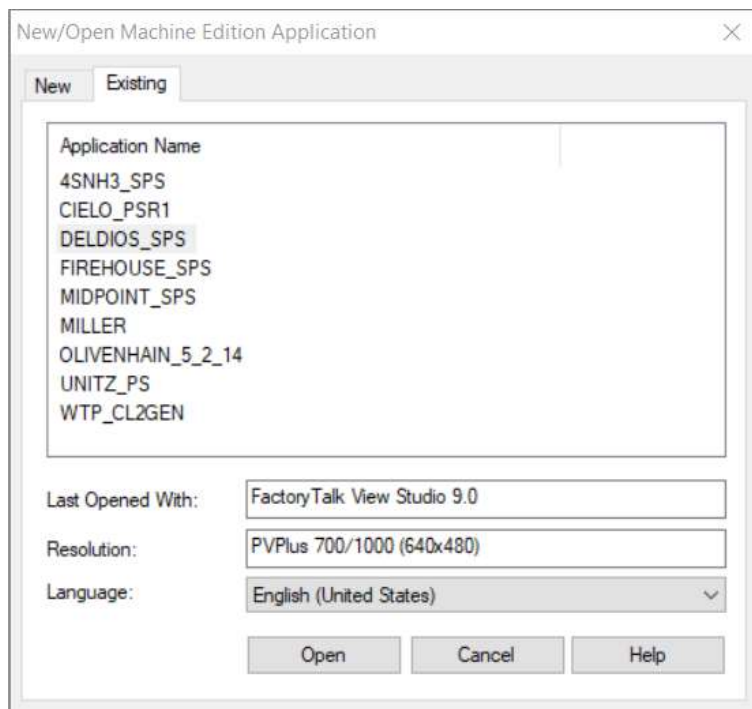


Figure 47 –Selecting the PV+1000 Application to Convert

Select the application to be converted, for this example “DELDIOS_SPS” has been selected. Next press open.

The application will load and come up as the following:

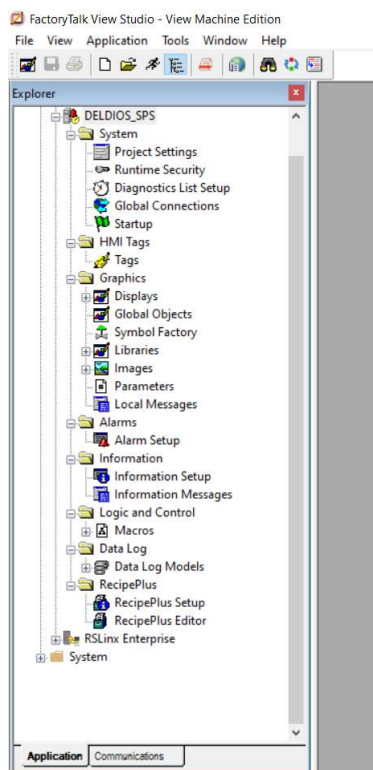


Figure 48 – PV+1000 Open in FactoryTalk View SE

Next, you will need to create a Runtime File. To do this, from the drop down menu select “Application, Create Runtime Application” as shown below.

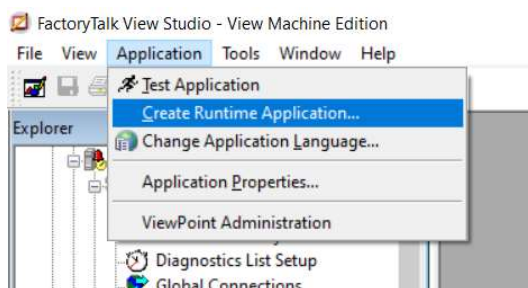


Figure 49 – Creating a Runtime Application

You will be prompted to save the Runtime Application. As you can see in the Figure 50 below, there are several versions of the Runtime Application (*.mer) files to pick from. It is advisable to choose the version that is compatible with the version of FactoryTalk View SE that you are running. In this example case, it is version 9.0.

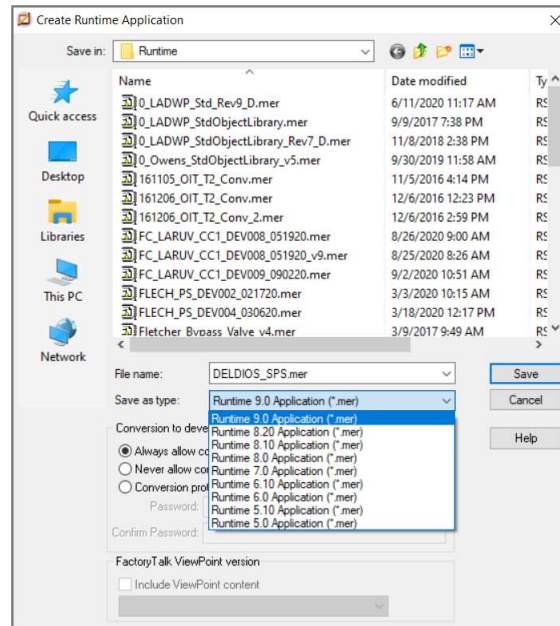


Figure 50 – Selecting the corresponding FactoryTalk View SE Version

After selecting the proper FactoryTalk View SE version select the “Save” button. The default path where the Runtime Application is saved is shown below in Figure 51.

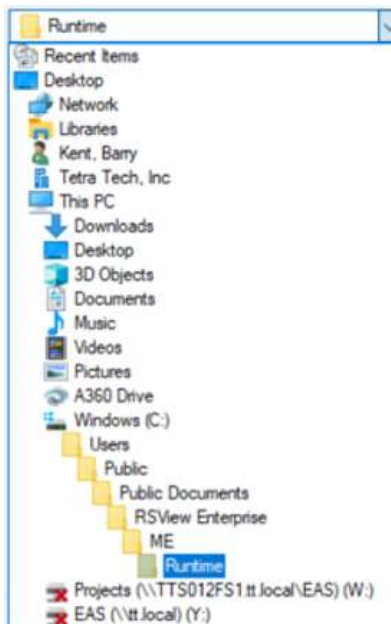


Figure 51 – Runtime Application Default Directory

FactoryTalk View SE will then create the Runtime File from the existing PV+1000 file and save it to the above directory.

When viewing the existing HMI Tags, the address format has not been converted to the ControlLogix / CompactLogix format. See the example below in Figure 52.

Type: Analog

Description: FLOW METERCURR 24HRFLOW TOTAL(M-GALLONS)

Minimum: 0 Scale: 1

Maximum: 5 Offset: 0 Data Type: (Default)

Data Source
Type: ☒ Device ☐ Memory

Address: ::[DELDTOS]F8:28

Prev

Next

New

Help

Search For:	Tag Name	Type	Description
	1 24HR_CUR_TOT	Analog	FLOW METERCURR 24HRFLOW TOTAL (M-GALLONS)
	2 24HR_PVS_TOT	Analog	FLOW METERPREV 24HRTOTAL(M-GALLONS)
	3 ALMACK	Digital	PLC Alarm Ack
	4 ALMRST	Digital	PLC Alarm Reset
	5 AUTORST	Digital	Auto-Reset Flag
	6 BATT_VOLTS	Analog	BatteryVoltage
	7 COMP_FAIL_ALM	Digital	Air Compressor Fail Alarm
	8 COMP_FAIL_DLY	Analog	Air Compressor Fail Alarm Delay

Figure 52 – Runtime Application File Tags

To correct the issues with the tags, the tag database needs to be exported to a CSV file, modified to agree with the tagging in the ControlLogix / CompactLogix controllers, then reimported back into the ME application. To export the tag database, select from the dropdown menu “Tools, Tag Import and Export Wizard”, shown below.

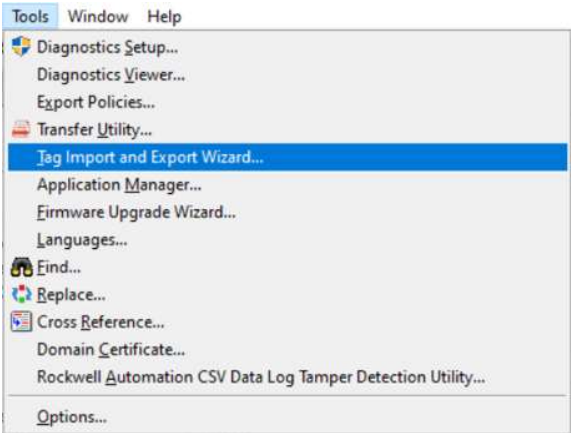


Figure 53 – Import / Export Tags

When the above is selected you will be prompted to export the file to a CSV file as shown below.

Tag Import and Export Wizard

Select the operation you would like to perform.

Operation
Export FactoryTalk View tag database to CSV files

If editing the exported CSV file in Microsoft Excel, ensure to save it as type 'CSV(Comma delimited)'. Otherwise, the modified CSV file cannot be imported into FactoryTalk View.

< Back

Next >

Cancel

Help

Figure 54 –Tag Export

After clicking next, you will be asked to navigate to the project (the associated *.med file). Continue with the remaining steps and the CSV file will be created. NOTE: The navigation for the project is similar to where the “Runtime” file was created, except it is up one level and under the “HMI projects” directory.

The CSV file “address” column can then be manipulated to match the tagging used in the ControlLogix or CompactLogix PLC’s. After the tagging has been updated to match the PLC addressing, the file can be saved and imported back into the *.med file. You will first need to select the *.med file to where the tags are to be imported. Next select the CSV file with the updated tags. Be sure the select the following option when importing tags, or no changes will be made.

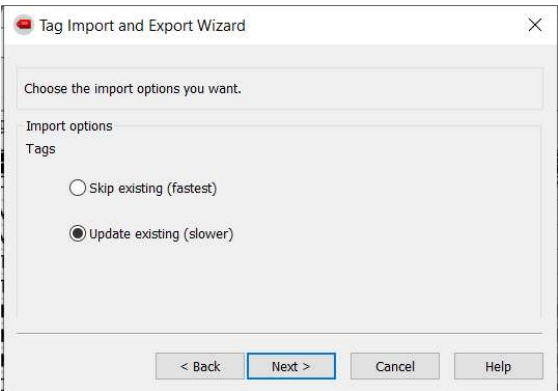


Figure 55 – Tag Import – Use Update Existing

Follow the prompts and import the tags.

When the operation has completed you will be notified with the following popup.



Figure 56 – Tag Import Popup After Completion

If you then go back into the application and check the tag database you will see the new tag format, as shown below. In this example the format changes from F8:28 to F8[28].

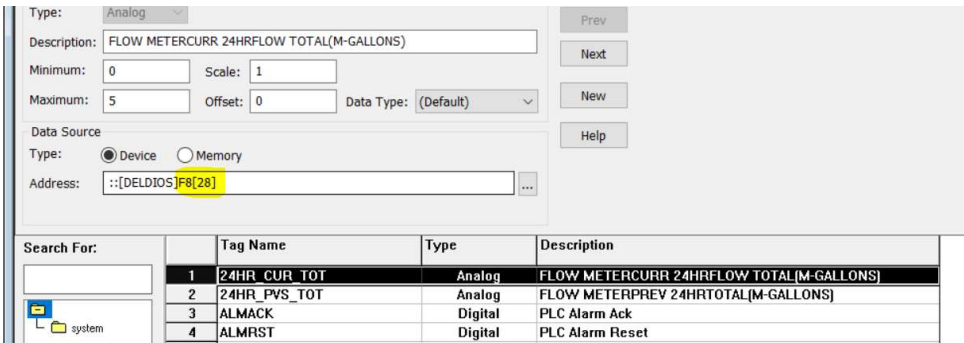


Figure 57 – Updated Tag Format

After all of the tags have been converted and successfully import the graphics need to have their resolution update for the new PV+7 ST, 10 inch hardware. To perform the update, double-click the “Project Settings” that is selected below.

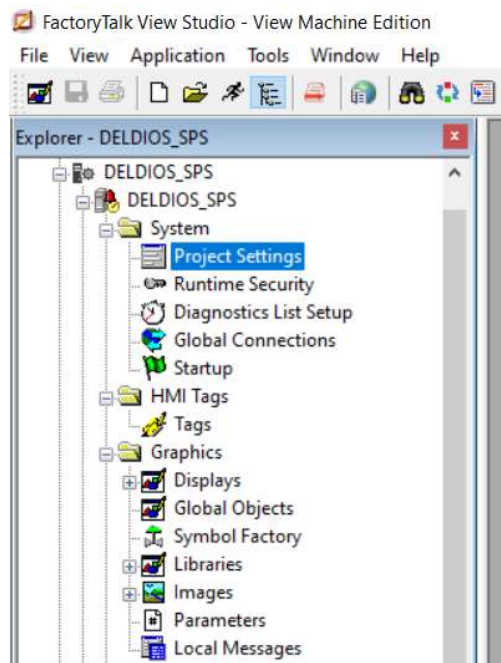


Figure 58 – Changing Resolution for PV+7 ST

The system will show the existing setting as 640x480, and have the PVPlus 700/1000 (640x480) picked as the “Project Window Size”. Use the Project Window Size dropdown to select the following:

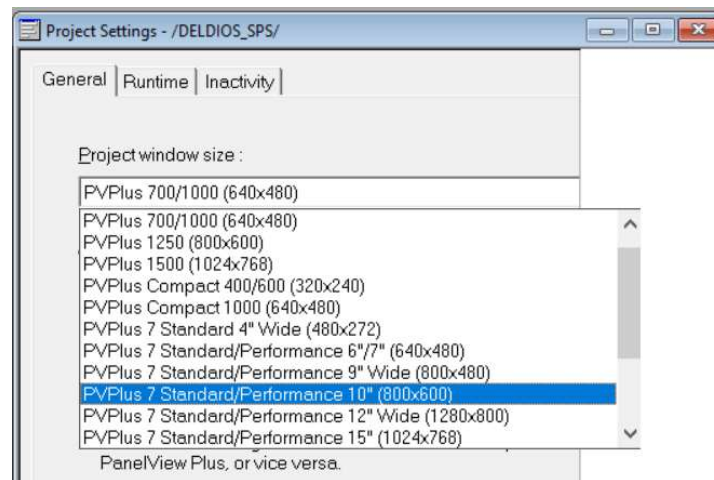


Figure 59 – Selecting the New PV+7 ST, 10 Inch

Make sure the “Execute MER on PanelView Plus 7 Performance” radio button is selected, see Figure 60, then exit, save changes, and update the graphics.

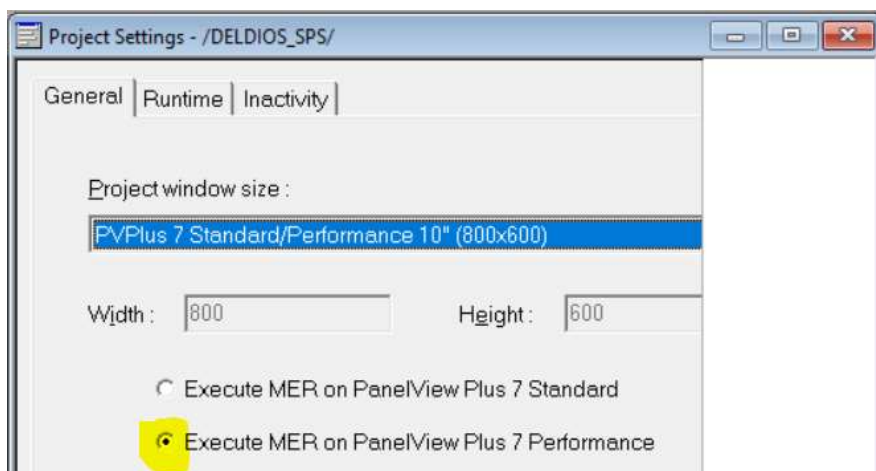


Figure 60 – Selecting the Proper Radio Button for Graphic Conversion

After the graphics have been updated, if you go back into the Project Settings the system will now show PVPlus 7 Standard/Performance 10" (800x600) as displayed below.

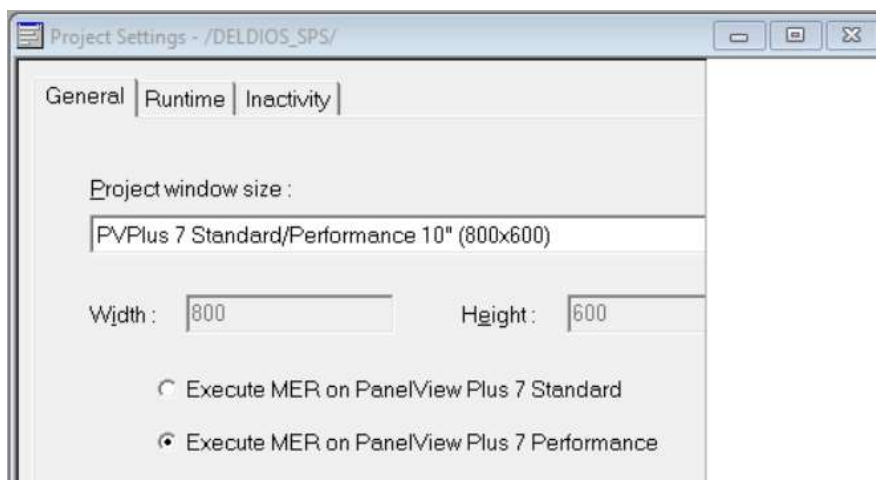


Figure 61 – Verifying Project Settings after Graphic Conversion

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SECTION 17300 – CONTROL PANELS AND APPURTENANCES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Panels and Appurtenances section covers the furnishing of panels and appurtenances as listed in Section 17000 Appendix A.

1.2 GENERAL

- A. Equipment furnished and installed under this section shall be fabricated and assembled in full conformity with the Drawings, specifications, equipment schedules, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
- B. General Equipment Stipulations
 - 1. The General Equipment Stipulations shall apply to all equipment and materials provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.3 SUBMITTALS

- A. Submittals shall be made as specified in the Instrumentation and Control System section.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Delivery, storage and shipping shall be as per The Instrumentation and Control System section.

PART 2 – PRODUCTS

2.1 PRODUCTS

- A. In order to reduce duration of cut-overs and minimize construction costs, ancillary equipment associated with the PLC Chassis (i.e. physical control panels, back panel, power supplies, network switches, terminal blocks, fusing, etc) will be preserved, excluding the following:
 - 1. A new Back Panel shall be provided for 4S-1 Reservoir (D-002), per 17000 – Appendix A.
- B. Where new or replacement control panel components or wiring are required, the following requirements shall apply per the specification herein.
- C. Enclosure
 - 1. Enclosures shall be per the existing dimensions, including form, fit and rating.

SECTION 17300 – CONTROL PANELS AND APPURTENANCES

D. Sub-Panels

1. Sub-Panels shall be per the existing dimensions, including form fit and rating

E. Power Entrance

1. The power entrance to each panel shall be provided with a surge protection device. Surge arresters shall be Transtector "ACP-100-HW
2. Series", Power Integrity Corporation "ZTA Series", Phoenix Contact "Mains PlugTrab", or MCG Surge Protection "400 Series".

F. Power Wiring

1. Power distribution wiring on the line side of panel fuses shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 14 AWG. Wiring for ac power distribution, dc power distribution, intrinsically safe, and control circuits shall have different colors and shall agree with the color-coding legend on System Supplier's panel wiring diagrams. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for not less than 600 volts, with a moisture resistant and flame retardant covering rated for not less than 90°C.

G. Instrument and Control Wiring

1. All internal panel wiring shall be type MTW stranded copper wiring rated not less than 600 volts. Electronic analog circuits shall be twisted and shielded pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits. Intrinsically safe circuits shall be physically separated from other circuits in accordance with applicable codes. Wires within the panel shall conform to the minimum size as shown in the table below.

Type	Min. Wire Size	Color
AC Control	16 AWG	Red
DC Control	16 AWG	Blue
Analog Circuits	18 AWG Twisted Pair	Insert colors

2. All wiring shall be grouped or cabled and firmly supported inside the panel. Each individual wire in power, control, and instrumentation circuits shall be provided with identification markers at each point of termination. The wire markers shall be positioned to be readily visible for inspection and the identification numbers shall match the identification on the supplier's panel wiring drawings. Wiring shall be bundled in groups and bound with nylon cable ties or routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel, with removable covers, and with space equal to at least 40 percent of the depth of the duct remaining

SECTION 17300 – CONTROL PANELS AND APPURTENANCES

available for future use after completion of installation and field wiring. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.

H. Terminal Blocks

1. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. Not less than inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fuses or circuit breakers shall be clearly labeled and located for easy maintenance.

I. Device Tag Numbering System

1. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the Contract Drawings and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand-lettered labels or tape labels will not be permitted.

J. Nameplates

1. Nameplates shall be provided on the face of the panel or on the individual device. Panel nameplates shall have legends and approximate dimensions as indicated on the Drawings and shall be made of laminated phenolic material having engraved letters approximately 3/16 inch [5 mm] high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified under the Device Tag Numbering System paragraph.

K. Indicating Light Color Designations

1. Indicating lights shall be colored as shown in the following table unless indicated otherwise on the Drawings, in other specification sections, or in the instrument device schedule.

L. Color Meaning

1. "Red" Associated equipment or device is "stopped," "open," or is in an "unsafe" state or position

SECTION 17300 – CONTROL PANELS AND APPURTENANCES

2. “Green” Associated equipment or device is “running,” “closed,” or is in a “safe” state or position
3. “Yellow or Amber” Associated equipment or device has “failed” or a process alarm condition is present or imminent.
4. “White” All other conditions not defined above.

M. Panel-Mounted Instruments

1. Instruments, power supplies, pilot devices, and appurtenances shall be provided as required for proper, efficient use of the control panel.

N. Factory Test

1. Panels shall be factory tested electrically and pneumatically by the panel fabricator before shipment

PART 3 - GENERAL

3.1 GENERAL INSTALLATION REQUIREMENTS

- B. Installation requirements are specified in the Instrumentation and Control System section. In addition, equipment furnished under this section shall conform to the following manufacturing stipulations.
 1. Wiring
 - a. All wiring shall be grouped or cabled and firmly supported inside the panel. Wiring shall be bundled in groups and routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables

****END OF SECTION****

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SECTION 17490 – FACTORY AND FIELD TESTING

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The SI testing and commissioning work shall include the following:
 - 1. Provide all materials, equipment, labor, and services required to perform the testing and commissioning as specified.
 - 2. No testing shall be performed until the associated testing procedures have been reviewed and approved by the Engineer.
 - 3. No testing activities will be considered completed until witnessed, approved and signed off by the Engineer.
 - 4. Factory Testing shall include both Unwitnessed and Witnessed sessions (UFT and WFT respectively). The UFT shall act as the SI's internal Quality Control measure to ensure satisfactory completion of all factory test procedures, prior to commencement of WFT.
 - 5. The Contractor shall provide a minimum of two(2) week's notice prior to performing WFT,
 - 6. The Contractor shall provide a minimum of two(2) week's notice prior to commencement of each facility commissioning and field test site.
 - 7. Testing notifications shall include the type of testing that will be performed, a detailed schedule of the testing to be performed, a list of equipment and converted PLC, HMI and OIT software components that will be included in the testing, and a description of any facility operations that will be affected.
 - 8. Provide a PLC Control Logic Simulator System to mimic plant operations for PLC logic, UFT, WFT and District personnel training for 4SWRF.

1.2 SUBMITTALS

- A. General
 - 1. As specified in Section 17000 including testing schedules as part of the SI.
- B. PLC Control Logic Simulation Systems
 - 1. As specified in Section 17000.
- C. Testing Plan
 - 1. Separate test procedures shall be submitted for each of the following:
 - a. Unwitnessed Factory Test (UFT): Hardware – PLC & IO
 - b. Unwitnessed Factory Test (UFT): Software – Simulation

SECTION 17490 – FACTORY AND FIELD TESTING

- c. Witnessed Factory Test (WFT): Hardware – PLC & IO
- d. Witnessed Factory Test (WFT): Software – Simulation
- e. Field Testing, including:
 - 1) Pre-Energization & Inspection Tests
 - 2) Pre-Operation Tests, and
 - 3) Operational Tests
- 2. Each test procedures shall include test descriptions, forms, and checklists to be used to control and document the required tests. Sign-off forms for each testing phase or loop with sign-off areas for the SI, the assigned District Representative, and the Engineer shall be provided.
- 3. Test procedures shall be coordinated with the sequenced startup of the system and control panels to match sequence of installation per the Special Provisions defined in Section 01170.
- 4. Electronic PDF copies of each signed and completed test shall be submitted. Testing shall not be considered complete until the signed-off test procedures have been submitted and favorably reviewed by the Engineer.
- 5. Within the simulation UFT and WFT test procedures, detailed and comprehensive reference shall be provided to testing protocol.

1.3 TESTING AND COMMISSIONING WORKSHOPS

- A. The SI shall schedule and hold a minimum of four (4) mandatory PLC Control System Upgrade - Testing and Commissioning Workshops. These workshops shall be for each of the specific Facility Group types as defined in Appendix 17000 -A by:
 - a. Phase 1a – 4S Remote Sites
 - b. Phase 1b – Distribution Remote Sites,
 - c. Phase 2a - DCMWTP, and
 - d. Phase 2b - 4SWRF.
- 2. The Testing and Commissioning Workshops shall include as a minimum the District, the Engineer, the Contractor, the SI's Project engineer, SI Programmer(s) and Electrical Subcontractor. District staff shall include technicians, operators, and maintenance staff as required. The District shall determine which staff members will attend each workshop. Workshops shall all be held at the District's headquarters located at 1966 Olivenhain Rd, Encinitas, CA 92024.
- B. Workshop activity shall be included as specified in Section 17000 for discussion

SECTION 17490 – FACTORY AND FIELD TESTING

and development of the PLC Control Logic Simulator for 4SWRF Plant.

- C. Schedule the Commissioning Workshops a minimum of two(2) weeks prior to the workshop date and include the workshop agenda.
- D. Draft workshop minutes shall be submitted for review and comment within one(1) week of each workshop. Final minutes shall be subsequently submitted incorporating any comments as necessary.
- E. The SI shall be responsible for facilitating the workshop and providing presentation material to all participants. The SI and Contractor shall document the proceedings of the Testing and Commissioning Workshops and submit along with all materials used at the workshop.

1.4 TEST EQUIPMENT

- A. Test equipment used by the SI during startup, testing, and commissioning shall have NIST traceable calibration. Copies of the current calibration certificates will be maintained on site by the SI's project manager for all test equipment in use by the SI's technical staff.

PART 2 PRODUCTS

2.1 4SWRF PLANT PLC CONTROL LOGIC SIMULATION SYSTEM

- A. Given limited downtime window available, and the criticality of the PLC control functions at 4SWRF Plant at 16595 Dove Canyon Road in Appendix 17000-A, the SI shall provide an external Control Logic and Process Simulation System for each of the PLC's at the facility, for use by the Contractor and the District for testing purposes. The following PLC's shall be included:

- 1. Phase 2 – 4SWRF associated PLC's, including:

- a. 4S-101 HW Scrubber PLC
- b. 4S-102 SDW Scrubber PLC
- c. 4S-104 Blower PLC
- d. 4S-112 Filter PLC
- e. 4S-116 PLC 2A
- f. 4S-117 PLC 2B
- g. 4S-118 PLC 3
- h. 4S-119 PLC 4

- B. The 4SWRF Plant Simulation System shall consist of:

- 1. One(1) External PLC or Software Emulator and Computer that shall contain

SECTION 17490 – FACTORY AND FIELD TESTING

the plant and equipment simulation logic and simulation IO. If an alternate Simulation Engine or means is recommended by the SI, details shall be provided in Contractor's Bid Proposal package.

2. Suitable HMI displays for manipulating process and IO conditions for the purposes of testing.
- C. The 4SWRF Plant Simulation System shall be released to the District at the completion of the Project for subsequent operator and maintenance staff training and troubleshooting use.
- D. Provision of a Control Logic and Process Simulation System for Factory Testing of the ERT System Upgrade at DCMWTP shall be at the discretion and recommendation of the OEM – Canyon Hydro in order to facilitate timely and successful execution of the upgrade.

PART 3 – EXECUTION

3.1 4SWRF PLANT PROCESS SIMULATION PROGRAM DEVELOPMENT

- A. Specific process simulation shall be provided to facilitate UFT and WFT as follows for Phase 2 – 4SWRF Plant Testing:
 1. Closed-loop process simulation shall be developed for testing of all new and modified existing PLC programs at 4SWRF
 2. Conventional PLC IO forcing approach (without closed-loop process simulation) and temporary logic modification may be used for all other facilities outside of 4SWRF.
- B. Process simulations shall generally mimic operation of existing plant systems and equipment. Simulation programs shall include software-based switches and setpoints within the simulation PLC to allow for testing of normal and abnormal operations, as well as failure modes.
- C. The Simulator shall read “field” mapped outputs (from the PLC) and provide simulated “field” mapped inputs (to the PLC) for each respective PLC's and Remote IO defined in Appendix 17000-A.
- D. Examples of individual component simulations include, but are not limited to the following:
 1. All attributes associated with analog and digital Inputs.
 2. Motor start and stop, including constant speed and variable speed.
 3. Valve open and closing, including single acting, dual-acting and proportional valves.
 4. Lead, lag and standby process equipment operation.
 5. Process variable response to changes in process condition and simulated

SECTION 17490 – FACTORY AND FIELD TESTING

equipment operation, including inter-process communications across the PLC network.

3.2 TESTING

A. General

1. Each test shall be in the cause and effect format, with expected results documented.
2. It is the responsibility of the SI to provide a complete operational control system. Confirmation of an operational control system is dependent upon results derived from test procedures as specified in this Section.
3. Factory testing shall be performed prior to shipment of the equipment and also testing of the equipment once installed in the field. Once the system is in operation, an additional Trial Period is required.
4. All tests shall be conducted in accordance with prior Engineer approved procedures, forms and checklist all as submitted by the SI.
5. Each test shall be signed off signoff by the appropriate parties after its satisfactory completion.
6. A separate punchlist forms to document any issues that arise during testing shall accompany each test procedure. The punchlist shall include a resolution section that allows a description of the correction and signoff areas for SI and Engineer.
7. Copies of the signed off test procedures, forms and resolved punchlists will constitute the required test documentation. The test result forms shall be submitted to Engineer for approval at the completion of each test.
8. Wherever possible, all tests shall be performed using actual process variables, equipment, and data. Where this is not practical, suitable means of simulation shall be defined in the test procedure by the SI.
9. All Factory Tests results shall be provided prior to shipment of equipment. No equipment shall be shipped without the approval of the District and Engineer.
10. Any special testing materials and equipment shall be provided by the SI.
11. The SI shall coordinate all required testing with the EC, all affected Subcontractors, the Engineer and the District.
12. The SI shall furnish the services of field service engineers, all special calibration and test equipment and labor to perform the field tests.
13. The Engineer shall reserve the right to test or retest all specified functions, whether or not explicitly stated on the Test Procedures, as required to

SECTION 17490 – FACTORY AND FIELD TESTING

determine compliance with the original system functionality. Any such testing required to determine compliance with the Specified requirements shall be performed at no additional cost to the District.

14. The Engineer's decision shall be final regarding the acceptability and completeness of all testing
15. Mock-up of the existing CC-MBR ControlLogix Hot-Backup PLC Processors and associated RIO's at DCMWTP shall be provided by the Contractor to facilitate Testing.
16. Provision of a Control Logic and Process Simulation System for Factory Testing of the ERT System Upgrade at DCMWTP shall be at the discretion and recommendation of the OEM – Canyon Hydro, in order to facilitate successful execution of the upgrade.

B. Testing Sequence

1. Testing for individual facilities has been divided into three (3) testing stages. Testing shall be performed in the following sequence.
 - a. Stage 1 – UFT and WFT for Hardware, including:
 - 1) Visual and mechanical inspection of assembled PLC, IO and Remote IO replacement assemblies and associated equipment
 - 2) Power Up Testing of Assembled Conversion Rack and IO kits for each PLC listed in Appendix 17000-A. Temporary Power Supplies, Wiring and Terminal Blocks to be provided by SI to facilities Hardware Testing of Equipment.
 - 3) Verification of each staged PLC assembly and physical IO channel using simulated inputs/output by means of: Inputs: Using jumpers and signal generators to simulate analog and digital inputs to the PLC data tables. Outputs: Force enabling within the PLC data tables to simulate analog and digital outputs to the channel IO.
 - b. Repeat the same series of tests as for the UFT for the WFT but in the presence of the District and the Engineer. All elements of the WFT shall be witnessed by the District and the Engineer. Provide two(2) weeks schedule notification to the District and the Engineer prior to performing the WFT. The WFT shall not be held until after favorable review of all hardware, software, and test procedure submittals as specified in these Specifications and successful completion of the UFT.
2. Stage 2 – UFT and WFT for Software – Simulation, including:
 - a. Testing Simulation:

SECTION 17490 – FACTORY AND FIELD TESTING

- 1) For 4SWRF Plant, the simulation testing shall include loading the developed process simulation code into the Emulator PLC (or equivalent), manually establishing initial values process variable or passed PLC network variables and implementing simulation of the process loops and equipment.
 - 2) For all other facilities and PLC's excluding 4SWRF Plant, simulated inputs/output and software conventional verification may be achieved by forcing logical test conditions within the converted PLC logic. All logic bypasses and force conditions applied for Testing shall be tracked by the SI, and removed upon completion of Testing.
- b. Demonstrate analog scaling and analog alarms for analog variables on the HMI screens; verify status of all discrete variables on the HMI screens.
 - c. Simulate and demonstrate functionality of the process controls. Simulate operating conditions to verify the performance of the monitoring and control functions. Simulate functionality of permissives and logic by the new programs.
 - d. Demonstrate simulation of control loop response on loss of process signals from analog instrumentation, failure of controlled equipment to respond to PLC commands.
 - e. Demonstrate simulation of control loop response on loss of communications to other associated PLC systems or on loss of remote IO. Confirm that output signals fail to the correct value.
 - f. Demonstrate graphical user interfaces (hardware and software) for process controllers and HMI.
 - g. Repeat the same series of tests as for the UFT for the WFT but in the presence of the District and the Engineer. All elements of the WFT shall be witnessed by the District and the Engineer.
3. Stage 3 – Field Testing as specified in this Section.

3.3 FIELD TESTING

A. General

1. Field testing is broken down into 4 components:
 - a. Pre-Energization Testing & Inspection Tests
 - b. Pre-Operational Testing
 - c. Operational Testing

SECTION 17490 – FACTORY AND FIELD TESTING

- d. Warranty
- 2. Project wide, all Pre-Energization testing must be completed prior to Pre-Operational testing, all Pre-Operational testing must be completed prior to Operational Testing, and all Operational Testing must be completed prior to Commissioning.
 - a. Any deviation of this order, whether on a component level or larger scale, must be approved.
 - b. Out of order testing, if allowed, will be evaluated on a case-by-case basis when brought to the attention of the Owner's Representative.
 - c. The Owner's Representative may require that the entire system, or portions thereof, be retested once the missing component(s) are installed and functional.
- 3. All equipment supplied by the Contractor or others shall be tested by Contractor per these specifications.
- 4. Two digital multimeters/signal generators (minimum +/- 0.1% accuracy), DC current meters, and other specialized test equipment shall be provided by the Contractor for use during testing.
- 5. If the equipment is determined not to be ready for testing, the test will be cancelled and rescheduled for a later date.
- 6. Faulty and/or incorrect hardware or software operation of major portions of the system may be cause for suspension, cancellation, or restarting of the area of testing, at no additional cost or extension in Contract time.
- 7. During the Operational testing period, under the supervision of the SI, the Owner's Representative shall have unlimited and unrestricted access to the usage and testing of all hardware and software in the system.
- 8. The SI shall pay all expenses incurred by his personnel including labor, material, transportation, lodging, daily subsistence, and other associated incidental costs during field testing.
- 9. Acceptance and witnessing of the tests does not relieve or exclude the Contractor from conforming to the requirements of the Contract Documents.
- 10. PID loop tuning and verification shall be completed as specified in these Specifications. Related loops shall be tested as a system to verify interlocks, operations and functionally related loops. The SI shall also provide trend graphs from within the ControlLogix programming environment to compare step response of all PID's and Closed Loop systems, as equal or better performance pre/post PLC upgrade.
- 11. The Loop/Component Inspections and Tests shall be implemented using

SECTION 17490 – FACTORY AND FIELD TESTING

SI developed, Engineer-approved forms and checklists. Each loop of functionally related group of loops (subsystem) shall have a Loop/Subsystem Status Report to organize and track inspection, adjustments and modifications.

12. The SI shall maintain the Loop Status Reports sheets at the job site and make them available to the Engineer at any time.
13. All modifications to documentation as a result of the tests shall be corrected and completed before the delivery of "as-built" documentation. Copies of the completed and witnessed field testing forms shall be included in the Operation and Maintenance Manual. The various contractors on this project (General Contractor, Electrical Contractor and SI) shall assume the lead role in testing activities as listed below. The Contractor shall obtain assistance of suppliers and/or OEM's representatives for any major equipment testing. This includes Canyon Hydro per the OEM Qualifications defined in 17000.

B. Field Testing - The following test shall be performed within each test category. Complete test forms for each electrical panel, instrument, and/or device. Provide separate form for each component to be tested.

1. No Field Testing shall be scheduled, or commenced on a Friday or Weekend period, without the approval of the Owner.
2. Pre-Energization Inspections and Tests: Prior to startup and the test sequencing identified below, the PLC control panel system shall be inspected, wired, calibrated and documented, that it is installed and ready for commencement of Pre-Operational and Operational testing. This includes performing:
 - a. Visual and Mechanical Inspection Tests.
 - b. Individual continuity tests from the newly re-wired and terminated IO module channel locations to the respective field terminal location within the modified control panel.
 - c. Grounding and bonding checks. Before power is applied to a system, integrity of the grounding system and bonding system needs to be verified, and presence of ground faults excluded.
3. Pre-Operational Tests:
 - a. Control Panel Pre-Operational Tests
 - b. IO Loop Tests
 - c. Communications Tests

SECTION 17490 – FACTORY AND FIELD TESTING

- 1) The Contractor shall verify that all communications via radio, fiber optic, or other are functional and ready for operational testing. Revise all configurable parameters without additional cost to the Owner as required for an optimally functional system.
 - 2) Verify that all components of the communication system operate together under all operating and power restart conditions. If faults occur, investigate source of problem and correct. Revise all configurable parameters without additional cost to the Owner.
 - 3) Change setpoints and commands from HMI and OIT and confirm that corresponding field equipment changes correctly. Every IO point on every screen, trend, and database shall be verified.
4. Operational Tests:
- a. After all the previous tests in this subsection are complete, the test forms are completed and signed-off, the Contractor shall conduct operational testing.
 - b. Representatives from the Contractor, EC, SI, and Owner's Representative shall be present during testing. Operational testing shall be performed by Contractor in the presence of the Owner's Representative.
 - c. During operational testing the Contractor shall follow the instructions of the Owner. The Owner may place restrictions on operation that must be followed by the Contractor during testing.
 - d. Alarm Tests
 - 1) Generate the digital and/or analog signals at the primary device to verify that each PLC IO point is functional and properly programmed. Verify that all parameters (i.e., setpoints, enable/disable toggle bits, timers, etc.) for the alarms operate according to the Specifications. Multiple alarm states (i.e., LO, LO-LO, HI, HI-HI, etc.) shall be checked.
 - e. Operational Controls Tests
 - 1) Generate the digital and/or analog signals at the primary device by raising or lowering the actual measured process. Inject signal into the terminals or utilize a "force" function within the device only as necessary. Verify that each control system is functional and properly configured and programmed.
 - 2) Verify all original operational modes and control functions, per the original software configuration.

SECTION 17490 – FACTORY AND FIELD TESTING

- 3) Verify that all parameters (i.e., setpoints, runtimers, totalization, etc.) operate according to the Specifications.
- 4) Verify that all data, setpoints, alarms are being received at SCADA correctly and that all IO points on screen are true and accurate representations of field information.

f. Other Tests

- 1) Force a power failure and power fail/restart of PLC and all other systems. Check the effects of each failure on each piece of equipment and automatic recovery.
- 2) Force a PLC communication error. Demonstrate error detection, alarming, and recovery.
- 3) Perform additional operational testing that has not already been witnessed.
- 4) Perform any additional operational testing as necessary to confirm robust and error free operation under all operational conditions.
- 5) Perform a UPS endurance test for at least 1/2hr to ensure that the newly installed PLC components are satisfactorily supplied by the existing site power system.

5. Phase 1 Project Sites - Trial Period:

- a. Phase 1 project sites are defined per Appendix 17000-A.
- b. Phase 1 Sites that have satisfactorily completed Operational Testing, shall be individual activated and automatically run for five(5) consecutive days, 24 hours per day, commencing on a Monday through Friday – known as the “Trial Period”.
- c. During the Trial Period the Owner’s Representative will test all modes of operation and will look for errors and malfunctions.
- d. If equipment failure occurs during the trial period, the Contractor shall repair or replace the defective equipment and shall begin another trial period, Monday through Friday.
- e. This test shall be repeated until all new equipment functions acceptably and without failure for consecutive days.
- f. Four(4) hour response time shall be maintained by the SI during the Phase 1 Trial Period for each Site.

6. Phase 2 Project Sites - Trial Period:

- a. Phase 2 project sites are defined per Appendix 17000-A, as

SECTION 17490 – FACTORY AND FIELD TESTING

DCMWTP and 4SWRF.

- b. Phase 2 Sites that have satisfactorily completed Operational Testing, shall be individual activated and automatically run for thirty(30) consecutive days, 24 hours per day – known as the “Trial Period”.
- c. During the Trial Period the Owner's Representative will test all modes of operation and will look for errors and malfunctions.
- d. If equipment failure occurs during the trial period, the Contractor shall repair or replace the defective equipment and shall begin another trial period, Monday through Friday.
- e. This test shall be repeated until all new equipment functions acceptably and without failure for consecutive days.
- f. The SI shall remain onsite during business hours, and have technical staffing residing locally for immediate response with the 1st – 48 hours commencement of each Phase 2 –site. Beyond the 1st 48 hours of the Trial Period, a four(4) hour response time to the site must be maintained by the SI for Phase 2 Sites.

3.4 WARRANTY

- A. The completion of the above tests does not relieve the Contractor from any warranties specified in the Specifications or other sections.
- B. Three(3) distinct Warranty Periods are defined for completion of OMWD facilities, and shall commence as follows:
 - 1. Project Phase 1a and 1b Completion of Both
 - 2. Project Phase 2a Completion – DCMWTP
 - 3. Project Phase 2b Completion – 4SWRF

3.5 FINAL ACCEPTANCE

- A. All other Final Acceptance shall be completed as specified in the Specifications or other sections.

****END OF SECTION****