

**Wastewater Treatment Facility
Supervisory Control and Data Acquisition
(SCADA) System Cybersecurity Upgrades
Contract NO. 2022-100**

**Contract Documents and
Technical Specifications**

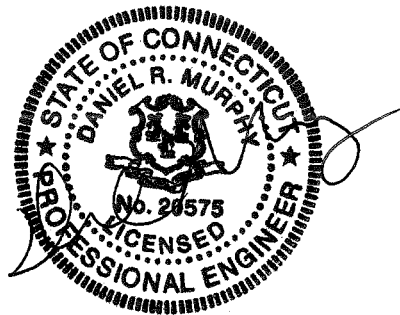
Prepared for:

***Town of Stafford,
Connecticut***

***Water Pollution Control
Authority***

Issue Date:

October 2022



**CDM
Smith**

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Table of Contents

Division	Section Title
DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS	
001117	Invitation to Bid
002113.16	Instructions to Bidders
004113.16	Bid Form
005214.16	Agreement
006113.16	Performance Bond
006115.16	Payment Bond
007200.16	General Conditions
007300.16	Supplementary Conditions
DIVISION 01 - GENERAL REQUIREMENTS	
011000	Summary
012001	Price and Payment
012600	Contract Change Procedures
012900	Payment Procedures
013100	Project Management and Coordination
013200	Construction Progress Documentation
013233	Photographic Documentation
013300	Submittal Procedures
013513.24	Special Procedures for Maintenance of Plant Operation and Sequence of Construction
014000	Quality Requirements
016000	Product Requirements
017300	Execution
017700	Closeout Procedures
017823	Operation and Maintenance Data
017839	Project Record Documents
017900	Demonstration and Training
019113	General Commissioning Requirements
DIVISION 26 - ELECTRICAL	
260510	Limited Electrical for Small Projects
DIVISION 27 - COMMUNICATIONS	
271116	Communications Racks, Frames, and Enclosures
271513	Communications Copper Horizontal Cabling
271523	Communications Optical Fiber Horizontal Cabling
DIVISION 40 - PROCESS INTERCONNECTIONS	
406100	Process Control and Enterprise Management Systems General Provisions
406121.10	Process Control System Testing
406126	Process Control System Training
406213	Server Computers

Division	Section Title
406216	Operator Workstation Computers
406219	Industrial Computer
406229	Tablet Computers and Mobile Devices
406243	Large Display Screens
406343	Programmable Logic Controllers
406613	Switches and Routers
406616	Firewall Hardware New
406626	Device Network Equipment
406643	Wireless Network Equipment
406733	Panel Wiring
406823	Reporting Software
406893	System Support Software

Appendix A – Neuros Quote

END OF TABLE OF CONTENTS

SECTION 001116.16 - INVITATION TO BID

TOWN OF STAFFORD, CONNECTICUT WPCA
WASTEWATER TREATMENT FACILITY
SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM AND
CYBERSECURITY UPGRADES
CONTRACT NO. 2022-100

INVITATION TO BID

Sealed Bids for construction of the Stafford Wastewater Treatment Facility Supervisory Control and Data Acquisition (SCADA) System and Cybersecurity Upgrades will be received by the Town of Stafford, Connecticut Water Pollution Control Authority Office, 50 River Road, Stafford, CT 06076 until 2:00 PM, January 5, 2023 and will be publicly opened and read aloud at that time and location.

The work consists of furnishing all labor, materials and equipment necessary to install an upgrade of the Water Treatment Plant's Supervisory Control and Data Acquisition (SCADA) system consisting of a SCADA Rack, servers, Programmable Logic Controller processors, software, communications systems, system configuration and integration, cybersecurity, and all miscellaneous work and cleanup specified or required to complete the work.

The Contract Time shall be 365 Calendar Days commencing ten days following the Effective Date of the Agreement. All work shall be completed within 365 Calendar Days commencing ten days following the Effective Date of the Agreement.

Contract Documents are available for purchase or may be examined from the online plan room at www.advancedrepro.net hosted by Advanced Reprographics 50 Corporate Avenue, Plainville Connecticut.

Each Bid shall be submitted in accordance with the Instructions to Bidders and shall be accompanied by a Bid Security in the amount of five percent of the Bid.

Bidders may not withdraw their Bids for a period of sixty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids.

The Successful Bidder must furnish a 100 percent Performance Bond and a 100 percent Payment Bond with a surety company acceptable to the Owner.

Complete instructions for filing Bids are included in the Instructions to Bidders.

Minimum wage rates for this Project are subject to both the state prevailing wage rates as per Connecticut General Statutes 31-53 and to the Federal Davis Bacon Wage Rates. It is the responsibility of the Contractor, before bid opening, to request if necessary, any additional information on Minimum Wage Rates for those tradespeople who may be employed for the proposed work under this Contract.

The Town of Stafford encourages the use of Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) participation on this project.

This project is being partially funded by American Rescue Plan Act of 2021 and is subject to applicable

requirements. It is NOT subject to American Iron and Steel (AIS) or Build America, Buy America (BABA) requirements.

Award of the Contract will be contingent on the Town's needs, appropriation, and availability of funds. The Owner reserves the right to waive any informality in or to reject any or all Bids if deemed to be in its best interest.

MR. SCOTT BONETT
WPCA CHAIRMAN
TOWN OF STAFFORD, CT

END OF DOCUMENT 001116.16

SECTION 002113.16 - INSTRUCTIONS TO BIDDERS

TOWN OF STAFFORD, CONNECTICUT WPCA WASTEWATER TREATMENT FACILITY SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM AND CYBERSECURITY UPGRADES CONTRACT NO. 2022-100

INSTRUCTIONS TO BIDDERS

ARTICLE 1. QUALIFICATIONS OF BIDDERS

1.1 Bidders may be investigated by OWNER to determine if they are qualified to perform the Work. All Bidders shall be prepared to submit within five days of OWNER's or ENGINEER's request, written evidence of such information and data necessary to make this determination.

1.2 The investigation of a Bidder will seek to determine whether the organization is adequate in size, is authorized to do business in the jurisdiction where the project is located, has had previous experience and whether available equipment and financial resources are adequate to assure OWNER that the Work will be completed in accordance with the terms of the Agreement. The amount of other work to which the Bidder is committed may also be considered.

1.3 In evaluating Bids, OWNER will consider the qualifications of only those Bidders whose Bids are in compliance with the prescribed requirements.

1.4 OWNER reserves the right to reject any Bid if the evidence submitted by, or the investigation of, such Bidder fails to satisfy OWNER that such Bidder is properly qualified to carry out the obligations of the Contract Documents and to complete the Work contemplated therein.

ARTICLE 2. COPIES OF CONTRACT DOCUMENTS

2.1 Complete sets of Contract Documents shall be used in preparing Bids; neither OWNER nor ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

2.2 OWNER and ENGINEER in making copies of Contract Documents available do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

ARTICLE 3. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

3.1 Before submitting a Bid, each Bidder must (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may in any manner affect cost, progress or performance of the Work, (c) become familiar with Federal, State and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work; and (d) study and carefully correlate Bidder's observations with the requirements of the Contract Documents.

3.2 Before submitting a Bid, Bidders may, at their own expense, make such [additional] investigations and tests as they may deem necessary to determine their Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

3.3 On request, OWNER will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for the submission of a Bid.

3.4 The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by CONTRACTOR in performing the Work are identified in the Supplementary Conditions, General Requirements or on the Drawings.

3.5 The submission of a Bid will constitute an incontrovertible representation that the Bidder has complied with every requirement of this Article 3 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

ARTICLE 4. INTERPRETATIONS

4.1 All questions about the meaning or intent of the Contract Documents shall be received in writing by email to Joshua Bryant, PE, Project Engineer, CDM Smith, at bryantjc@cdmsmith.com at least ten days before the date set herein for the opening of bids.

4.2 Written clarifications or interpretations will be issued by Addenda not later than five days before the bid opening date. Only questions answered by formal written Addenda will be binding. Oral and other clarifications or interpretations will be without legal effect.

4.3 Bidders are responsible for determining that they have received all Addenda issued.

ARTICLE 5. NOT USED

ARTICLE 6. BID SECURITY

6.1 Each Bid must be accompanied by cash, bid bond, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to OWNER. The Bid Security shall be in the amount stated in the Invitation to Bid. Bid Security shall be sealed in a separate envelope from the Bid and then attached to the envelope containing the Bid. All Bid Securities except those of the three lowest responsible and eligible Bidders will be returned within five days, Saturdays, Sundays, and legal holidays excluded, after opening of the Bids. All Bid Securities will be returned on the execution of the Agreement or if no award is made, within thirty days, excluding Saturdays, Sundays and legal holidays after the actual date of opening of the Bids, unless forfeited under the conditions herein stipulated.

6.2 In case a party to whom a Contract is awarded shall fail or neglect to execute the Agreement and furnish the satisfactory bonds within the time specified, OWNER may determine that the Bidder has abandoned the Contract, and thereupon the Bid Forms and acceptance shall be null and void and the Bid Security accompanying the Bid Form shall be forfeited to OWNER as liquidated damages for such failure or neglect and to indemnify said OWNER for any loss which may be sustained by failure of the Bidder to execute the Agreement and furnish the bonds as aforesaid, provided that the amount forfeited to OWNER shall not exceed the difference between the Bid Price of said Bidder and that of the next lowest responsible and eligible bidder and provided further that, in case of death, disability, or other unforeseen circumstances affecting the Bidder, such Bid Security may be returned to the Bidder. After execution of the Agreement and acceptance of the bonds by OWNER, the Bid Security accompanying the Bid Form of the Successful Bidder will be returned.

ARTICLE 7. PERFORMANCE, PAYMENT AND OTHER BONDS

7.1 Performance, Payment and other Bonds shall be provided in accordance with Article 6 of the Conditions of the Contract.

7.2 All Bonds required as Contract Security shall be furnished with the executed Agreement.

ARTICLE 8. BID FORM

8.1 Each Bid shall be submitted on the Bid Form on the perforated pages appended to the Project Manual. The Bid Form shall be removed and submitted separately. All blank spaces for Bid prices must be filled in with the unit price for the item or the lump sum for which the Bid is made.

8.2 Bid Forms shall be completed in ink or by typewriter. The Bid price of each item on the form shall be stated in words, and figures. If unit prices are required on the Bid Form, discrepancies between unit prices and their respective total amounts will be resolved in favor of the unit prices. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

8.3 Bids by corporations shall be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

8.4 Bids by Limited Liability Companies shall be executed in the Limited Liability name by the Manager (or other Limited Liability Company officer/representative accompanied by evidence of authority to sign.) The Limited Liability Company address and state where the Limited Liability Company was formed shall be shown below the signature.

8.5 Bids by partnerships shall be executed in the partnership name and signed by a partner, whose title shall appear under the signature. The official address of the partnership shall be shown below the signature.

8.6 All names shall be typed or printed below the signature.

8.7 The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

8.8 The address to which communications regarding the Bid are to be directed shall be shown.

8.9 One copy of each Bid shall be submitted in a sealed opaque envelope bearing on the outside the Bidder's name, address, and the Project Title for which the Bid is submitted. (If forwarded by mail, Bid and sealed envelope marked as described above shall be enclosed in another envelope with the notation "BID ENCLOSED" on the face and addressed as indicated in the Invitation to Bid.)

ARTICLE 9. RECEIPT OF BIDS

9.1 Sealed Bids for the work of this Contract will be received at the time and place indicated in the Invitation to Bid.

9.2 OWNER may consider informal any Bid not prepared and submitted in accordance with the provisions hereof.

9.3 Bidders are cautioned that it is the responsibility of each individual bidder to assure that their bid is in the possession of the responsible official or the designated alternate prior to the stated time and at the place of the Bid Opening. Owner is not responsible for bids delayed by mail and/or delivery services, of any nature.

ARTICLE 10. MODIFICATION AND WITHDRAWAL OF BIDS

10.1 Bids may be modified only by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

10.2 Bids may be withdrawn prior to the scheduled time (or authorized postponement thereof) for the opening of Bids.

10.3 Any Bid received after the time and date specified shall not be considered. No Bid may be withdrawn for a period of thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids.

ARTICLE 11. AWARD OF CONTRACT

11.1 The Contract will be awarded to the lowest responsible and eligible Bidder (Successful Bidder). Such a Bidder shall possess the skill, ability, and integrity necessary for the faithful performance of the work. The term "lowest responsible and eligible Bidder" as used herein shall mean the Bidder whose Bid is the lowest of those Bidders possessing the skill, ability and integrity necessary to the faithful performance of the Work.

11.2 OWNER reserves the right to reject any and all Bids, to waive any and all informalities if it is in Owner's best interest to do so, and the right to disregard all nonconforming, non-responsive or conditional Bids.

11.3 A Bid which includes for any item a Bid Price that is abnormally low or high may be rejected as unbalanced.

11.4 OWNER also reserves the right to reject the Bid of any Bidder that OWNER considers to be unqualified relative to Article 1 above.

11.5 If the Contract is to be awarded, OWNER will give the Successful Bidder a Notice of Award within thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids. All bids shall remain open for thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids but OWNER may, at OWNER's sole discretion, release any Bid and return the Bid Security prior to that date.

ARTICLE 12. EXECUTION OF AGREEMENT

12.1 When OWNER gives a Notice of Award to the Successful Bidder, it will be accompanied by at least six unsigned copies of the Agreement and all other applicable Contract Documents. Within five days, excluding Saturdays, Sundays and legal holidays, after the date of receipt of such notification CONTRACTOR shall execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER.

ARTICLE 13. SAFETY AND HEALTH REGULATIONS

13.1 This project is subject to the Safety and Health Regulations (CFR 29, Part 1926 and all subsequent amendments) as promulgated by the U.S. Department of Labor on June 24, 1974 and CFR 29, Part 1910, General Industry Safety and Health Regulations Identified as Applicable to Construction.

13.2 The Successful Bidder shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (PL-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-54).

13.3 The Successful Bidder shall have a competent person or persons, as required under the Occupational Safety and Health Act, on the Site to inspect the Work and to supervise the conformance of the Work with the regulations of the Act.

ARTICLE 14. FEDERAL WAGE RATES

14.1 Davis Bacon (DB) Prevailing Wage Requirements

14.1.1 The following clauses shall apply to any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2012 Appropriations Act, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1 (b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The Owner(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known) or their representatives, and the Owner(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the Owner(s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Owner(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The Owner(s) shall, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, their correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the Owner, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the Owner shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Owner(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the Owner(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or its agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in their first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where

a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1,3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Owner(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(11) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

15.1.2 Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full shall apply to any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall apply in addition to the clauses required by Item 1, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The Owner, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor

under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 1, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Owner shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Owner shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

14.2 It is the responsibility of the Contractor before the bid opening to request, if necessary, any additional information on Federal Wage Rates for those tradespeople who are not covered by the applicable Federal Wage Determination, but who may be employed for the proposed work under this Contract.

14.3 Building rates will apply to all work associated with the construction of all the buildings. Those rates will apply to the complete structure, including the foundation, and the installation of all equipment and utilities within and below the structure. Where utility lines pass out through the walls of the structure, building rates will apply up to five feet outside the walls.

14.4 All other construction will be covered by Heavy and Highway Rates.

MR. SCOTT BONETT
WPCA CHAIRMAN
TOWN OF STAFFORD, CT

END OF DOCUMENT 002114

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SECTION 004113.16 - BID FORM

BID FORM
TO

TOWN OF STAFFORD, CONNECTICUT WPCA
WASTEWATER TREATMENT FACILITY
SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM AND
CYBERSECURITY UPGRADES
CONTRACT NO. 2022-100

The undersigned declares that the only persons or parties interested in this Bid as principals are as stated; that the Bid is made without any collusion with other persons, firms, or corporations; that all the Contract Documents as prepared by CDM Smith, 77 Hartland Street, East Hartford, CT 06108 and dated October 2022, have been carefully examined; that the undersigned is fully informed in regard to all conditions pertaining to the Work and the place where it is to be done, and from them the undersigned makes this Bid. These prices shall cover all expenses incurred in performing the Work required under the Contract Documents, of which this Bid Form is a part.

The Bid Security accompanying this Bid shall be in the amount of 5 percent of the Bid.

If a Notice of Award accompanied by at least six unsigned copies of the Agreement and all other applicable Contract Documents is delivered to the undersigned within thirty days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening of the Bids, the undersigned will within five days, excluding Saturdays, Sundays, and legal holidays, after the date of receipt of such notification, execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER. The premiums for all Bonds required shall be paid by CONTRACTOR and shall be included in the Contract Price. The undersigned Bidder further agrees that the Bid Security accompanying this Bid shall become the property of OWNER if the Bidder fails to execute the Agreement as stated above.

The Bid Security shall be sealed in a separate envelope from the Bid and then attached to the envelope containing the Bid.

The undersigned hereby agrees that the Contract Time shall commence 10 days following the Effective Date of the Agreement and to fully complete the Work within 365 Calendar Days and in accordance with the terms as stated in the Agreement. The undersigned further agrees to pay OWNER, as liquidated damages, \$1,000 per day for each calendar day beyond the Contract Time Limit or extension thereof that the Work remains incomplete, in accordance with the terms of the Agreement.

The undersigned acknowledges receipt of addenda numbered:

In accordance with the above understanding, the undersigned proposes to perform the Work, furnish all materials and complete the Work in its entirety in the manner and under the conditions required at the prices listed as follows:

BID ITEM		ESTIMATED QUANTITY	COST PER UNIT	TOTAL COST
1.0	Construction of SCADA and Cybersecurity Upgrade and all other work, complete as shown on the Drawings and as specified herein, except equipment included in Bid Item 2 below.	Lump Sum	\$ _____	\$ _____
2.0	Equipment and service provided by APG Neuros as described in their proposal letter dated December 14, 2022 and included in Appendix A.	Lump Sum	\$76,650	\$76,650
Total Bid Items 1.0 - 2.0			\$ _____	

TOTAL BID for the Contract Price of:

_____.
(amount in words)

The undersigned agrees that extra work, if any, will be performed and will be paid for in accordance with Article 11 of the Conditions of the Contract.

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, bailing, shoring, removal, overhead, profit, insurance and incidentals required to complete the Work.

The names and residences of all persons and parties interested in the foregoing Bid as principals are as follows:

(Give first and last names in full. In the case of a corporation, see Article 8.3 of the Instructions to Bidders, in the case of a limited liability company (LLC), see Article 8.4 of the Instructions to Bidders, in the case of a partnership, see Article 8.5 of the Instructions to Bidders.)

The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.

The undersigned hereby certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this section, the word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity.

Social Security Number
or Federal Identification
Number

Signature of Individual or
Corporate Name

By: _____
Corporate Officer
(if applicable)

Notice of acceptance should be mailed, faxed, or delivered to the following:

(Name)

By: _____
(Title)

(Business Address)

(City and State)

Date _____

If the Bidder is a corporation, indicate State of incorporation under signature, and affix corporate seal; if a partnership, give full names and residential addresses, if different from business address.

END OF SECTION 004113

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SECTION 005214.16 – AGREEMENT

TOWN OF STAFFORD, CONNECTICUT WPCA
WASTEWATER TREATMENT FACILITY
SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM AND
CYBERSECURITY UPGRADES
CONTRACT NO. 2022-100

AGREEMENT

THIS AGREEMENT made as of the _____ day of _____ in the year 20__ by and between Town of Stafford, Connecticut, acting through its Water Pollution Control Authority, hereinafter called OWNER and _____ with legal address and principal place of business at _____ hereinafter called CONTRACTOR. OWNER and CONTRACTOR in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK

1.1 CONTRACTOR shall perform the Work as specified or indicated in the Contract Documents. The Work is as described in SECTION 011000.

ARTICLE 2. ENGINEER

2.1 The Project has been designed by CDM Smith, 77 Hartland Street, Suite 201 who will act as ENGINEER in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 3. CONTRACT TIME

3.1 The Contract Time shall be 365 Calendar Days commencing ten days following the Effective Date of this Agreement.

3.2 CONTRACTOR agrees that the Work shall be prosecuted regularly, diligently and uninterruptedly and at such rate of progress as will insure full completion thereof within the Contract Time stated above. It is expressly understood and agreed, by and between CONTRACTOR and OWNER that the Contract Time is reasonable for the completion of the Work, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

ARTICLE 4. CONTRACT PRICE.

4.1 OWNER will pay CONTRACTOR for performance of the Work in accordance with the Contract Documents in current funds at the Contract Price agreed upon in the CONTRACTOR's Bid Form attached to this Agreement.

ARTICLE 5. APPLICATIONS FOR PAYMENT

5.1 CONTRACTOR shall submit Applications for Payment in accordance with Article 15 of the Conditions of the Contract. Applications for Payment will be processed by ENGINEER as provided in the Conditions of the Contract.

ARTICLE 6. PROGRESS AND FINAL PAYMENTS

6.1 OWNER will make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, monthly during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the schedule of values provided for in Paragraph 15.01. of the Conditions of the Contract.

6.2 Upon Substantial Completion, OWNER will pay an amount sufficient to increase total payments to CONTRACTOR to 99 percent of the Contract Price, less retainages as ENGINEER shall determine, in accordance with Paragraph 15.01. of the Conditions of the Contract.

6.3 Upon final inspection and acceptance of the Work, in accordance with Paragraph 15.06. of the Conditions of the Contract, OWNER will pay the remainder of the Contract Price as recommended by ENGINEER.

ARTICLE 7. LIQUIDATED DAMAGES

7.1 OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the Contract Time specified in Article 3 above, plus any extensions thereof allowed in accordance with Article 11 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER \$1000 per day for each calendar day of delay until the Work is complete.

7.2 Provided, that CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is for reasons included in Paragraph 4.05. of the General Conditions.

7.3 Provided, further, that CONTRACTOR shall furnish OWNER the required notification of such delays in accordance with Paragraph 11.06. of the General Conditions.

ARTICLE 8. ASSURANCE

8.1 CONTRACTOR has familiarized himself with the nature and extent of the Contract Documents, Work, locality, and with all local conditions and Federal, State and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work.

8.2 CONTRACTOR has made or caused to be made examinations, investigations and tests and studies of such reports and related data as CONTRACTOR deems necessary for the performance of the Work at the Contract Price within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required for such purposes.

8.3 CONTRACTOR has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.

8.4 CONTRACTOR has given ENGINEER written notice of any conflict, error or discrepancy that CONTRACTOR has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

8.5 CONTRACTOR agrees that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

ARTICLE 9. CONTRACT DOCUMENTS

9.1 The Contract Documents which comprise the Contract between OWNER and CONTRACTOR are attached hereto and made a part hereof and consist of the following:

9.1.1 Invitation To Bid.

9.1.2 Instructions To Bidders.

9.1.3 Bid Form.

9.1.4 This Agreement.

9.1.5 Performance Bond, EJCDC Document C-610, 2013 edition, Payment Bond, EJCDC Document C-615, 2013 edition, and other required Bonds.

9.1.6 General Conditions, EJCDC Document No. C-700, 2013 edition.

9.1.7 Supplementary Conditions Parts I and II.

9.1.8 Specifications (as listed in Table of Contents).

9.1.9 Drawings, numbered I-1 through E-2 inclusive and dated October 2022.

9.1.10 Addenda numbers _____ to _____, inclusive.

9.1.11 Any modification, including Change Orders, duly delivered after execution of Agreement.

ARTICLE 10. MISCELLANEOUS

10.1 Terms used in this Agreement which are defined in Article 1 of the Conditions of the Contract shall have the meanings assigned in the Conditions of the Contract.

10.2 Neither OWNER nor CONTRACTOR shall, without the prior written consent of the other, assign or sublet in whole or in part any interest under any of the Contract Documents; and, specifically but without limitation, CONTRACTOR shall not assign any monies due or to become due without the prior written consent of OWNER. In case CONTRACTOR assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to CONTRACTOR shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the Work called for in this Contract.

10.3 OWNER and CONTRACTOR each binds themselves, their partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

10.4 The Contract Documents constitute the entire agreement between OWNER and CONTRACTOR and may only be altered, amended or repealed by a Modification.

IN WITNESS WHEREOF, the parties hereto have signed this Agreement in sextuple. Four copies each have been delivered to OWNER and one copy each to CONTRACTOR and ENGINEER. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or by ENGINEER on their behalf.

This Agreement shall become effective on _____, 20__.

CONTRACTOR

OWNER

BY

BY

(CORPORATE SEAL)

(CORPORATE SEAL)

Attest

Attest

Address for giving notices

Address for giving notices

Note: If CONTRACTOR is a corporation, an affidavit giving the principal the right to sign the Agreement must accompany the executed Agreement.

END OF DOCUMENT 005214

PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form: None See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal *(seal)*

Surety's Name and Corporate Seal *(seal)*

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:
 - 3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
 - 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.
7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

- 7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
- 7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
14. Definitions
- 14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
- 14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
- 14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
- 14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
16. Modifications to this Bond are as follows:

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PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*:

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: None See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

(seal)
Contractor's Name and Corporate Seal

(seal)
Surety's Name and Corporate Seal

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
 - 5.1 Claimants who do not have a direct contract with the Contractor,
 - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2 Pay or arrange for payment of any undisputed amounts.
 - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
 12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
 13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
 14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
 15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
- 16. Definitions**
- 16.1 **Claim:** A written statement by the Claimant including at a minimum:
 1. The name of the Claimant;
 2. The name of the person for whom the labor was done, or materials or equipment furnished;
 3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 4. A brief description of the labor, materials, or equipment furnished;
 5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
 - 16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
 - 16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 7. The total amount of previous payments received by the Claimant; and
 8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
18. Modifications to this Bond are as follows:

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SECTION 007200 - GENERAL CONDITIONS

**STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT**

Prepared by



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STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
ARTICLE 1 – Definitions and Terminology	1
1.01 Defined Terms	1
1.02 Terminology	5
ARTICLE 2 – Preliminary Matters.....	6
2.01 Delivery of Bonds and Evidence of Insurance	6
2.02 Copies of Documents	7
2.03 Before Starting Construction	7
2.04 Preconstruction Conference; Designation of Authorized Representatives	7
2.05 Initial Acceptance of Schedules	8
2.06 Electronic Transmittals.....	8
ARTICLE 3 – Documents: Intent, Requirements, Reuse	9
3.01 Intent.....	9
3.02 Reference Standards	9
3.03 Reporting and Resolving Discrepancies	9
3.04 Requirements of the Contract Documents	10
3.05 Reuse of Documents	11
ARTICLE 4 – Commencement and Progress of the Work.....	11
4.01 Commencement of Contract Times; Notice to Proceed	11
4.02 Starting the Work.....	11
4.03 Reference Points	11
4.04 Progress Schedule	12
4.05 Delays in Contractor’s Progress	12
ARTICLE 5 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions	13
5.01 Availability of Lands	13

5.02	Use of Site and Other Areas	13
5.03	Subsurface and Physical Conditions.....	15
5.04	Differing Subsurface or Physical Conditions	15
5.05	Underground Facilities	17
5.06	Hazardous Environmental Conditions at Site	19
ARTICLE 6 – Bonds and Insurance		21
6.01	Performance, Payment, and Other Bonds	21
6.02	Insurance—General Provisions	21
6.03	Contractor’s Insurance	23
6.04	Owner’s Liability Insurance	25
6.05	Property Insurance	25
6.06	Waiver of Rights	27
6.07	Receipt and Application of Property Insurance Proceeds	28
ARTICLE 7 – Contractor’s Responsibilities		29
7.01	Supervision and Superintendence	29
7.02	Labor; Working Hours	29
7.03	Services, Materials and Equipment.....	29
7.04	“Or Equals”	30
7.05	Substitutes	31
7.06	Concerning Subcontractors, Suppliers, and Others	33
7.07	Patent Fees and Royalties	34
7.08	Permits	35
7.09	Taxes	35
7.10	Laws and Regulations.....	35
7.11	Record Documents.....	36
7.12	Safety and Protection.....	36
7.13	Safety Representative	37
7.14	Hazard Communication Programs	37

7.15	Emergencies	37
7.16	Shop Drawings, Samples, and Other Submittals.....	38
7.17	Contractor’s General Warranty and Guarantee.....	40
7.18	Indemnification	41
7.19	Delegation of Professional Design Services	42
ARTICLE 8 – Other Work at the Site		42
8.01	Other Work	42
8.02	Coordination	43
8.03	Legal Relationships.....	43
ARTICLE 9 – Owner’s Responsibilities.....		44
9.01	Communications to Contractor.....	44
9.02	Replacement of Engineer	45
9.03	Furnish Data	45
9.04	Pay When Due.....	45
9.05	Lands and Easements; Reports, Tests, and Drawings	45
9.06	Insurance.....	45
9.07	Change Orders.....	45
9.08	Inspections, Tests, and Approvals.....	45
9.09	Limitations on Owner’s Responsibilities	45
9.10	Undisclosed Hazardous Environmental Condition.....	46
9.11	Evidence of Financial Arrangements.....	46
9.12	Safety Programs	46
ARTICLE 10 – Engineer’s Status During Construction		46
10.01	Owner’s Representative.....	46
10.02	Visits to Site.....	46
10.03	Project Representative.....	47
10.04	Rejecting Defective Work.....	47
10.05	Shop Drawings, Change Orders and Payments.....	47

10.06	Determinations for Unit Price Work	47
10.07	Decisions on Requirements of Contract Documents and Acceptability of Work	47
10.08	Limitations on Engineer’s Authority and Responsibilities.....	47
10.09	Compliance with Safety Program.....	48
ARTICLE 11 – Amending the Contract Documents; Changes in the Work		48
11.01	Amending and Supplementing Contract Documents	48
11.02	Owner-Authorized Changes in the Work	49
11.03	Unauthorized Changes in the Work	49
11.04	Change of Contract Price	50
11.05	Change of Contract Times	51
11.06	Change Proposals	51
11.07	Execution of Change Orders.....	52
11.08	Notification to Surety.....	52
ARTICLE 12 – Claims		53
12.01	Claims	53
ARTICLE 13 – Cost of the Work; Allowances; Unit Price Work		54
13.01	Cost of the Work	54
13.02	Allowances	57
13.03	Unit Price Work	57
ARTICLE 14 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work		58
14.01	Access to Work.....	58
14.02	Tests, Inspections, and Approvals.....	58
14.03	Defective Work	59
14.04	Acceptance of Defective Work.....	60
14.05	Uncovering Work	60
14.06	Owner May Stop the Work	61
14.07	Owner May Correct Defective Work.....	61
ARTICLE 15 – Payments to Contractor; Set-Offs; Completion; Correction Period		61

15.01	Progress Payments	61
15.02	Contractor’s Warranty of Title	65
15.03	Substantial Completion	65
15.04	Partial Use or Occupancy	66
15.05	Final Inspection	67
15.06	Final Payment.....	67
15.07	Waiver of Claims	68
15.08	Correction Period	68
ARTICLE 16 – Suspension of Work and Termination		69
16.01	Owner May Suspend Work	69
16.02	Owner May Terminate for Cause.....	69
16.03	Owner May Terminate for Convenience.....	71
16.04	Contractor May Stop Work or Terminate	71
ARTICLE 17 – Final Resolution of Disputes		72
17.01	Methods and Procedures.....	72
ARTICLE 18 – Miscellaneous.....		72
18.01	Giving Notice	72
18.02	Computation of Times.....	72
18.03	Cumulative Remedies	72
18.04	Limitation of Damages	73
18.05	No Waiver	73
18.06	Survival of Obligations	73
18.07	Controlling Law	73
18.08	Headings.....	73

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer

concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to

conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives*:
 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

- C. *Day*:
1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective*:
1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide*:
1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

- B. *Evidence of Contractor's Insurance:* When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner's Insurance:* After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

- A. *Standards Specifications, Codes, Laws and Regulations:*
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check

and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and

binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the

Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site,

adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
2. is of such a nature as to require a change in the Drawings or Specifications; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection

therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
 - 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study

of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
- 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
- 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.
- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents,

or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments:*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such

actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
 - 4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
 - 1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 - 2. claims for damages insured by reasonably available personal injury liability coverage.
 - 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
 - 1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 - 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 - 3. Broad form property damage coverage.

4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may

be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

- I. *General provisions:* The policies of insurance required by this Paragraph 6.03 shall:
 1. include at least the specific coverages provided in this Article.
 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
6. extend to cover damage or loss to insured property while in transit.
7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
8. allow for the waiver of the insurer's subrogation rights, as set forth below.
9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and

damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, 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. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and

- 3) be suited to the same use as that specified.
- b. will state:
- 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
- c. will identify:
- 1) all variations of the proposed substitute item from that specified, and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
- d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to 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, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to 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, product, or device not specified in the Contract Documents.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals

and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them

in the protection, removal, relocation, and replacement of their property or work in progress.

- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a

change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding

the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying,

disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any

Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.
3. *Field Orders:* Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

- B. An adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
 - 1. a mutually acceptable fixed fee; or
 - 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.
 - 1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 - 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

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thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

- E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
3. by manufacturers of equipment furnished under the Contract Documents;
4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective

Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and

accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

- C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;

2. correct such defective Work;
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be

construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SECTION 007300.16 - SUPPLEMENTARY CONDITIONS

TABLE OF CONTENTS

PART I - AMENDMENTS TO GENERAL CONDITIONS

Article Number	Title
1	DEFINITIONS AND TERMINOLOGY
2	PRELIMINARY MATTERS
3	DOCUMENTS; INTENT, REQUIREMENTS, REUSE
4	COMMENCEMENT AND PROGRESS OF THE WORK
5	AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS
6	BONDS AND INSURANCE
7	CONTRACTOR'S RESPONSIBILITIES
8	OTHER WORK AT THE SITE
9	OWNER'S RESPONSIBILITIES
10	ENGINEER'S STATUS DURING CONSTRUCTION
11	AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK
13	COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK
14	TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK
15	PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD
16	SUSPENSION OF WORK AND TERMINATION
17	FINAL RESOLUTION OF DISPUTES
18	MISCELLANEOUS

PART II - FEDERAL AND STATE GOVERNMENT PROVISIONS

- 1.0. FEDERAL WAGE RATES
- 2.0. STATE WAGE RATES

SECTION 007300.16 - SUPPLEMENTARY CONDITIONS

PART 1 - AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC Document No. C-700, 2013 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01A.38.

Delete paragraph 1.01A.38. of the General Conditions in its entirety and replace with the following:

38. Specifications - Sections included under Division 01 through Division 40 of the Project Manual.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.01C.

Delete Paragraph 2.01C of the General Conditions in its entirety.

ARTICLE 3 - DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.01E.

Add the following new paragraph immediately after Paragraph 3.01E. of the General Conditions which is to read as follows:

F. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion.

ARTICLE 4 - COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01A.

Delete Paragraph 4.01A of the General Conditions in its entirety and replace with the following:

A. The Contract Time will commence to run on the tenth day following the Effective Date of the Agreement.

SC-4.03A.

Add the following new paragraph immediately after Paragraph 4.03A of the General Conditions which is to read as follows:

B. Engineer may check the lines, elevations, reference marks, batter boards, etc., set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for accurate construction of the entire Work. Contractor shall furnish personnel to assist Engineer in checking lines and grades.

ARTICLE 5 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.01A.

Add the following new paragraph immediately after Paragraph 5.01A. of the General Conditions which is to read as follows:

1. If all lands and rights-of-way are not obtained as herein contemplated before construction begins, Contractor shall begin the Work upon such land and rights-of-way as Owner has previously acquired.

SC-5.03

Delete Paragraphs 5.03A and 5.03B in their entirety and insert the following:

A. No reports of explorations or tests of subsurface conditions at or adjacent to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.

SC-5.06

Delete Paragraphs 5.06A and 5.06B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site, are known to Owner.

ARTICLE 6 - BONDS AND INSURANCE

SC-6.02C

Add the following paragraphs immediately after Paragraph 6.02C of the General Conditions which are to read as follows:

Contractor shall provide evidence of its insurance coverage on the ACORD certificate of insurance form and shall include the following statement in its entirety in the section of the form entitled "Description of Operations/Locations/Vehicles/Special Items".

The Town of Stafford, Connecticut and CDM Smith, and their officers, directors, partners, employees and other consultants and subcontractors are named as additional insureds with respect to the insured's Commercial General Liability, Automobile Liability and Pollution Liability Insurance Policies. All

insurers waive all rights of subrogation against the Town of Stafford, Connecticut and CDM Smith, their officers, directors, partners, employees and other consultants and subcontractors. All insurance is primary for all claims covered thereby. Commercial General Liability Insurance includes contractual liability coverage.

SC-6.03

Add the following new paragraph immediately after Paragraph 6.03.J of the General Conditions:

K. Additional Insureds: The Town of Stafford, Connecticut and CDM Smith, and their officers, directors, partners, employees and other consultants and subcontractors are named as additional insureds. All insurers waive all rights of subrogation against the Town of Stafford, Connecticut and CDM Smith, their officers, directors, partners, employees and other consultants and subcontractors. All insurance is primary for all claims covered thereby. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

1. 6.03.A Workers' Compensation and related coverages

- | | |
|---------------------------|---|
| (1) Worker's Compensation | Statutory |
| (2) Employer's Liability | \$500,000 Each Occurrence
\$500,000 Disease per employee |

2. 6.03B. and 6.03C. Commercial General Liability including Premise/Operations; Explosion, Collapse and Underground Property Damage; Products/Completed Operations, Contractual, Independent Contractors; Property Damage; and Personal Injury liabilities:

- | | | |
|------------------------------|-------------|------------------|
| (1) Bodily Injury: | \$1,000,000 | Each Occurrence |
| \$1,000,000 Annual Aggregate | | |
| (2) Property Damage: | \$1,000,000 | Each Occurrence |
| \$1,000,000 Annual Aggregate | | |
| (3) Personal Injury: | \$1,000,000 | Annual Aggregate |

3. 6.03D. Comprehensive Automobile Liability including all owned (private and others), hired and non-owned vehicles:

- | | | |
|---|-------------|-----------------|
| (1) Bodily Injury | \$1,000,000 | Each Person |
| \$1,000,000 Each Accident | | |
| (2) Property Damage: Each accident
or Combined Single Limit of | \$1,000,000 | Each Occurrence |

4. 6.03E Umbrella or Excess Liability:

- | | |
|-------------------|-------------|
| Per Occurrence | \$5,000,000 |
| General Aggregate | \$5,000,000 |

5. 6.03F Contractor's Pollution Liability:

Each Occurrence	\$2,000,000
General Aggregate	\$2,000,000

If box is checked, Contractor is required to provide Contractor's Pollution Liability insurance under this Contract.

6. 6.03H Contractor's Professional Liability:

Each Claim	\$1,000,000
Annual Aggregate	\$2,000,000

If box is checked, Contractor is required to provide Contractor's Professional Liability insurance under this Contract.

7. Owner's Liability Insurance: Here list additional types and amounts of insurance that may be required by Owner.

The issue of Owner's Liability Insurance should be discussed with the Owner. For an Owner's Protective Liability Policy, the Owner has three options: (1) provide their own Owner's Protective Policy; (2) have the Contractor issue an Owner's Protective Policy; or (3) do not require any Owner's Protective Liability Insurance.

If Owner will provide its own Owner's Liability Insurance, no change to GC 6.04 is required.

If Owner wants Contractor to provide the Owner's Liability Insurance, add the following SC-6.04A.

If the Owner does not require Owner's Liability, no change to GC 6.04 is required.

This issue needs to be discussed with the Owner. If Owner does not respond to the letter, the default shall be that Contractor provides the policy (Option 2).

Use the following paragraphs SC-6.04A and SC-6.04B when Contractor will provide Owner's Liability Insurance.

SC-6.04A.

Delete Paragraph 6.04A. of the General Conditions in its entirety and replace with the following:

A. Contractor shall purchase and maintain a separate Owner's Protective Liability policy, issued to Owner at the expense of Contractor, including Owner and Engineer as named insured. This insurance shall provide coverage for not less than the following amounts:

6.04A.1. Bodily Injury \$1,000,000 Each Occurrence

6.04A.2. Property Damage \$1,000,000 Each Occurrence
\$1,000,000 Annual Aggregate

SC-6.04B

Delete Paragraph 6.04B of the General Conditions in its entirety and replace with the following:

B. All policies required by this Paragraph 6.04 shall contain provisions to the effect that the insurer(s) waive all rights of subrogation against the Owner, Engineer and their officers, directors, partners, employees and other consultants and subcontractors of each and any of them.

ARTICLE 7 - CONTRACTOR'S RESPONSIBILITIES

SC-7.02

Add the following 2 new paragraphs immediately after Paragraph 7.02B. of the General Conditions which are to read as follows:

C. Regular working hours are defined as 8 hours per day, Monday through Friday, excluding holidays, between the hours of 7:00 AM and 3:30 PM. Requests to work other than regular working hours shall be submitted to Engineer not less than 48 hours prior to any proposed weekend work or scheduled extended work weeks. Occasional unscheduled overtime on weekdays may be permitted provided two hours' notice is given to Engineer.

D. Contractor shall reimburse the Owner for additional engineering and/or inspection costs incurred as a result of overtime work in excess of the regular working hours stipulated in Paragraph SC-7.02C. At Owner's option, overtime costs may either be deducted from the Contractor's monthly payment request or deducted from the Contractor's retention prior to release of final payment. Overtime costs for the Owner's personnel shall be based on the individual's current overtime wage rate. Overtime costs for personnel employed by the Engineer or Owner's independent testing laboratory shall be calculated in accordance with the terms of their respective contracts with the Owner.

SC-7.02B.

Add the following new paragraphs immediately after Paragraph 7.02B. of the General Conditions which are to read as follows:

E. This Agreement is subject to the applicable provisions of the Contract Work Hours and Safety Standards Act, Public Law 87-581, 87th Congress. No Contractor or Subcontractor contracting for any part of the Work shall require or permit any laborer or mechanic to be employed on the Work in excess of forty hours in any work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times that person's basic rate of pay for all hours worked in excess of forty hours in such work week.

F. Contractor shall employ only competent persons to do the work and whenever Owner shall notify Contractor, in writing, that any person on the Work appears to be incompetent, disorderly, or otherwise unsatisfactory, such person shall be removed from the Project and shall not again be employed on it except with the consent of Owner.

G. Contractor and Subcontractors shall, insofar as practicable, give preference in the hiring of workers for the Project to qualified local residents with first preference being given to citizens of the United States who have served in the armed forces of the United States and have been honorably discharged therefrom or released from active duty therein.

H. Contractor and all Subcontractors shall pay to all laborers and mechanics employed for the construction covered by this Contract the minimum rates of pay as determined by the Secretary of Labor in accordance with the Act of March 3, 1931, as amended, known as the Davis-Bacon Act (40 U.S.C. 276a through 276a-7). Furthermore, Contractor and Subcontractors shall adhere to the stipulations and provisions published by the Secretary of Health, Education, and Welfare in "Labor Standards (Federal Water Pollution Control Act)." The Wage Rate Schedule as prepared by the Secretary of Labor and the "Labor Standards" are part of this Contract and are included in PART II of these Supplementary Conditions.

I. Except as may be otherwise required by law, all claims and disputes pertaining to the classification of labor employed on the project under this Contract shall be decided by the governing body having jurisdiction.

J. Contractor and all Subcontractors shall comply with the Regulations of the Secretary of Labor made pursuant to the Anti-Kickback Act of June 30, 1940 (40 U.S.C. 276c) and all amendments or modifications thereto. Contractor and all Subcontractors shall furnish Owner with weekly Statements of Compliance. In case of Subcontracts, Contractor shall cause appropriate provision to be inserted in all subcontracts for the Work which Contractor may let to ensure compliance with said Anti-Kickback Act by all Subcontractors subject thereto, and Contractor shall be responsible for the submission of all Statements of Compliance required of Subcontractors by said Anti-Kickback Act except as the Secretary of Labor may specifically provide for reasonable limitations, variations, and exemptions from the requirements thereof. These Regulations are part of this Contract and are included in PART II of these Supplementary Conditions.

SC-7.07B

Delete Paragraph 7.07B of the General Conditions in its entirety.

SC-7.09A

Add the following new sentences at the end of Paragraph 7.09A of the General Conditions to read as follows:

The materials and supplies to be used in the Work of this Contract are exempt from the Sales and Use Tax of the State of Connecticut. Contractor shall obtain the proper certificates, maintain the necessary records and otherwise comply with the requirements of Chapter 219 of the Connecticut General Statutes and any amendments thereto.

SC-7.15A.

Delete the last sentence in Paragraph 7.15A. of the General Conditions in its entirety and replace with the following:

If Engineer determines that the incident giving rise to the emergency action was not the responsibility of the Contractor and that a change in the Contract Document is required because of the action taken by the Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

SC-7.17A.

Add the following new paragraph immediately after Paragraph 7.17A. of the General Conditions which is to read as follow:

B. The Contractor guarantees that the Work and Services to be performed under the Contract, and all workmanship, materials and equipment performed, furnished, used or installed in the construction of the same shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, Specifications, and other Contract Documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the Contract shall be fulfilled. This guarantee shall be for a period of one year from and after the date of substantial completion. If part of the Work is accepted in accordance with Paragraph 15.04 of the General Conditions, the guarantee for that part of the Work shall be for a period of one year from the date fixed for such acceptance.

1. If at any time within the said period of guarantee any part of the Work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, corrections or replacements to the satisfaction of the Owner within seven (7) days from the date of receipt of such notice, or having commenced fails to prosecute such Work with diligence, the Owner may employ other persons to make said repairs, correction or replacements, and charge the costs, including compensation for additional professional services, to the Contractor.

2. The Contractor's guarantee under Paragraphs 7.17A and 7.17B, is in addition to the Contractor's express or implied warranties under this Contract and State law and in no way diminish any other rights that the Owner may have against the Contractor.

SC-7.17B., C. and D.

Renumber Paragraphs 7.17B., 7.17C and 7.17D. of the General Conditions to read 7.17C., 7.17D. and 7.17E.

SC-7.17E.

Add the following new paragraph immediately after Paragraph 7.17E. of the General Conditions which is to read as follows:

F. Manufacturer's Guaranty/Warranty

1. The Contractor shall obtain the following guaranty/warranty from the manufacturer of all major pieces of equipment furnished and installed on this Project. Such guaranty/warranty shall be for the benefit of Owner and be furnished in writing by the manufacturer. The Contractor's and manufacturer's obligations under this provision are in addition to other express or implied warranties under the Contract Documents and under the law and in no way diminish any other right that the Owner may have against the Contractor or manufacturer for faulty material, equipment or work. The warranty period shall not be interpreted as a limitation on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

2. The manufacturer warrants and guarantees for a period of one year from the date of Substantial Completion, or such longer period that may be specified in the Contract Documents, that all materials and equipment furnished and installed shall be free from flaws, defects in material and workmanship and shall be in conformance with the Contract Documents.

SC-7.18A.

Delete Paragraph 7.18A of the General Conditions in its entirety and replace with the following:

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall defend, indemnify and hold harmless Owner, Engineer and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost or loss or damage:

1. is attributable to bodily injury, sickness, disease or death or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such indemnified party unless caused by the sole negligence of a party indemnified hereunder. If through the acts of neglect on the part of Contractor, any other contractor or any Subcontractor shall suffer loss or damage on the Work, Contractor shall 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 Owner and/or Engineer, or the officers, directors, members, partners, employees, agents, consultants and subcontractors of each on account of any damage alleged to have been sustained, Owner shall notify Contractor, who shall defend, indemnify and save harmless Owner, Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each against any such claims.

ARTICLE 9. OWNER'S RESPONSIBILITIES

SC-9.06

Delete Paragraph 9.06 of the General Conditions in its entirety.

ARTICLE 10 - ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.03 Project Representative

SC-10.03

Add the following new paragraphs immediately after paragraph 10.03A of the General Conditions which are to read as follows:

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.

2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
4. Liaison:
 - a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
6. Shop Drawings and Samples:
 - a. Record date of receipt of Samples and Contractor-approved Shop Drawings.
 - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
 - c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.
7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
8. Review of Work and Rejection of Defective Work:
 - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:
 - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
 - b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.
10. Records:
 - a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.
 - b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
 - c. Maintain records for use in preparing Project documentation.
11. Reports:
 - a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.
 - b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
 - c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.
12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.
14. Completion:

- a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.
- b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.
- c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.
4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.
5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
8. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 11 - AMENDING THE CONTRACT DOCUMENTS: CHANGES IN THE WORK

SC-11.04B.2

Delete paragraph 11.04B.2. of the General Conditions in its entirety.

SC-11.04C.1.

Delete paragraph 11.04C.1 of the General Conditions in its entirety.

SC-11.04C.2.

Delete "15 percent" in the second line of paragraph 11.04C.2.a of the General Conditions and replace with "twenty percent".

SC-11.04C.2.b.

In paragraph 11.04C.2.b, before the semicolon add the following words "based on subcontractor's Cost of the Work";

Include the following two paragraphs for SRF or other state funded projects. Confirm percentages.

Delete "five percent" in paragraph 11.04C.2.b of the General Conditions and replace with "seven and one-half percent."

Delete "15 percent" in the third line of paragraph 11.04C.2.c, of the General Conditions and replace with "twenty percent" and delete "five percent" in the seventh line and replace with "seven and one-half percent."

ARTICLE 13 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-13.01B.1.

Delete the second sentence in paragraph 13.01B.1. of the General Conditions in its entirety and replace with the following:

Such employees shall include foremen at the site.

SC-13.02.

Delete Paragraph 13.02 of the General Conditions in its entirety.

SC-13.03E.

Delete Paragraph 13.03E. of the General Conditions in its entirety and replace with the following:

E. The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment under the following conditions:

1. if the total cost of a particular item of Unit Price Work amounts to 5 percent or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 15 percent from the estimated quantity of such item indicated in the Agreement; and
2. if there is no corresponding adjustment with respect to any other item of Work; and
3. if Contractor believes that Contractor has incurred additional expense as a result thereof; or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, either Owner or Contractor may make a claim for an adjustment in the Unit Price for that quantity by which the actual quantity exceeds 115% of the estimated quantity in accordance with Article 12 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

ARTICLE 14 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.06A.

Add the following new paragraph immediately after Paragraph 14.06A. of the General Conditions to read as follows:

B. If Owner stops Work under Paragraph 14.06A. Contractor shall not be entitled to any extension of Contract Time or increase in Contract Price.

ARTICLE 15 - PAYMENTS TO CONTRACTOR, SET-OFFS, AND COMPLETION; CORRECTION PERIOD

SC-15.01B.3.

Add the following new paragraph immediately after paragraph 15.01B.3 of the General Conditions which is to read as follows:

4. Contractor shall furnish evidence that payment received on the basis of materials and equipment not incorporated and suitably stored, has in fact been paid to the respective supplier(s) within sixty days of payment by Owner. Failure to provide such evidence of payment may result in the withdrawal of previous approval(s) and removal of the cost of related materials and equipment from the next submitted Application for Payment.

SC-15.01D.1.

Add the following new paragraphs immediately after paragraph 15.01D.1. of the General Conditions which are to read as follows:

2. Should Contractor neglect to pay any undisputed claims, made in writing to Owner within thirty days after completion of the Work, but continuing unsatisfied for a period of ninety days, Owner may pay such claim and deduct the amount thereof from the balance due Contractor. Owner may also, with the written consent of Contractor, use any monies retained, due, or to become due under this Contract for the purpose of paying for both labor and materials for the Work, for which claims have not been filed.

3. Security is provided both by the Payment Bond and the power of Owner to retain any monies for claims, but payment by one shall in no way impair or discharge the liability of the other.

4. All monies paid by Owner in settlement of liens, with the costs and expenses incurred by Owner in connection therewith, shall be charged to Contractor, shall bear interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank, and shall be deducted from the next payment due Contractor under the terms of this Contract.

SC-15.02

Add the following new paragraphs immediately after Paragraph 15.02A of the General Conditions which are to read as follows:

B. No materials or supplies for the Work shall be purchased by Contractor or Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. Contractor warrants that Contractor has good title to all materials and supplies used by Contractor in the Work, free from all liens, claims or encumbrances.

C. Contractor shall defend, indemnify and save Owner and Engineer harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. Contractor shall at Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If Contractor fails to do so, then Owner may, after having served written notice on the said Contractor either pay unpaid bills, of which Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to Contractor shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon Owner to either Contractor or Contractor's Surety. In paying any unpaid bills of the Contractor, Owner shall be deemed the agent of Contractor and any payment so made by Owner shall be considered as payment made under the Contract by Owner to Contractor and Owner shall not be liable to Contractor for any such payment made in good faith.

SC-15.06B.1.

Delete paragraph 15.06B.1. of the General Conditions in its entirety and replace with the following:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will indicate in writing Engineer's recommendation of payment and present the Application to Owner for payment. Thereupon Engineer will give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of paragraph 15.07. Otherwise, Engineer will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, Owner shall in accordance with the applicable laws and regulations, pay Contractor the amount recommended by Engineer.

ARTICLE 16 - SUSPENSION OF WORK AND TERMINATION

SC-16.02A.4.

Add the following new paragraph immediately after paragraph 16.02.A.4 of the General Conditions which is to read as follows:

5. If Contractor abandons the Work, or sublets this Contract or any part thereof, without the previous written consent of Owner, or if the Contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified;

ARTICLE 17 - FINAL RESOLUTION OF DISPUTES

SC-17.01A

Delete paragraph 17.01A.1 of the General Conditions in its entirety and replace with the following:

1. Either Owner or Contractor may request mediation of any Claim. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of this Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract.

SC-17.01B.3.

Add a new paragraph immediately after paragraph 17.01B.3. of the General Conditions which is to read as follows:

C. Contractor shall carry on the Work and maintain the progress schedule during the dispute resolution proceedings, unless otherwise agreed by Contractor and Owner in writing.

ARTICLE 18 - MISCELLANEOUS

SC-18.08

Add the following new paragraphs immediately after Paragraph 18.08 of the General Conditions which are to read as follows:

18.09 Addresses

A. Both the address given in the Bid Form upon which this Agreement is founded, and Contractor's office at or near the site of the Work are hereby designated as places to either of which notices, letters, and other communications to Contractor shall be certified, mailed, or delivered. The delivering at the above-named place, or depositing in a postpaid wrapper directed to the first-named place, in any post office box regularly maintained by the post office department, of any notice, letter or other communication to Contractor shall be deemed sufficient service thereof upon Contractor; and the date of said service shall be the date of such delivery or mailing. The first-named address may be changed at any time by an instrument in writing, executed and acknowledged by Contractor, and delivered to Owner and Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon Contractor personally.

18.10 Wage Rates

A. The requirements and provisions of all applicable laws and any amendments thereof or additions thereto as to the employment of labor, and to the schedule of minimum wage rates established in compliance with laws shall be a part of these Contract Documents. Copies of the wage schedules are included in PART II of these Supplementary Conditions. If, after the Notice of Award, it becomes necessary to employ any person in a trade or occupation not classified in the wage determinations, such person shall be paid at not less than such rates as shall be determined by the officials administering the laws mentioned above. Such approved minimum rate shall be retroactive to the time of the initial employment of such person in such trade or occupation. Contractor shall notify Owner of Contractor's intention to employ persons in trades or occupations not classified in sufficient time for Owner to obtain approved rates for such trades or occupations.

B. The schedules of wages referred to above are minimum rates only, and Owner will not consider any claims for additional compensation made by Contractor because of payment by Contractor of any wage rate in excess of the applicable rate contained in these Contract Documents. All disputes between Contractor and employees of Contractor in regard to the payment of wages in excess of these specified in the schedules shall be resolved by Contractor.

C. The said schedules of wages shall continue to be the minimum rates to be paid during the life of this Agreement and a legible copy of said schedules shall be kept posted in a conspicuous place at the site of the work.

PART 2 - D. Both Federal and State schedules of minimum wage rates are included in PART II of these Supplementary Conditions. Where rates differ, the higher rates shall apply as a minimum for that trade.

PART 3 - FEDERAL AND STATE GOVERNMENT PROVISIONS

1.0. FEDERAL WAGE RATES

2.0. STATE WAGE RATES

END OF SECTION 007300.16

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2.0 DAVIS-BACON (U.S. DEPARTMENT OF LABOR) WAGE RATES

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"General Decision Number: CT20220006 10/07/2022

Superseded General Decision Number: CT20210006

State: Connecticut

Construction Type: Heavy Dredging

Counties: Connecticut Statewide.

CONNECTICUT

ALL DREDGING, EXCEPT SELF-PROPELLED HOPPER DREDGES, ON THE ATLANTIC OCEAN AND TRIBUTARY WATERS EMPTYING INTO THE ATLANTIC OCEAN.

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

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

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

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

Modification Number	Publication Date
0	01/07/2022
1	02/25/2022
2	10/07/2022

* ENGI0025-001 10/01/2022

STATEWIDE

	Rates	Fringes
Dredging:		
CLASS A1.....	\$ 43.94	14.49+a+b
CLASS A2.....	\$ 39.16	14.20+a+b
CLASS B1.....	\$ 38.00	14.13+a+b
CLASS B2.....	\$ 35.77	14.00+a+b
CLASS C1.....	\$ 34.79	13.69+a+b
CLASS C2.....	\$ 33.67	13.62+a+b
CLASS D.....	\$ 27.97	13.28+a+b

CLASSIFICATIONS:

- CLASS A1: Deck Captain; Mechanical Dredge Operator, Leverman, Licensed Tug Operator over 1000 HP.
- CLASS A2: Crane Operator (360 swing).
- CLASS B1: Derrick Operator (180 swing), Spider/Spill Barge Operator, Engineer, Electrician, Chief Welder, Chief Mate, Fill Placer, Operator II, Maintenance Engineer, Licensed Boat Operator, Licensed Crew Boat Operator.
- CLASS B2: Certified Welder.
- CLASS C1: Mate, Drag Barge Operator, Assistant Fill Placer, Welder, Steward.
- CLASS C2: Boat Operator.
- CLASS D: Oiler, Deckhand, Shoreman, Rodman, Scowman, Cook, Messman, Porter/Janitor.

INCENTIVE PAY: (Add to Hourly Rate)

Operator (NCCCO License/Certification) \$1.80 Licensed Tug Operator over 1000 HP (Assigned as Master) (USCG licensed Master of Towing Vessels (MOTV) \$1.80; Licensed Boat Operator (Assigned as lead boat captain) USCG licensed boat operator \$1.30; Engineer (QMED and Tankerman endorsement or licensed engineer (USCG) \$1.80 Oiler (QMED and Tankerman endorsement (USCG) \$1.80; All classifications (Tankerman endorsement only) USCG \$1.55; Deckhand or Mate (AB with Lifeboatman endorsement (USCG) \$1.80; All classifications (lifeboatman endorsement only (USCG) \$1.55; Welder (ABS certification) \$1.55

FOOTNOTES APPLICABLE TO ABOVE CRAFTS:

- a. PAID HOLIDAYS: New Year's Day, Martin Luther King, Jr.'s Birthday, Memorial Day, Good Friday, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day and Christmas Day
- b. VACATION: Eight percent (8%) of the straight time rate, multiplied by the total hours worked.

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

=====
Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any

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

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates

the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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

Wage and Hour Administrator
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

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

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

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

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

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END OF GENERAL DECISIO"

Superseded General Decision Number: CT20210001

State: Connecticut

Construction Type: Highway

Counties: Fairfield, Litchfield, Middlesex, New Haven, Tolland and Windham Counties in Connecticut.

HIGHWAY CONSTRUCTION PROJECTS

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

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

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

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

1	02/04/2022
2	02/25/2022
3	04/29/2022
4	05/13/2022
5	05/20/2022
6	05/27/2022
7	06/03/2022
8	06/17/2022
9	07/08/2022
10	10/07/2022

BRCT0001-004 01/03/2022

Rates Fringes

BRICKLAYER

BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, PLASTERERS AND STONE MASONS.	\$ 38.27	34.47
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CARP0326-003 05/02/2022

LITCHFIELD COUNTY

Harwinton, Plymouth, Thomaston, Watertown

MIDDLESEX COUNTY

NEW HAVEN COUNTY

Beacon Falls, Bethany, Branford, Cheshire, East Haven,
Guilford, Hamden, Madison, Meriden, Middlebury, Naugatuck, New
Haven, North Branford, North Haven, Orange (east of Orange
Center Road and north of Route 1, and north of Route 1 and east
of the Oyster River), Prospect, Southbury, Wallingford,
Waterbury, West Haven, Wolcott, Woodbridge

TOLLAND COUNTY

Andover, Columbia, Coventry, Hebron, Mansfield, Union,
Willington

WINDHAM COUNTY

Rates Fringes

Carpenters:

CARPENTERS, PILEDRIVERS.....	\$ 36.07	26.15
DIVER TENDERS.....	\$ 36.07	26.15
DIVERS.....	\$ 44.53	26.15

CARP0326-014 05/02/2022

Rates Fringes

Carpenters: (TOLLAND COUNTY

Bolton, Ellington, Somers,
Tolland, Vernon)

CARPENTERS, PILEDRIVERS.....	\$ 36.07	26.15
DIVER TENDERS.....	\$ 36.07	26.15
DIVERS.....	\$ 44.53	26.15

CARP0326-017 05/02/2022

Rates Fringes

Carpenters:

CARPENTERS, PILEDRIVERS.....	\$ 36.07	26.15
DIVER TENDERS.....	\$ 36.07	26.15
DIVERS.....	\$ 44.53	26.15

FAIRFIELD COUNTY

Bethel, Bridgeport, Brookfield, Danbury, Darien, Easton, Fairfield, Greenwich, Monroe, New Canaan, New Fairfield, Newtown, Norwalk, Redding, Ridgefield, Shelton, Sherman, Stamford, Stratford, Trumbull, Weston, Westport, Wilton;
LITCHFIELD COUNTY

Barkhamstead, Bethlehem, Bridgewater, Canaan, Colebrook, Cornwall, Goshen, Kent, Litchfield, Morris, New Hartford, New Milford, Norfolk, North Canaan, Roxbury, Salisbury, Sharon, Torrington, Warren, Washington, Winchester, Woodbury;

NEW HAVEN COUNTY

Ansonia, Derby, Milford, Orange (west of Orange Center Road and south of Route 1 and west of the Oyster River), Oxford, Seymour;

CARP1121-006 01/03/2022

	Rates	Fringes
MILLWRIGHT.....	\$ 36.32	26.81

ELEC0003-002 05/08/2008

	Rates	Fringes
Electricians FAIRFIELD COUNTY Darien, Greenwich, New Canaan, Stamford.....	\$ 44.75	30.42

ELEC0035-001 06/01/2022

	Rates	Fringes
Electricians: MIDDLESEX COUNTY (Cromwell, Middlefield, Middleton and Portland); TOLLAND COUNTY; WINDHAM COUNTY.....	\$ 41.75	3%+31.47

ELEC0090-002 06/01/2022

	Rates	Fringes
Electricians:.....	\$ 40.60	3%+32.21
LITCHFIELD COUNTY Plymouth Township; MIDDLESEX COUNTY Chester, Clinton, Deep River, Durham, East Haddam, East Hampton, Essex, Haddam, Killingworth, Old Saybrook, Westbrook; NEW HAVEN COUNTY All Townships excluding Beacon Falls, Middlebury, Milford, Naugatuck, Oxford, Prospect, Seymour, Southbury, Waterbury and Wolcott.		

ELEC0488-002 06/01/2022

	Rates	Fringes
Electricians.....	\$ 41.40	3%+31.07
FAIRFIELD COUNTY Bethel, Bridgeport, Brookfield, Danbury, Easton, Fairfield, Monroe, New Fairfield, Newtown, Norwalk, Redding, Ridgefield, Shelton, Sherman, Stratford, Trumbull, Weston, Westport and Wilton.		

LITCHFIELD COUNTY

Except Plymouth;

NEW HAVEN COUNTY

Beacon Falls, Middlebury, Milford, Naugatuck, Oxford,
Prospect, Seymour, Southbury, Waterbury and Wolcott

ENGI0478-001 04/03/2022

	Rates	Fringes
Power equipment operators:		
GROUP 1.....	\$ 50.27	26.80
GROUP 2.....	\$ 49.91	26.80
GROUP 3.....	\$ 49.06	26.80
GROUP 4.....	\$ 44.42	26.80
GROUP 5.....	\$ 43.73	26.80
GROUP 6.....	\$ 43.38	26.80
GROUP 7.....	\$ 42.99	26.80
GROUP 8.....	\$ 44.86	26.80
GROUP 9.....	\$ 42.04	26.80
GROUP 10.....	\$ 39.70	26.80
GROUP 11.....	\$ 39.70	26.80
GROUP 12.....	\$ 39.63	26.80
GROUP 13.....	\$ 41.39	26.80
GROUP 14.....	\$ 38.97	26.80
GROUP 15.....	\$ 38.61	26.80
GROUP 16.....	\$ 37.66	26.80
GROUP 17.....	\$ 37.20	26.80
GROUP 18.....	\$ 36.46	26.80
GROUP 19.....	\$ 46.07	26.80
GROUP 20.....	\$ 45.71	26.80
GROUP 21.....	\$ 44.86	26.80

Hazardous waste premium \$3.00 per hour over classified rate.

- Crane with boom, including jib, 150 feet - \$1.50 extra.
- Crane with boom, including jib, 200 feet - \$2.50 extra.
- Crane with boom, including jib, 250 feet - \$5.00 extra.
- Crane with boom, including jib, 300 feet - \$7.00 extra.
- Crane with boom, including jib, 400 feet - \$10.00 extra

- 1) Crane handling or erecting structural steel or stone, hoisting engineer(2 drums or over)
- 2) Cranes(100 ton rated capacity and over) Bauer Drill/Caisson
- 3) Cranes(under 100 ton rated capacity)

a. PAID HOLIDAYS: New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday.

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Crane handling or erecting structural steel or stone, hoisting engineer (2 drums or over)

GROUP 2: Cranes (100 ton capacity & over) Bauer Drill/Caisson

GROUP 3: Cranes (under 100 ton rated capacity)

GROUP 4: Trenching machines, lighter derrick, concrete finishing machine, CMI machine or similar, Koehring Loader (skoper).

GROUP 5: Specialty railroad equipment, asphalt spreader, asphalt reclaiming machine, line grider, concrete pumps, drills with self contained power units, boring machine, post hole digger, auger, pounder, well digger, milling machine (over 24' mandrel), side boom, combination hoe and loader, directional driller

GROUP 6: Front end loader (3 cu. yds. up to 7 cu. yards), bulldozer (Rough grade dozer) .

GROUP 7: Asphalt roller, concrete saws and cutters (ride on types), Vermeer concrete cutter, stump grinder, scraper, snooper, skidder, milling machine (24" and under Mandrel).

GROUP 8: Mechanic, grease truck operator, hydoblaster, barrier mover, power stone spreader, welder, work boat under 26 ft. transfer machine.

GROUP 9: Front end loader (under 3 cubic yards), skid steer loader (regardless of attachments), bobcat or similar, forklift, power chipper, landscape equipment (including hydroseeder), Vacuum Excavation Truck and Hydrovac Excavation Truck (27 HG pressure or greater).

GROUP 10: Vibratory hammer, ice machine, diesel & air, hammer, etc.

GROUP 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.

GROUP 12: Wellpoint operator.

GROUP 13: Portable asphalt plant operator, portable concrete plant operator, portable crusher plant operator, portable grout plant operator, portable water filtration plant operator.

GROUP 14: Compressor battery operator.

GROUP 15: Power Safety boat, Vacuum truck, Zim mixer, Sweeper; (Minimum for any job requiring a CDL license) .

GROUP 16: Elevator operator, tow motor operator (solid tire no rough terrain).

GROUP 17: Generator operator, compressor operator, pump operator, welding machine operator; Heater operator.

GROUP 18: Maintenance engineer.

GROUP 19: Front end loader (7 cubic yards or over); work boat 26 ft. and over.

GROUP 20: Excavator over 2 cubic yards; pile driver (\$3.00 premium when operator controls hammer).

GROUP 21: Excavator, gradall, master mechanic, hoisting engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power or operating), rubber tire excavator (drott 1085 similar), grader operator, bulldozer finegrade (slopes shaping, laser or GPS, ect.)

IRON0015-002 06/06/2022

	Rates	Fringes
Ironworkers: (Reinforcing, Structural and Precast Concrete Erection).....	\$ 39.70	38.77

a. PAID HOLIDAY: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

LAB00146-001 04/03/2022

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 32.00	24.40
GROUP 2.....	\$ 32.25	24.40
GROUP 3.....	\$ 32.50	24.40
GROUP 4.....	\$ 33.00	24.40
GROUP 5.....	\$ 33.75	24.40
GROUP 6.....	\$ 34.00	24.40
GROUP 7.....	\$ 18.00	24.40

LABORERS CLASSIFICATIONS

GROUP 1: Laborers (Unskilled), acetylene burner, concrete specialist

GROUP 2: Chain saw operators, fence and guard rail erectors, pneumatic tool operators and powdermen.

GROUP 3: Pipelayers, Jackhammer/Pavement breaker (handheld), mason tenders/catch basin builders, asphalt rakers, air track operators, block paver and curb setter

GROUP 4: Asbestos/lead removal

GROUP 5: Blasters

GROUP 6: Toxic waste remover

GROUP 7: Traffic control signalman

LAB00146-002 04/03/2022

	Rates	Fringes
Laborers: (TUNNEL CONSTRUCTION)		
CLEANING, CONCRETE AND CAULKING TUNNEL:		
Concrete Workers, Form Movers and Strippers.....	\$ 33.26	24.40
Form Erectors.....	\$ 33.59	24.40
ROCK SHAFT, CONCRETE, LINING OF SAME AND TUNNEL IN FREE AIR:		
Brakemen, Trackmen, Tunnel Laborers, Shaft		

Laborers.....	\$ 33.26	24.40
Laborers Topside, Cage		
Tenders, Bellman.....	\$ 33.15	24.40
Miners.....	\$ 34.23	24.40
SHIELD DRIVE AND LINER		
PLATE TUNNELS IN FREE AIR:		
Brakemen and Trackmen.....	\$ 33.26	24.40
Miners, Motormen, Mucking Machine Operators, Nozzlemen, Grout Men, Shaft and Tunnel, Steel and Rodmen, Shield and Erector, Arm Operator, Cable Tenders.....	\$ 34.23	24.40
TUNNELS, CAISSON AND CYLINDER WORK IN COMPRESSED AIR:		
Blaster.....	\$ 40.72	24.40
Brakemen, Trackmen, Groutman, Laborers, Outside Lock Tender, Gauge Tenders.....	\$ 40.52	24.40
Change House Attendants, Powder Watchmen, Top on Iron Bolt.....	\$ 38.54	24.40
Mucking Machine Operator...	\$ 41.31	24.40

a. PAID HOLIDAYS: On tunnel work only: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day.

No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

* PAIN0011-001 06/01/2022

	Rates	Fringes
Painters:		
Blast and Spray.....	\$ 40.22	23.55
Brush and Roll.....	\$ 37.22	23.55
Tanks, Towers, Swing.....	\$ 39.22	23.55

PAIN0011-003 06/01/2022

	Rates	Fringes
Painters: (BRIDGE CONSTRUCTION)		
Brush, Roller, Blasting (Sand, Water, etc.) Spray...	\$ 55.00	23.75

TEAM0251-002 04/03/2022

	Rates	Fringes
Truck drivers:		
2 Axle Ready Mix.....	\$ 31.27	28.78
2 Axle.....	\$ 31.16	28.78
3 Axle Ready Mix.....	\$ 31.33	28.78
3 Axle.....	\$ 31.27	28.78
4 Axle Ready Mix.....	\$ 31.44	28.78
4 Axle.....	\$ 31.39	28.78

Heavy Duty Trailer 40 tons and over.....	\$ 33.66	28.78
Heavy Duty Trailer up to 40 tons.....	\$ 32.39	28.78
Specialized (Earth moving equipment other than conventional type on-the- road trucks and semi- trailers, including Euclids).....	\$ 31.44	28.78

Hazardous waste removal work receives additional \$1.25 per hour.

a. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

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

=====

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

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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 Wage and Hour Division
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 200 Constitution Avenue, N.W.
 Washington, DC 20210

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

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

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

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

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

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

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END OF GENERAL DECISIO"

"General Decision Number: CT20220015 06/17/2022

Superseded General Decision Number: CT20210015

State: Connecticut

Construction Type: Heavy

Counties: Middlesex and Tolland Counties in Connecticut.

HEAVY CONSTRUCTION PROJECTS

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

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 14026 generally applies to the contract.. The contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 13658 generally applies to the contract.. The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

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

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

Modification Number	Publication Date
0	01/07/2022
1	02/04/2022

2 02/25/2022
 3 04/29/2022
 4 05/13/2022
 5 05/20/2022
 6 05/27/2022
 7 06/03/2022
 8 06/17/2022

BRCT0001-011 01/03/2022

	Rates	Fringes
BRICKLAYER.....	\$ 38.27	34.47

BRCT0001-012 01/03/2022

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 38.27	34.47

CARP0326-012 05/02/2022

MIDDLESEX COUNTY
 TOLLAND COUNTY
 Andover, Columbia, Coventry, Hebron, Mansfield, Union,
 Willington

	Rates	Fringes
CARPENTER		
CARPENTERS, PILEDRIVERS.....	\$ 36.07	26.15
DIVER TENDER.....	\$ 36.07	26.15
DIVER.....	\$ 44.35	26.15

CARP0326-016 05/02/2022

TOLLAND COUNTY
 Bolton, Ellington, Somers, Tolland, Vernon

	Rates	Fringes
CARPENTER		
CARPENTER, PILEDRIVER.....	\$ 36.07	26.15
DIVER TENDER.....	\$ 36.07	26.15
DIVER.....	\$ 44.53	26.15

CARP1121-006 01/03/2022

	Rates	Fringes
MILLWRIGHT.....	\$ 36.32	26.81

ELEC0035-004 06/01/2022

Cromwell, Middlefield, Middleton and Portland

	Rates	Fringes
ELECTRICIAN.....	\$ 41.75	3%+31.47

ELEC0090-006 06/01/2022

Chester, Clinton, Deep River, Durham, East Haddam, East
 Hampton, Essex, Haddam, Killingsworth, Old Saybrook, Westbrook

	Rates	Fringes
ELECTRICIAN.....	\$ 40.60	3%+32.21

* ENGI0478-001 04/03/2022

	Rates	Fringes
Power equipment operators:		
GROUP 1.....	\$ 50.27	26.80
GROUP 2.....	\$ 49.91	26.80
GROUP 3.....	\$ 49.06	26.80
GROUP 4.....	\$ 44.42	26.80
GROUP 5.....	\$ 43.73	26.80
GROUP 6.....	\$ 43.38	26.80
GROUP 7.....	\$ 42.99	26.80
GROUP 8.....	\$ 44.86	26.80
GROUP 9.....	\$ 42.04	26.80
GROUP 10.....	\$ 39.70	26.80
GROUP 11.....	\$ 39.70	26.80
GROUP 12.....	\$ 39.63	26.80
GROUP 13.....	\$ 41.39	26.80
GROUP 14.....	\$ 38.97	26.80
GROUP 15.....	\$ 38.61	26.80
GROUP 16.....	\$ 37.66	26.80
GROUP 17.....	\$ 37.20	26.80
GROUP 18.....	\$ 36.46	26.80
GROUP 19.....	\$ 46.07	26.80
GROUP 20.....	\$ 45.71	26.80
GROUP 21.....	\$ 44.86	26.80

Hazardous waste premium \$3.00 per hour over classified rate.

- Crane with boom, including jib, 150 feet - \$1.50 extra.
- Crane with boom, including jib, 200 feet - \$2.50 extra.
- Crane with boom, including jib, 250 feet - \$5.00 extra.
- Crane with boom, including jib, 300 feet - \$7.00 extra.
- Crane with boom, including jib, 400 feet - \$10.00 extra

- 1) Crane handling or erecting structural steel or stone, hoisting engineer(2 drums or over)
- 2) Cranes(100 ton rated capacity and over) Bauer Drill/Caisson
- 3) Cranes(under 100 ton rated capacity)

a. PAID HOLIDAYS: New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday.

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

- GROUP 1: Crane handling or erecting structural steel or stone, hoisting engineer (2 drums or over)
- GROUP 2: Cranes (100 ton capacity & over) Bauer Drill/Caisson
- GROUP 3: Cranes (under 100 ton rated capacity)
- GROUP 4: Trenching machines, lighter derrick, concrete finishing machine, CMI machine or similar, Koehring Loader (skoper).

GROUP 5: Specialty railroad equipment, asphalt spreader, asphalt reclaiming machine, line grider, concrete pumps, drills with self contained power units, boring machine, post hole digger, auger, pounder, well digger, milling machine (over 24' mandrel), side boom, combination hoe and loader, directional driller

GROUP 6: Front end loader (3 cu. yds. up to 7 cu. yards), bulldozer (Rough grade dozer) .

GROUP 7: Asphalt roller, concrete saws and cutters (ride on types), Vermeer concrete cutter, stump grinder, scraper, snooper, skidder, milling machine (24" and under Mandrel).

GROUP 8: Mechanic, grease truck operator, hydoblaster, barrier mover, power stone spreader, welder, work boat under 26 ft. transfer machine.

GROUP 9: Front end loader (under 3 cubic yards), skid steer loader (regardless of attachments), bobcat or similar, forklift, power chipper, landscape equipment (including hydroseeder), Vacuum Excavation Truck and Hydrovac Excavation Truck (27 HG pressure or greater).

GROUP 10: Vibratory hammer, ice machine, diesel & air, hammer, etc.

GROUP 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.

GROUP 12: Wellpoint operator.

GROUP 13: Portable asphalt plant operator, portable concrete plant operator, portable crusher plant operator, portable grout plant operator, portable water filtration plant operator.

GROUP 14: Compressor battery operator.

GROUP 15: Power Safety boat, Vacuum truck, Zim mixer, Sweeper; (Minimum for any job requiring a CDL license) .

GROUP 16: Elevator operator, tow motor operator (solid tire no rough terrain).

GROUP 17: Generator operator, compressor operator, pump operator, welding machine operator; Heater operator.

GROUP 18: Maintenance engineer.

GROUP 19: Front end loader (7 cubic yards or over); work boat 26 ft. and over.

GROUP 20: Excavator over 2 cubic yards; pile driver (\$3.00 premium when operator controls hammer).

GROUP 21: Excavator, gradall, master mechanic, hoisting engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power or operating), rubber tire excavator (drott 1085 similar), grader operator, bulldozer finegrade (slopes shaping, laser or GPS, ect.)

* ENGI0478-007 04/04/2022

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
Asphalt Paver.....	\$ 43.73	26.80
Asphalt Roller.....	\$ 42.99	26.80
Asphalt Spreader.....	\$ 43.73	26.80
Backhoe/Excavator 2 cubic yards and over.....	\$ 45.71	26.80
Backhoe/Excavator under 2 cubic yards.....	\$ 44.86	26.80
Bulldozer (Rough Grade Dozer).....	\$ 43.38	26.80
Bulldozer Fine Grade(includes slopes, shaping, laser or gps).....	\$ 44.86	26.80
Crane handling or erecting structural steel or stone...\$	50.27	26.80
Cranes (100 ton capacity & over).....	\$ 49.91	26.80
Cranes (under 100 ton rated capacity).....	\$ 49.06	26.80
Drills with self contained power units; Directional driller.....	\$ 43.73	26.80
Earth Roller.....	\$ 39.70	26.80
Forklift.....	\$ 42.04	26.80
Front End Loader (3 cubic yards up to 7 cubic yards)..\$	43.38	26.80
Front End Loader (7 cubic yards or over).....	\$ 46.07	26.80
Front End Loader (under 3 cubic yards).....	\$ 42.04	26.80
Grader/Blade.....	\$ 44.86	26.80
Maintenance Engineer/Oiler..\$	36.46	26.80
Mechanic.....	\$ 44.86	26.80
Rubber Tire Backhoe/Excavator.....	\$ 44.86	26.80

a. PAID HOLIDAYS: New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday.

- b. Crane with boom, including jib, 150 feet - \$1.50 extra .
Crane with boom, including jib, 200 feet- \$2.50 extra.
Crane with boom, including jib, 250 feet - \$5.00 extra.
Crane with boom, including jib, 300 feet - \$7.00 extra.
Crane with boom, including jib, 400 feet - \$10.00 extra.

- 1) Crane handling or erecting structural steel or stone,
hoisting engineer(2 drums or over)
2) Cranes(100 ton rated capacity and over) Bauer Drill/Caisson
3) Cranes(under 100 ton rated capacity)

* IRON0015-008 06/06/2022

	Rates	Fringes
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IRONWORKER, REINFORCING AND
 STRUCTURAL.....\$ 39.70 38.77

a. PAID HOLIDAY: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

 LAB00146-002 04/03/2022

	Rates	Fringes
Laborers: (TUNNEL CONSTRUCTION)		
CLEANING, CONCRETE AND CAULKING TUNNEL:		
Concrete Workers, Form Movers and Strippers.....	\$ 33.26	24.40
Form Erectors.....	\$ 33.59	24.40
ROCK SHAFT, CONCRETE, LINING OF SAME AND TUNNEL IN FREE AIR:		
Brakemen, Trackmen, Tunnel Laborers, Shaft Laborers.....	\$ 33.26	24.40
Laborers Topside, Cage Tenders, Bellman.....	\$ 33.15	24.40
Miners.....	\$ 34.23	24.40
SHIELD DRIVE AND LINER PLATE TUNNELS IN FREE AIR:		
Brakemen and Trackmen.....	\$ 33.26	24.40
Miners, Motormen, Mucking Machine Operators, Nozzlemen, Grout Men, Shaft and Tunnel, Steel and Rodmen, Shield and Erector, Arm Operator, Cable Tenders.....		
	\$ 34.23	24.40
TUNNELS, CAISSON AND CYLINDER WORK IN COMPRESSED AIR:		
Blaster.....	\$ 40.72	24.40
Brakemen, Trackmen, Groutman, Laborers, Outside Lock Tender, Gauge Tenders.....	\$ 40.52	24.40
Change House Attendants, Powder Watchmen, Top on Iron Bolt.....	\$ 38.54	24.40
Mucking Machine Operator...	\$ 41.31	24.40

a. PAID HOLIDAYS: On tunnel work only: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day.

No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

 LAB00146-005 04/03/2022

	Rates	Fringes
LABORERS		

GROUP 1.....	\$ 32.00	24.40
GROUP 2.....	\$ 32.25	24.40
GROUP 3.....	\$ 32.50	24.40
GROUP 4.....	\$ 33.00	24.40
GROUP 5.....	\$ 33.75	24.40
GROUP 6.....	\$ 34.00	24.40
GROUP 7.....	\$ 18.00	24.40

LABORERS CLASSIFICATIONS

GROUP 1: Laborers (Unskilled), acetylene burner, concrete specialist

GROUP 2: Chain saw operators, fence and guard rail erectors, pneumatic tool operators and powdermen.

GROUP 3: Pipelayers, Jackhammer/Pavement breaker (handheld), mason tenders/catch basin builders, asphalt rakers, air track operators, block paver and curb setter

GROUP 4: Asbestos/lead removal

GROUP 5: Blasters

GROUP 6: Toxic waste remover

GROUP 7: Traffic control signalman

PAIN0011-013 06/01/2021

	Rates	Fringes
PAINTER		
Brush and Roller.....	\$ 36.42	22.90
Spray Only.....	\$ 39.42	22.90
Steel Only.....	\$ 38.42	22.90

TEAM0064-001 04/03/2022

	Rates	Fringes
Truck drivers:		
2 Axle Ready Mix.....	\$ 31.27	28.78
2 Axle.....	\$ 31.16	28.78
3 Axle Ready Mix.....	\$ 31.33	28.78
3 Axle.....	\$ 31.27	28.78
4 Axle Ready Mix.....	\$ 31.44	28.78
4 Axle.....	\$ 31.39	28.78
Heavy Duty Trailer 40 tons and over.....	\$ 33.66	28.78
Heavy Duty Trailer up to 40 tons.....	\$ 32.39	28.78
Specialized (Earth moving equipment other than conventional type on-the-road trucks and semi-trailers, including Euclids).....	\$ 31.44	28.78
Snorle Truck	\$ 31.54	28.78

Hazardous waste removal work receives additional \$1.25 per

hour.

a. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

TEAM0064-006 04/03/2022

	Rates	Fringes
TRUCK DRIVER: 4 Axle Truck.....	\$ 31.39	28.78

Hazardous waste removal work receives additional \$1.25 per hour.

a. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

SUCT2002-010 12/16/2008

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 25.52	8.49
TRUCK DRIVER: 3 Axle & Semi - Truck.....	\$ 19.93	7.39

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

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

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

A UAVG rate will be updated once a year, usually in January of

each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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

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

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

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

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

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

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END OF GENERAL DECISIO"

"General Decision Number: CT20220012 07/08/2022

Superseded General Decision Number: CT20210012

State: Connecticut

Construction Type: Residential

County: Tolland County in Connecticut.

RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories).

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

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

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

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

Modification Number	Publication Date
0	01/07/2022
1	01/14/2022

2 02/18/2022
 3 02/25/2022
 4 04/29/2022
 5 05/27/2022
 6 07/08/2022

ELEV0091-001 01/01/2022

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 58.90	36.885+a+b

FOOTNOTE:

- a. Vacation: 6%/under 5 years based on regular hourly rate for all hours worked. 8%/over 5 years based on regular hourly rate for all hours worked.
- b. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Veterans' Day; Thanksgiving Day; the Friday after Thanksgiving Day; and Christmas Day.

 ENGI0478-006 04/03/2022

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
Backhoe/Excavator 2 cubic yards and over.....	\$ 45.71	26.80
Backhoe/Excavator under 2 cubic yards; Rubber Tire Backhoe/Excavator.....	\$ 44.86	26.80
Bulldozer (Rough Grade Dozer).....	\$ 43.38	26.80
Bulldozer Fine Grade.....	\$ 44.86	26.80
Combination Hoe and Loader..	\$ 43.73	26.80
Loader (3 cubic yards up to 7 cubic yards).....	\$ 43.38	26.80
Loader (7 cubic yards or over).....	\$ 46.07	26.80
Loader (under 3 cubic yards).....	\$ 42.04	26.80

- a. PAID HOLIDAYS: New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday.

 * ROOF0009-005 06/01/2022

	Rates	Fringes
ROOFER		
Composition.....	\$ 40.10	22.25
Slate and Tile.....	\$ 40.60	22.25

 SFCT0676-002 04/01/2022

	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers).....	\$ 47.55	28.96

a. PAID HOLIDAYS: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

 SHEE0040-003 07/01/2021

	Rates	Fringes
SHEET METAL WORKER.....	\$ 40.08	40.53

 * SUCT2002-007 12/16/2008

	Rates	Fringes
CARPENTER, Including Drywall Hanging.....	\$ 24.53	1.60
CEMENT MASON/CONCRETE FINISHER...	\$ 21.22	0.00
DRYWALL FINISHER/TAPER.....	\$ 16.25	2.70
ELECTRICIAN.....	\$ 19.99	2.00
LABORERS		
Common or General.....	\$ 16.67	1.63
Landscape.....	\$ 14.96 **	4.63
PAINTER: Brush and Roller, Excludes Drywall Finishing/Taping.....	\$ 18.19	1.56
PLUMBER/PIPEFITTER (Including HVAC Pipe Installation).....	\$ 16.67	2.63

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

=====
 ** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$15.00) or 13658 (\$11.25). Please see the Note at the top of the wage determination for more information.

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

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010

08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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

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

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

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

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

Washington, DC 20210

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

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END OF GENERAL DECISIO"

2.0 CONNECTICUT DEPARTMENT OF LABOR WAGE RATES

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PAYROLL CERTIFICATION FORMS

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**Minimum Rates and Classifications for
Heavy/Highway Construction**

ID#: 22-40914

**Connecticut Department of Labor
Wage and Workplace Standards**

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number:

Project Town: Stafford

State#:

FAP#:

Project: SCADA and Cybersecurity Upgrade At The Wastewater Treatment Facility

CLASSIFICATION	Hourly Rate	Benefits
1) Boilermaker	44.46	28.51
1a) Bricklayer, Cement Masons, Cement Finishers, Plasterers, Stone Masons	38.27	34.47
2) Carpenters, Piledrivermen	36.07	26.15
2a) Diver Tenders	36.07	26.15
3) Divers	44.53	26.15
03a) Millwrights	36.32	26.81
4) Painters: (Bridge Construction) Brush, Roller, Blasting (Sand, Water, etc.), Spray	55.0	23.75
4a) Painters: Brush and Roller	37.22	23.40
4b) Painters: Spray Only	40.22	23.40
4c) Painters: Steel Only	39.22	23.40

4d) Painters: Blast and Spray	40.22	23.40
4e) Painters: Tanks, Tower and Swing	39.22	23.40
4f) Elevated Tanks (60 feet and above)	46.22	23.40
5) Electrician (Trade License required: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	41.75	31.47+3% of gross wage
6) Ironworkers: Ornamental, Reinforcing, Structural, and Precast Concrete Erection	39.7	38.77 + a
7) Plumbers (Trade License required: (P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2) and Pipefitters (Including HVAC Work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4 G-1, G-2, G-8, G-9)	47.03	34.05
----LABORERS-----		
8) Group 1: Laborer (Unskilled), Common or General, acetylene burner, concrete specialist	32.0	24.40
9) Group 2: Chain saw operators, fence and guard rail erectors, pneumatic tool operators, powdermen	32.25	24.40
10) Group 3: Pipelayers	32.5	24.40
11) Group 4: Jackhammer/Pavement breaker (handheld); mason tenders (cement/concrete), catch basin builders, asphalt rakers, air track operators, block paver, curb setter and forklift operators	32.5	24.40
12) Group 5: Toxic waste removal (non-mechanical systems)	34.0	24.40
13) Group 6: Blasters	33.75	24.40

Group 7: Asbestos/lead removal, non-mechanical systems (does not include leaded joint pipe)	33.0	24.40
Group 8: Traffic control signalmen	18.0	24.40
Group 9: Hydraulic Drills	32.75	24.40
----LABORERS (TUNNEL CONSTRUCTION, FREE AIR). Shield Drive and Liner Plate Tunnels in Free Air.----		
13a) Miners, Motormen, Mucking Machine Operators, Nozzle Men, Grout Men, Shaft & Tunnel Steel & Rodmen, Shield & Erector, Arm Operator, Cable Tenders	34.23	24.40 + a
13b) Brakemen, Trackmen, Miners' Helpers and all other men	33.26	24.40 + a
----CLEANING, CONCRETE AND CAULKING TUNNEL----		
14) Concrete Workers, Form Movers, and Strippers	33.26	24.40 + a
15) Form Erectors	33.59	24.40 + a
----ROCK SHAFT LINING, CONCRETE, LINING OF SAME AND TUNNEL IN FREE AIR:----		
16) Brakemen, Trackmen, Tunnel Laborers, Shaft Laborers, Miners Helpers	33.26	24.40 + a
17) Laborers Topside, Cage Tenders, Bellman	33.15	24.40 + a
18) Miners	34.23	24.40 + a
----TUNNELS, CAISSON AND CYLINDER WORK IN COMPRESSED AIR: ----		

18a) Blaster	40.72	24.40 + a
19) Brakemen, Trackmen, Groutman, Laborers, Outside Lock Tender, Gauge Tenders	40.52	24.40 + a
20) Change House Attendants, Powder Watchmen, Top on Iron Bolts	38.54	24.40 + a
21) Mucking Machine Operator, Grout Boss, Track Boss	41.31	24.40 + a
----TRUCK DRIVERS----(*see note below)		
Two Axle Trucks, Helpers	31.16	28.78 + a
Three Axle Trucks; Two Axle Ready Mix	31.27	28.78 + a
Three Axle Ready Mix	31.33	28.78 + a
Four Axle Trucks	31.39	28.78 + a
Four Axle Ready-Mix	31.44	28.78 + a
Heavy Duty Trailer (40 tons and over)	33.66	28.78 + a
Specialized earth moving equipment other than conventional type on-the road trucks and semi-trailer (including Euclids)	31.44	28.78 + a
Heavy Duty Trailer (up to 40 tons)	32.39	28.78 + a
Heavy Duty Trailer (up to 40 tons)	32.39	28.78 + a
Snorkle Truck	31.54	28.78 + a

----POWER EQUIPMENT OPERATORS----

Group 1: Crane Handling or Erecting Structural Steel or Stone, Hoisting Engineer (2 drums or over). (Trade License Required)	50.27	26.80 + a
Group 1a: Front End Loader (7 cubic yards or over); Work Boat 26 ft. and over.	46.07	26.80 + a
Group 2: Cranes (100 ton rate capacity and over); Bauer Drill/Caisson. (Trade License Required)	49.91	26.80 + a
Group 2a: Cranes (under 100 ton rated capacity).	49.06	26.80 + a
Group 2b: Excavator over 2 cubic yards; Pile Driver (\$3.00 premium when operator controls hammer).	45.71	26.80 + a
Group 3: Excavator; Gradall; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Fine Grade (slopes, shaping, laser or GPS, etc.). (Trade License Required)	44.86	26.80 + a
Group 4: Trenching Machines; Lighter Derrick; CMI Machine or Similar; Koehring Loader (Skooper).	44.42	26.80 + a
Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Spreader; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24" mandrel)	43.73	26.80 + a
Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller.	43.73	26.80 + a
Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	43.38	26.80 + a
Group 7: Asphalt Roller; Concrete Saws and Cutters (ride on types); Vermeer Concrete Cutter; Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and under Mandrel)	42.99	26.80 + a

Group 8: Mechanic, Grease Truck Operator, Hydroblaster, Barrier Mover, Power Stone Spreader; Welder; Work Boat under 26 ft.; Transfer Machine.	42.54	26.80 + a
Group 9: Front End Loader (under 3 cubic yards), Skid Steer Loader regardless of attachments (Bobcat or Similar); Fork Lift, Power Chipper; Landscape Equipment (including hydroseeder), Vacuum Excavation Truck and Hydrovac Excavation Truck (27 HG pressure or greater).	42.04	26.80 + a
Group 10: Vibratory Hammer, Ice Machine, Diesel and Air Hammer, etc.	39.7	26.80 + a
Group 11: Conveyor, Earth Roller; Power Pavement Breaker (whiphammer), Robot Demolition Equipment.	39.7	26.80 + a
Group 12: Wellpoint Operator.	39.63	26.80 + a
Group 13: Compressor Battery Operator.	38.97	26.80 + a
Group 14: Elevator Operator; Tow Motor Operator (Solid Tire No Rough Terrain).	37.66	26.80 + a
Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	37.2	26.80 + a
Group 16: Maintenance Engineer.	36.46	26.80 + a
Group 17: Portable Asphalt Plant Operator; Portable Crusher Plant Operator; Portable Concrete Plant Operator., Portable Grout Plant Operator, Portable Water Filtration Plant Operator.	41.39	26.80 + a
Group 18: Power Safety Boat; Vacuum Truck; Zim Mixer; Sweeper; (minimum for any job requiring CDL license).	38.61	26.80 + a

**NOTE: SEE BELOW

----LINE CONSTRUCTION----(Railroad Construction and Maintenance)----

20) Lineman, Cable Splicer, Technician	48.19	6.5% + 22.00
21) Heavy Equipment Operator	42.26	6.5% + 19.88
22) Equipment Operator, Tractor Trailer Driver, Material Men	40.96	6.5% + 19.21
23) Driver Groundmen	26.5	6.5% + 9.00
23a) Truck Driver	40.96	6.5% + 17.76

----LINE CONSTRUCTION----

24) Driver Groundmen	30.92	6.5% + 9.70
25) Groundmen	22.67	6.5% + 6.20
26) Heavy Equipment Operators	37.1	6.5% + 10.70
27) Linemen, Cable Splicers, Dynamite Men	41.22	6.5% + 12.20
28) Material Men, Tractor Trailer Drivers, Equipment Operators	35.04	6.5% + 10.45

Welders: Rate for craft to which welding is incidental.

**Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.*

***Note: Hazardous waste premium \$3.00 per hour over classified rate*

- Crane with 150 ft. boom (including jib) - \$1.50 extra
- Crane with 200 ft. boom (including jib) - \$2.50 extra
- Crane with 250 ft. boom (including jib) - \$5.00 extra
- Crane with 300 ft. boom (including jib) - \$7.00 extra
- Crane with 400 ft. boom (including jib) - \$10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

--Connecticut General Statute Section 31-55a: Annual Adjustments to wage rates by contractors doing state work
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The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page:

www.ct.gov/dol. For those without internet access, please contact the division listed below.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

As of: October 24, 2022

**Minimum Rates and Classifications
for Building Construction**

ID#: 22-40914

**Connecticut Department of Labor
Wage and Workplace Standards**

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number: _____ Project Town: Stafford
 State#: _____ FAP#: _____
 Project: SCADA and Cybersecurity Upgrade At The Wastewater Treatment Facility

CLASSIFICATION	Hourly Rate	Benefits
1b) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters. **See Laborers Group 7**		
1c) Asbestos Worker/Heat and Frost Insulator	44.57	31.79
2) Boilermaker	44.46	28.51
3a) Bricklayer, Cement Mason, Concrete Finisher (including caulking), Stone Masons	37.75	34.62 + a
3b) Tile Setter	37.1	30.52
3c) Tile and Stone Finishers	30.0	25.30
3d) Marble & Terrazzo Finishers	31.07	24.23
3e) Plasterer	41.9	28.75

-----LABORERS-----

4) Group 1: Laborers (common or general), acetylene burners, concrete specialists, wrecking laborers, fire watchers.	32.0	24.40
4a) Group 2: Mortar mixers, plaster tender, power buggy operators, powdermen, fireproofers/mixer/nozzleman (Person running mixer and spraying fireproof only).	32.25	24.40
4b) Group 3: Jackhammer operators/pavement breaker, mason tender (brick), mason tender (cement/concrete), forklift operators and forklift operators (masonry).	32.5	24.40
4c) **Group 4: Pipelayers (Installation of water, storm drainage or sewage lines outside of the building line with P6, P7 license) (the pipelayer rate shall apply only to one or two employees of the total crew who primary task is to actually perform the mating of pipe sections) P6 and P7 rate is \$26.80.	33.0	24.40
4d) Group 5: Air track operator, sand blaster and hydraulic drills.	32.75	24.40
4e) Group 6: Blasters, nuclear and toxic waste removal.	35.0	24.40
4f) Group 7: Asbestos/lead removal and encapsulation (except it's removal from mechanical systems which are not to be scrapped).	33.0	24.40
4g) Group 8: Bottom men on open air caisson, cylindrical work and boring crew.	30.28	24.40
4h) Group 9: Top men on open air caisson, cylindrical work and boring crew.	29.74	24.40
4i) Group 10: Traffic Control Signalman	18.0	24.40
5) Carpenter, Acoustical Ceiling Installation, Soft Floor/Carpet Laying, Metal Stud Installation, Form Work and Scaffold Building, Drywall Hanging, Modular-Furniture Systems Installers, Lathers, Piledrivers, Resilient Floor Layers.	36.07	26.15
5a) Millwrights	36.32	26.81

6) Electrical Worker (including low voltage wiring) (Trade License required: E1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	41.75	31.47+3% of gross wage
7a) Elevator Mechanic (Trade License required: R-1,2,5,6)	58.9	36.885+a+b
-----LINE CONSTRUCTION-----		
Groundman	26.5	6.5% + 9.00
Linemen/Cable Splicer	48.19	6.5% + 22.00
8) Glazier (Trade License required: FG-1,2)	40.78	23.40 + a
9) Ironworker, Ornamental, Reinforcing, Structural, and Precast Concrete Erection	39.7	38.77 + a
-----OPERATORS-----		
Group 1: Crane Handling or Erecting Structural Steel or Stone; Hoisting Engineer (2 drums or over). (Trade License Required)	50.27	26.80 + a
Group 1a: Front End Loader (7 cubic yards or over); Work Boat 26 ft. and Over	46.07	26.80 + a
Group 2: Cranes (100 ton rate capacity and over); Bauer Drill/Caisson. (Trade License Required)	49.91	26.80 + a
Group 2a: Cranes (under 100 ton rated capacity).	49.06	26.80 + a
Group 2b: Excavator over 2 cubic yards; Pile Driver (\$3.00 premium when operator controls hammer)	45.71	26.80 + a
Group 3: Excavator; Gradall; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Finegrade. (slopes, shaping, laser or GPS, etc.). (Trade License	44.86	26.80 + a

Required)

Group 4: Trenching Machines; Lighter Derrick; CMI Machine or Similar; Koehring Loader (Skooper); Goldhofer.	44.42	26.80 + a
Group 5: Specialty Railroad Equipment; Asphalt Spreader, Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24 mandrel).	43.73	26.80 + a
Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller.	43.73	26.80 + a
Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	43.38	26.80 + a
Group 7: Asphalt Roller; Concrete Saws and Cutters (ride on types); Vermeer Concrete Cutter; Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and under mandrel).	42.99	26.80 + a
Group 8: Mechanic; Grease Truck Operator; Hydroblaster; Barrier Mover; Power Stone Spreader; Welding; Work Boat Under 26 ft.; Transfer Machine; Rigger Foreman.	42.54	26.80 + a
Group 9: Front End Loader (under 3 cubic yards); Skid Steer Loader regardless of attachments; (Bobcat or Similar); Forklift, Power Chipper; Landscape Equipment (including Hydroseeder); Vacuum Excavation Truck and Hydrovac Excavation Truck (27 HG pressure or greater).	42.04	26.80 + a
Group 10: Vibratory hammer; ice machine; diesel and air, hammer, etc.	39.7	26.80 + a
Group 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.	39.7	26.80 + a
Group 12: Wellpoint Operator.	39.63	26.80 + a
Group 13: Compressor Battery Operator.	38.97	26.80 + a

Group 14: Elevator Operator; Tow Motor Operator (solid tire no rough terrain).	37.66	26.80 + a
Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	37.2	26.80 + a
Group 16: Maintenance Engineer.	36.46	26.80 + a
Group 17: Portable Asphalt Plant Operator; Portable Crusher Plant Operator; Portable Concrete Plant Operator; Portable Grout Plant Operator; Portable Water Filtration Plant Operator.	41.39	26.80 + a
Group 18: Power Safety Boat; Vacuum Truck; Zim Mixer; Sweeper; (Minimum for any job requiring a CDL license); Rigger; Signalman.	38.61	26.80 + a
-----PAINTERS (Including Drywall Finishing)-----		
10a) Brush and Roller	37.22	23.40
10b) Taping Only/Drywall Finishing	37.97	23.40
10c) Paperhanger and Red Label	37.72	23.40
10e) Blast and Spray	40.22	23.40
11) Plumber (excluding HVAC pipe installation) (Trade License required: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2)	47.03	34.05
12) Well Digger, Pile Testing Machine	37.26	24.05 + a
13) Roofer (composition)	40.1	23.40
14) Roofer (slate & tile)	40.6	23.40

15) Sheetmetal Worker (Trade License required for HVAC and Ductwork: SM-1,SM-2,SM-3,SM-4,SM-5,SM-6)	40.89	41.72
16) Pipefitter (Including HVAC work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4, G-1, G-2, G-8 & G-9)	47.03	34.05
-----TRUCK DRIVERS-----		
17a) 2 Axle, Helpers	31.16	28.78 + a
17b) 3 Axle, 2 Axle Ready Mix	31.27	28.78 + a
17c) 3 Axle Ready Mix	31.33	28.78 + a
17d) 4 Axle	31.39	28.78 + a
17e) 4 Axle Ready Mix	31.44	28.78 + a
17f) Heavy Duty Trailer (40 Tons and Over)	33.66	28.78 + a
17g) Specialized Earth Moving Equipment (Other Than Conventional Type on-the-Road Trucks and Semi-Trailers, Including Euclids)	31.44	28.78 + a
17h) Heavy Duty Trailer up to 40 tons	32.39	28.78 + a
17i) Snorkle Truck	31.54	28.78 + a
18) Sprinkler Fitter (Trade License required: F-1,2,3,4)	47.55	28.96 + a
19) Theatrical Stage Journeyman	25.76	7.34

Welders: Rate for craft to which welding is incidental.

**Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.*

***Note: Hazardous waste premium \$3.00 per hour over classified rate*

Crane with 150 ft. boom (including jib) - \$1.50 extra

Crane with 200 ft. boom (including jib) - \$2.50 extra

Crane with 250 ft. boom (including jib) - \$5.00 extra

Crane with 300 ft. boom (including jib) - \$7.00 extra

Crane with 400 ft. boom (including jib) - \$10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page:

www.ct.gov/dol. For those without internet access, please contact the division listed below.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

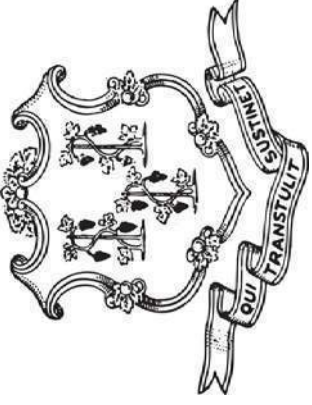
All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

As of: October 24, 2022



Opportunity ★ Guidance ★ Support



THIS IS A PUBLIC WORKS PROJECT

Covered by the

PREVAILING WAGE LAW

CT General Statutes Section 31-53

**If you have QUESTIONS regarding your wages
CALL (860) 263-6790**

Section 31-55 of the CT State Statutes requires every contractor or subcontractor performing work for the state to post in a prominent place the prevailing wages as determined by the Labor Commissioner.

Sec. 31-53b. Construction safety and health course. New miner training program. Proof of completion required for mechanics, laborers and workers on public works projects. Enforcement. Regulations. Exceptions. (a) Each contract for a public works project entered into on or after July 1, 2009, by the state or any of its agents, or by any political subdivision of the state or any of its agents, described in subsection (g) of section 31-53, shall contain a provision requiring that each contractor furnish proof with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

(b) Any person required to complete a course or program under subsection (a) of this section who has not completed the course or program shall be subject to removal from the worksite if the person does not provide documentation of having completed such course or program by the fifteenth day after the date the person is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section.

(c) Not later than January 1, 2009, the Labor Commissioner shall adopt regulations, in accordance with the provisions of chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with Federal Mine Safety and Health Administration Standards or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issued by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project.

(d) This section shall not apply to employees of public service companies, as defined in section 16-1, or drivers of commercial motor vehicles driving the vehicle on the public works project and delivering or picking up cargo from public works projects provided they perform no labor relating to the project other than the loading and unloading of their cargo.

(P.A. 06-175, S. 1; P.A. 08-83, S. 1.)

History: P.A. 08-83 amended Subsec. (a) by making provisions applicable to public works project contracts entered into on or after July 1, 2009, replacing provision re total cost of work with reference to Sec. 31-53(g), requiring proof in certified payroll form that new mechanic, laborer or worker has completed a 10-hour or more construction safety course and adding provision re new miner training program, amended Subsec. (b) by substituting "person" for "employee" and adding "or program", amended Subsec. (c) by adding "or in accordance with Federal Mine Safety and Health Administration Standards" and setting new deadline of January 1, 2009, deleted former Subsec. (d) re "public building", added new Subsec. (d) re exemptions for public service company employees and delivery drivers who perform no labor other than delivery and made conforming and technical changes, effective January 1, 2009.

Informational Bulletin

THE 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE

(applicable to public building contracts entered into *on or after July 1, 2007*, where the total cost of all work to be performed is at least \$100,000)

- (1) This requirement was created by Public Act No. 06-175, which is codified in Section 31-53b of the Connecticut General Statutes (pertaining to the prevailing wage statutes);
- (2) The course is required for public building construction contracts (projects funded in whole or in part by the state or any political subdivision of the state) entered into on or after July 1, 2007;
- (3) It is required of private employees (not state or municipal employees) and apprentices who perform manual labor for a general contractor or subcontractor on a public building project where the total cost of all work to be performed is at least \$100,000;
- (4) The ten-hour construction course pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, and, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268;
- (5) The internet website for the federal OSHA Training Institute is http://www.osha.gov/fso/ote/training/edcenters/fact_sheet.html;
- (6) The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course;
- (7) Within 30 days of receiving a contract award, a general contractor must furnish proof to the Labor Commissioner that all employees and apprentices performing manual labor on the project will have completed such a course;
- (8) Proof of completion may be demonstrated through either: (a) the presentation of a *bona fide* student course completion card issued by the federal OSHA Training Institute; *or* (2) the presentation of documentation provided to an employee by a trainer certified by the Institute pending the actual issuance of the completion card;
- (9) Any card with an issuance date more than 5 years prior to the commencement date of the construction project shall not constitute proof of compliance;

- (10) Each employer shall affix a copy of the construction safety course completion card to the certified payroll submitted to the contracting agency in accordance with Conn. Gen. Stat. § 31-53(f) on which such employee's name first appears;
- (11) Any employee found to be in non-compliance shall be subject to removal from the worksite if such employee does not provide satisfactory proof of course completion to the Labor Commissioner by the fifteenth day after the date the employee is determined to be in noncompliance;
- (12) Any such employee who is determined to be in noncompliance may continue to work on a public building construction project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance;
- (13) The Labor Commissioner may make complaint to the prosecuting authorities regarding any employer or agent of the employer, or officer or agent of the corporation who files a false certified payroll with respect to the status of an employee who is performing manual labor on a public building construction project;
- (14) The statute provides the minimum standards required for the completion of a safety course by manual laborers on public construction contracts; any contractor can exceed these minimum requirements; and
- (15) Regulations clarifying the statute are currently in the regulatory process, and shall be posted on the CTDOL website as soon as they are adopted in final form.
- (16) Any questions regarding this statute may be directed to the Wage and Workplace Standards Division of the Connecticut Labor Department via the internet website of <http://www.ctdol.state.ct.us/wgwkstnd/wgemenu.htm>; or by telephone at (860)263-6790.

THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE, AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETATIONS WHICH MAY ULTIMATELY ARISE CONCERNING THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.

November 29, 2006

Notice
To All Mason Contractors and Interested Parties
Regarding Construction Pursuant to Section 31-53 of the
Connecticut General Statutes (Prevailing Wage)

The Connecticut Labor Department Wage and Workplace Standards Division is empowered to enforce the prevailing wage rates on projects covered by the above referenced statute.

Over the past few years the Division has withheld enforcement of the rate in effect for workers who operate a forklift on a prevailing wage rate project due to a potential jurisdictional dispute.

The rate listed in the schedules and in our Occupational Bulletin (see enclosed) has been as follows:

Forklift Operator:

- **Laborers (Group 4) Mason Tenders** - operates forklift solely to assist a mason to a maximum height of nine feet only.
- **Power Equipment Operator (Group 9)** - operates forklift to assist any trade and to assist a mason to a height over nine feet.

The U.S. Labor Department conducted a survey of rates in Connecticut but it has not been published and the rate in effect remains as outlined in the above Occupational Bulletin.

Since this is a classification matter and not one of jurisdiction, effective January 1, 2007 the Connecticut Labor Department will enforce the rate on each schedule in accordance with our statutory authority.

Your cooperation in filing appropriate and accurate certified payrolls is appreciated.

STATUTE 31-55a

- SPECIAL NOTICE -

To: All State and Political Subdivisions, Their Agents, and Contractors

Connecticut General Statute 31-55a - Annual adjustments to wage rates by contractors doing state work.

Each contractor that is awarded a contract on or after October 1, 2002, for (1) the construction of a state highway or bridge that falls under the provisions of section 31-54 of the general statutes, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 of the general statutes shall contact the Labor Commissioner on or before July first of each year, for the duration of such contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee, effective each July first.

- The prevailing wage rates applicable to any contract or subcontract awarded on or after October 1, 2002 are subject to annual adjustments each July 1st for the duration of any project which was originally advertised for bids on or after October 1, 2002.
- Each contractor affected by the above requirement shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.
- It is the **contractor's** responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's Web Site. The annual adjustments will be posted on the Department of Labor Web page: www.ctdol.state.ct.us. For those without internet access, please contact the division listed below.
- The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project. All subsequent annual adjustments will be posted on our Web Site for contractor access.

Any questions should be directed to the Contract Compliance Unit, Wage and Workplace Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109 at (860)263-6790.

NOTICE

TO ALL CONTRACTING AGENCIES

Please be advised that Connecticut General Statutes Section 31-53, requires the contracting agency to certify to the Department of Labor, the total dollar amount of work to be done in connection with such public works project, regardless of whether such project consists of one or more contracts.

Please find the attached “Contracting Agency Certification Form” to be completed and returned to the Department of Labor, Wage and Workplace Standards Division, Public Contract Compliance Unit.

Inquiries can be directed to 860.263.6790.



CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION

Contracting Agency Certification Form

I, _____, acting in my official capacity as _____,
Authorized Representative Title

for _____, located at _____,
Contracting Agency Address

do hereby certify that the total dollar amount of work to be done in connection with

_____, located at _____,
Project name and number Address

shall be \$_____, which includes all work, regardless of whether such project
contains of one or more contracts.

Contractor Information

Name: _____

Address: _____

Authorized Representative: _____

Approximate Starting Date: _____

Approximate Completion Date: _____

Signature

Date

Return to:

Connecticut Department of Labor
Wage & Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109

Rate Schedule Issued (Date): _____

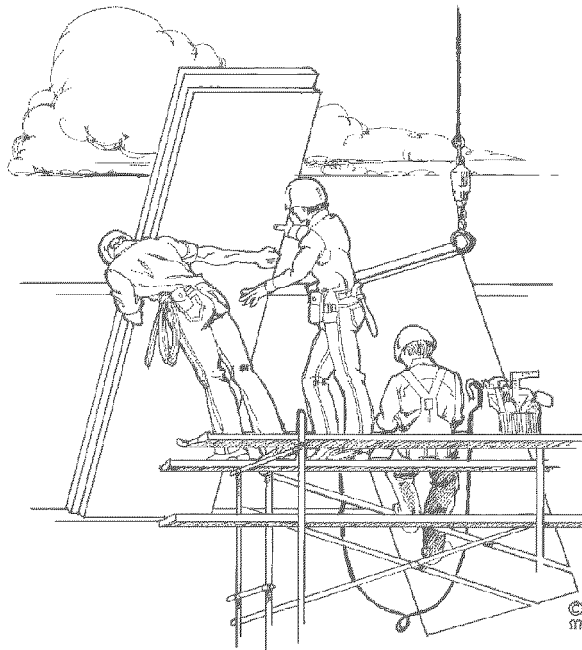
~ NOTICE ~

TO ALL CONTRACTING AGENCIES

Please be advised that Connecticut General Statutes Section 31-53, requires the contracting agency to certify to the Department of Labor, the total dollar amount of work to be done in connection with such public works project, regardless of whether such project consists of one or more contracts.

Please find the attached "Contracting Agency Certification Form" to be completed and returned to the Department of Labor, Wage and Workplace Standards Division, Public Contract Compliance Unit.

 Inquiries can be directed to (860)263-6543.



CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION
CONTRACT COMPLIANCE UNIT

CONTRACTING AGENCY CERTIFICATION FORM

I, _____, acting in my official capacity as _____,
authorized representative title

for _____, located at _____,
contracting agency address

do hereby certify that the total dollar amount of work to be done in connection with

_____, located at _____,
project name and number address

shall be \$_____, which includes all work, regardless of whether such project
consists of one or more contracts.

CONTRACTOR INFORMATION

Name: _____

Address: _____

Authorized Representative: _____

Approximate Starting Date: _____

Approximate Completion Date: _____

Signature

Date

Return To: Connecticut Department of Labor
Wage & Workplace Standards Division
Contract Compliance Unit
200 Folly Brook Blvd.
Wethersfield, CT 06109

Date Issued: _____

CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION

CONTRACTORS WAGE CERTIFICATION FORM

I, _____ of _____
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the _____
Company Name

Street

City

and all of its subcontractors will pay all workers on the

Project Name and Number

Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

Signed

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

Notary Public

Return to:

Connecticut Department of Labor
Wage & Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109

Rate Schedule Issued (Date): _____

[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

In accordance with Connecticut General Statutes, 31-53 Certified Payrolls with a statement of compliance shall be submitted monthly to the contracting agency.

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

Connecticut Department of Labor
 Wage and Workplace Standards Division
 200 Folly Brook Blvd.
 Wethersfield, CT 06109

WEEKLY PAYROLL

CONTRACTOR NAME AND ADDRESS:		SUBCONTRACTOR NAME & ADDRESS														WORKER'S COMPENSATION INSURANCE CARRIER				
PAYROLL NUMBER	Week-Ending Date	PROJECT NAME & ADDRESS		DAY AND DATE							Total ST Hours	Total O/T Hours	Base Hourly Rate	Type of Fringe Benefits Per Hour 1 through 6 (see back)	Gross Pay for all work performed this week	Total Deductions		Gross Pay for this prevailing rate job	Check # and Net Pay	
				S	M	T	W	TH	F	S						Federal State	With-Holding			Other
PERSON/WORKER, ADDRESS and SECTION	APPR RATE % AND RACE*	WORK CLASSIFICATION	HOURS WORKED EACH DAY							S-TIME	O-TIME	S-TIME	O-TIME	S-TIME	O-TIME	S-TIME	O-TIME	S-TIME	O-TIME	
		Trade License Type & Number - OSHA 10 Certification Number								\$		\$		\$		\$		\$		\$
										Base Rate		Base Rate		Base Rate		Base Rate		Base Rate		Base Rate
										Cash Fringe		Cash Fringe		Cash Fringe		Cash Fringe		Cash Fringe		Cash Fringe
										1. \$		1. \$		1. \$		1. \$		1. \$		1. \$
										2. \$		2. \$		2. \$		2. \$		2. \$		2. \$
										3. \$		3. \$		3. \$		3. \$		3. \$		3. \$
										4. \$		4. \$		4. \$		4. \$		4. \$		4. \$
										5. \$		5. \$		5. \$		5. \$		5. \$		5. \$
										6. \$		6. \$		6. \$		6. \$		6. \$		6. \$
										1. \$		1. \$		1. \$		1. \$		1. \$		1. \$
										2. \$		2. \$		2. \$		2. \$		2. \$		2. \$
										3. \$		3. \$		3. \$		3. \$		3. \$		3. \$
										4. \$		4. \$		4. \$		4. \$		4. \$		4. \$
										5. \$		5. \$		5. \$		5. \$		5. \$		5. \$
										6. \$		6. \$		6. \$		6. \$		6. \$		6. \$

* IF REQUIRED

***FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker’s compensation, income taxes, etc.).

Please specify the type of benefits provided:

- 1) Medical or hospital care _____ 4) Disability_____
- 2) Pension or retirement _____ 5) Vacation, holiday_____
- 3) Life Insurance _____ 6) Other (please specify) _____

CERTIFIED STATEMENT OF COMPLIANCE

For the week ending date of _____,

I, _____ of _____, (hereafter known as Employer) in my capacity as _____ (title) do hereby certify and state:

Section A:

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

- a) The records submitted are true and accurate;
- b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;
- c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);
- d) Each such employee of the Employer is covered by a worker’s compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;
- e) The Employer does not receive kickbacks, which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contractor; and
- f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA~The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such employee’s name first appears.

(Signature) (Title) Submitted on (Date)

Section B: Applies to CONNDOT Projects ONLY

That pursuant to CONNDOT contract requirements for reporting purposes only, all employees listed under Section B who performed work on this project are not covered under the prevailing wage requirements defined in Connecticut General Statutes Section 31-53.

(Signature) (Title) Submitted on (Date)

Note: CTDOL will assume all hours worked were performed under Section A unless clearly delineated as Section B WWS-CP1 as such. Should an employee perform work under both Section A and Section B, the hours worked and wages paid must be segregated for reporting purposes.

*****THIS IS A PUBLIC DOCUMENT***
DO NOT INCLUDE SOCIAL SECURITY NUMBERS**

Weekly Payroll Certification For
Public Works Projects (Continued)

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

Week-Ending Date:
Contractor or Subcontractor Business Name:

WEEKLY PAYROLL

PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/ FEMALE AND RACE*	WORK CLASSIFICATION Trade License Type & Number - OSHA 10 Certification Number	DAY AND DATE							Total ST Hours Total O/T Hours	BASE HOURLY RATE TOTAL FRINGE BENEFIT PLAN CASH	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS				GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY							
				S	M	T	W	TH	F	S					FICA	FEDERAL WITH- HOLDING	STATE WITH- HOLDING	OTHER									
				HOURS WORKED EACH DAY																							
											S-TIME	\$	1. \$														
												Base Rate	2. \$														
											O-TIME	\$	3. \$														
												Cash Fringe	4. \$														
													5. \$														
													6. \$														

*IF REQUIRED

[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS											Connecticut Department of Labor Wage and Workplace Standards Division 200 Folly Brook Blvd. Wethersfield, CT 06109								
In accordance with Connecticut General Statutes, 31-53 Certified Payrolls with a statement of compliance shall be submitted monthly to the contracting agency.											WEEKLY PAYROLL								
CONTRACTOR NAME AND ADDRESS: Landon Corporation, 15 Connecticut Avenue, Northford, CT 06472							SUBCONTRACTOR NAME & ADDRESS XYZ Corporation 2 Main Street Yantic, CT 06389				WORKER'S COMPENSATION INSURANCE CARRIER Travelers Insurance Company POLICY # #BAC8888928 EFFECTIVE DATE: 1/1/09 EXPIRATION DATE: 12/31/09								
PAYROLL NUMBER	Week-Ending Date	PROJECT NAME & ADDRESS								Total ST Hours	BASE HOURLY RATE	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS				GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY
		Week-Ending Date	DAY AND DATE											Total O/T Hours	TOTAL FRINGE BENEFIT PLAN CASH	FICA	FEDERAL		
PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/FEMALE AND RACE*	WORK CLASSIFICATION	S	M	T	W	TH	F	S									
			Trade License Type & Number - OSHA 10 Certification Number	20	21	22	23	24	25	26									
Robert Craft 81 Maple Street Willimantic, CT 06226		M/C	Electrical Lineman E-1 1234567 Owner OSHA 123456		8	8	8	8	8		S-TIME 40	\$ 30.75 Base Rate	1. \$ 5.80 2. \$ 3. \$ 2.01	\$1,582.80				P-xxxx \$1,582.80 \$ xxx.xx	#123
Ronald Jones 212 Elm Street Norwich, CT 06360	65%	M/B	Electrical Apprentice OSHA 234567		8	8	8	8	8		S-TIME 40	\$ 19.99 Base Rate	1. \$ 2. \$ 3. \$ 4. \$ 5. \$ 6. \$	\$1,464.80	xx.xx	xxx.xx	xx.xx	G-xxx \$1,464.80 \$xxx.xx	#124
Franklin T. Smith 234 Washington Rd. New London, CT 06320 SECTION B		M/H	Project Manager			8					S-TIME 8	\$ Base Rate	1. \$ 2. \$ 3. \$ 4. \$ 5. \$ 6. \$	\$1,500.00	xx.xx	xx.xx	xx.xx	M-xx.x xxx.xx	#125
											S-TIME	\$ Base Rate	1. \$ 2. \$ 3. \$ 4. \$ 5. \$ 6. \$						

7/13/2009 *IF REQUIRED
WWS-CP1

*SEE REVERSE SIDE

PAGE NUMBER 1 OF 2

OSHA 10 ~ATTACH CARD TO 1ST CERTIFIED PAYROLL

***FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker's compensation, income taxes, etc.).

Please specify the type of benefits provided:

- 1) Medical or hospital care Blue Cross 4) Disability _____
- 2) Pension or retirement _____ 5) Vacation, holiday _____
- 3) Life Insurance Utopia 6) Other (please specify) _____

CERTIFIED STATEMENT OF COMPLIANCE

For the week ending date of 9/26/09,

I, Robert Craft of XYZ Corporation, (hereafter known as Employer) in my capacity as Owner (title) do hereby certify and state:

Section A:

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

- a) The records submitted are true and accurate;
- b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;
- c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);
- d) Each such employee of the Employer is covered by a worker's compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;
- e) The Employer does not receive kickbacks, which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contractor; and
- f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA-The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such employee's name first appears.

Robert Craft owner 10/2/09
 (Signature) (Title) Submitted on (Date)

Section B: Applies to CONNDOT Projects ONLY

That pursuant to CONNDOT contract requirements for reporting purposes only, all employees listed under Section B who performed work on this project are not covered under the prevailing wage requirements defined in Connecticut General Statutes Section 31-53.

Robert Craft owner 10/2/09
 (Signature) (Title) Submitted on (Date)

Note: CTDOL will assume all hours worked were performed under Section A unless clearly delineated as Section B WWS-CP1 as such. Should an employee perform work under both Section A and Section B, the hours worked and wages paid must be segregated for reporting purposes.

*****THIS IS A PUBLIC DOCUMENT***
 DO NOT INCLUDE SOCIAL SECURITY NUMBERS**

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)



Rev. Dec. 2008

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

OMB No.: 1215-0149
Expires: 12/31/2011

NAME OF CONTRACTOR <input type="checkbox"/> OR SUBCONTRACTOR <input type="checkbox"/>				ADDRESS				OMB No.: 1215-0149 Expires: 12/31/2011											
PAYROLL NO.		FOR WEEK ENDING			PROJECT AND LOCATION				PROJECT OR CONTRACT NO.										
(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT OR ST.	(4) DAY AND DATE							(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS					(9) NET WAGES PAID FOR WEEK
				HOURS WORKED EACH DAY										FICA	WITH- HOLDING TAX	OTHER	TOTAL DEDUCTIONS		
			O								0.00		\$0.00					\$0.00	\$0.00
			S								0.00		\$0.00					\$0.00	\$0.00
			O								0.00		\$0.00					\$0.00	\$0.00
			S								0.00		\$0.00					\$0.00	\$0.00
			O								0.00		\$0.00					\$0.00	\$0.00
			S								0.00		\$0.00					\$0.00	\$0.00
			O								0.00		\$0.00					\$0.00	\$0.00
			S								0.00		\$0.00					\$0.00	\$0.00
			O								0.00		\$0.00					\$0.00	\$0.00
			S								0.00		\$0.00					\$0.00	\$0.00
			O								0.00		\$0.00					\$0.00	\$0.00
			S								0.00		\$0.00					\$0.00	\$0.00

While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

Date _____

I, _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____ ; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,
all persons employed on said project have been paid the full weekly wages earned, that no rebates have
been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly
from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part
3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948,
63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

(2) That any payrolls otherwise under this contract required to be submitted for the above period are
correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the
applicable wage rates contained in any wage determination incorporated into the contract; that the
classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide
apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of
Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a
State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

– in addition to the basic hourly wage rates paid to each laborer or mechanic listed in
the above referenced payroll, payments of fringe benefits as listed in the contract
have been or will be made to appropriate programs for the benefit of such
employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

– Each laborer or mechanic listed in the above referenced payroll has been paid,
as indicated on the payroll, an amount not less than the sum of the applicable
basic hourly wage rate plus the amount of the required fringe benefits as listed
in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR
SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE
31 OF THE UNITED STATES CODE.

Information Bulletin

Occupational Classifications

The Connecticut Department of Labor has the responsibility to properly determine "job classification" on prevailing wage projects covered under C.G.S. Section 31-53.

Note: This information is intended to provide a sample of some occupational classifications for guidance purposes only. It is not an all-inclusive list of each occupation's duties. This list is being provided only to highlight some areas where a contractor may be unclear regarding the proper classification.

Below are additional clarifications of specific job duties performed for certain classifications:

- **ASBESTOS WORKERS**

Applies all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.

- **ASBESTOS INSULATOR**

Handle, install apply, fabricate, distribute, prepare, alter, repair, dismantle, heat and frost insulation, including penetration and fire stopping work on all penetration fire stop systems.

- **BOILERMAKERS**

Erects hydro plants, incomplete vessels, steel stacks, storage tanks for water, fuel, etc. Builds incomplete boilers, repairs heat exchanges and steam generators.

- **BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, MARBLE MASONS, PLASTERERS, STONE MASONS, PLASTERERS. STONE MASONS, TERRAZZO WORKERS, TILE SETTERS**

Lays building materials such as brick, structural tile and concrete cinder, glass, gypsum, terra cotta block. Cuts, tools and sets marble, sets stone, finishes concrete, applies decorative steel, aluminum and plastic tile, applies cements, sand, pigment and marble chips to floors, stairways, etc.

- **CARPENTERS, MILLWRIGHTS. PILEDRIVERMEN. LATHERS. RESILIENT FLOOR LAYERS, DOCK BUILDERS, DIKERS, DIVER TENDERS**

Constructs, erects, installs and repairs structures and fixtures of wood, plywood and wallboard. Installs, assembles, dismantles, moves industrial machinery. Drives piling into ground to provide foundations for structures such as buildings and bridges, retaining walls for earth embankments, such as cofferdams. Fastens wooden, metal or rockboard lath to walls, ceilings and partitions of buildings, acoustical tile layer, concrete form builder. Applies firestopping materials on fire resistive joint systems only. Installation of curtain/window walls only where attached to wood or metal studs. Installation of insulated material of all types whether blown, nailed or attached in other ways to walls, ceilings and floors of buildings. Assembly and installation of modular furniture/furniture systems. Free-standing furniture is not covered. This includes free standing: student chairs, study top desks, book box desks, computer furniture, dictionary stand, atlas stand, wood shelving, two-position information access station, file cabinets, storage cabinets, tables, etc.

- **CLEANING LABORER**

The clean up of any construction debris and the general cleaning, including sweeping, wash down, mopping, wiping of the construction facility, washing, polishing, dusting, etc., prior to the issuance of a certificate of occupancy falls under the *Labor classification*.

- **DELIVERY PERSONNEL**

If delivery of supplies/building materials is to one common point and stockpiled there, prevailing wages are not required. If the delivery personnel are involved in the distribution of the material to multiple locations within the construction site then they would have to be paid prevailing wages for the type of work performed: laborer, equipment operator, electrician, ironworker, plumber, etc.

An example of this would be where delivery of drywall is made to a building and the delivery personnel distribute the drywall from one "stockpile" location to further sub-locations on each floor. Distribution of material around a construction site is the job of a laborer/tradesman and not a delivery personnel.

- **ELECTRICIANS**

Install, erect, maintenance, alteration or repair of any wire, cable, conduit, etc., which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, including the Installation or maintenance of telecommunication, LAN wiring or computer equipment, and low voltage wiring.

***License required per Connecticut General Statutes: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9.**

- **ELEVATOR CONSTRUCTORS**

Install, erect, maintenance and repair of all types of elevators, escalators, dumb waiters and moving walks. ***License required by Connecticut General Statutes: R-1,2,5,6.**

- **FORK LIFT OPERATOR**

Laborers Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine (9) feet only.

Power Equipment Operator Group 9 - operates forklift to assist any trade, and to assist a mason to a height over nine (9) feet.

- **GLAZIERS**

Glazing wood and metal sash, doors, partitions, and 2 story aluminum storefronts. Installs glass windows, skylights, store fronts and display cases or surfaces such as building fronts, interior walls, ceilings and table tops and metal store fronts. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which requires either a blended rate or equal composite workforce.

- **IRONWORKERS**

Erection, installation and placement of structural steel, precast concrete, miscellaneous iron, ornamental iron, metal curtain wall, rigging and reinforcing steel. Handling, sorting, and installation of reinforcing steel (rebar). Metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which requires either a blended rate or equal composite workforce. Insulated metal and insulated composite panels are still installed by the Ironworker.

- **INSULATOR**

Installing fire stopping systems/materials for "Penetration Firestop Systems": transit to cables, electrical conduits, insulated pipes, sprinkler pipe penetrations, ductwork behind radiation, electrical cable trays, fire rated pipe penetrations, natural polypropylene, HVAC ducts, plumbing bare metal, telephone and communication wires, and boiler room ceilings. Past practice using the applicable licensed trades, Plumber, Sheet Metal, Sprinkler Fitter, and Electrician, is not inconsistent with the Insulator classification and would be permitted.

- **LABORERS**

Acetylene burners, asphalt rakers, chain saw operators, concrete and power buggy operator, concrete saw operator, fence and guard rail erector (except metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation.), hand operated concrete vibrator operator, mason tenders, pipelayers (installation of storm drainage or sewage lines on the street only), pneumatic drill operator, pneumatic gas and electric drill operator, powermen and wagon drill operator, air track operator, block paver, curb setters, blasters, concrete spreaders.

- **PAINTERS**

Maintenance, preparation, cleaning, blasting (water and sand, etc.), painting or application of any protective coatings of every description on all bridges and appurtenances of highways, roadways, and railroads. Painting, decorating, hardwood finishing, paper hanging, sign writing, scenic art work and drywall hhg for any and all types of building and residential work.

- **LEAD PAINT REMOVAL**

Painter's Rate

1. Removal of lead paint from bridges.
2. Removal of lead paint as preparation of any surface to be repainted.
3. Where removal is on a Demolition project prior to reconstruction.

Laborer's Rate

1. Removal of lead paint from any surface NOT to be repainted.
2. Where removal is on a *TOTAL* Demolition project only.

- **PLUMBERS AND PIPEFITTERS**

Installation, repair, replacement, alteration or maintenance of all plumbing, heating, cooling and piping. ****License required per Connecticut General Statutes: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2 S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4.***

- **POWER EQUIPMENT OPERATORS**

Operates several types of power construction equipment such as compressors, pumps, hoists, derricks, cranes, shovels, tractors, scrapers or motor graders, etc. Repairs and maintains equipment. ***License required, crane operators only, per Connecticut General Statutes.**

- **ROOFERS**

Covers roofs with composition shingles or sheets, wood shingles, slate or asphalt and gravel to waterproof roofs, including preparation of surface. (tear-off and/or removal of any type of roofing and/or clean-up of any and all areas where a roof is to be relaid)

- **SHEETMETAL WORKERS**

Fabricate, assembles, installs and repairs sheetmetal products and equipment in such areas as ventilation, air-conditioning, warm air heating, restaurant equipment, architectural sheet metal work, sheetmetal roofing, and aluminum gutters.

Fabrication, handling, assembling, erecting, altering, repairing, etc. of coated metal material panels and composite metal material panels when used on building exteriors and interiors as soffits, fascia, louvers, partitions, wall panel siding, canopies, cornice, column covers, awnings, beam covers, cladding, sun shades, lighting troughs, spires, ornamental roofing, metal ceilings, mansards, copings, ornamental and ventilation hoods, vertical and horizontal siding panels, trim, etc.

The sheet metal classification also applies to the vast variety of coated metal material panels and composite metal material panels that have evolved over the years as an alternative to conventional ferrous and non-ferrous metals like steel, iron, tin, copper, brass, bronze, aluminum, etc. Insulated metal and insulated composite panels are still installed by the Iron Worker. Fabrication, handling, assembling, erecting, altering, repairing, etc. of architectural metal roof, standing seam roof, composite metal roof, metal and composite bathroom/toilet partitions, aluminum gutters, metal and composite lockers and shelving, kitchen equipment, and walk-in coolers.

- **SPRINKLER FITTERS**

Installation, alteration, maintenance and repair of fire protection sprinkler systems.

***License required per Connecticut General Statutes: F-1,2,3,4.**

- **TILE MARBLE AND TERRAZZO FINISHERS**

Assists and tends the tile setter, marble mason and terrazzo worker in the performance of their duties.

- **TRUCK DRIVERS**

Definitions:

1) “Site of the work” (29 Code of Federal Regulations (CFR) 5.2(l)(b) is the physical place or places where the building or work called for in the contract will remain and any other site where a significant portion of the building or work is constructed, provided that such site is established specifically for the performance of the contract or project;

(a) Except as provided in paragraph (l) (3) of this section, job headquarters, tool yards, batch plants, borrow pits, etc. are part of the “site of the work”; provided they are dedicated exclusively, or nearly so, to the performance of the contract or project, and provided they are adjacent to “the site of work” as defined in paragraph (e)(1) of this section;

(b) Not included in the “site of the work” are permanent home offices, branch plant establishments, fabrication plants, tool yards etc, of a contractor or subcontractor whose location and continuance in operation are determined wholly without regard to a particular State or political subdivision contract or uncertain and indefinite periods of time involved of a few seconds or minutes duration and where the failure to count such time is due to consideration justified by industrial realities (29 CFR 785.47)

2) “Engaged to wait” is waiting time that belongs to and is controlled by the employer which is an integral part of the job and is therefore compensable as hours worked. (29 CFR 785.15)

3) “Waiting to be engaged” is waiting time that an employee can use effectively for their own purpose and is not compensable as hours worked. (29 CFR 785.16)

4) “De Minimus” is a rule that recognizes that unsubstantial or insignificant periods of time which cannot as a practical administrative matter be precisely recorded for payroll purposes, may be disregarded. This rule applies only where there are uncertain and indefinite periods of time involved of a short duration and where the failure to count such time is due to consideration justified by worksite realities. For example, with respect to truck drivers on prevailing wage sites, this is typically less than 15 minutes at a time.

Coverage of Truck Drivers on State or Political subdivision Prevailing Wage Projects

Truck drivers are covered for payroll purposes under the following conditions:

- Truck Drivers for time spent working on the site of the work.
- Truck Drivers for time spent loading and/or unloading materials and supplies on the site of the work, if such time is not de minimus

- Truck drivers transporting materials or supplies between a facility that is deemed part of the site of the work and the actual construction site.
- Truck drivers transporting portions of the building or work between a site established specifically for the performance of the contract or project where a significant portion of such building or work is constructed and the physical places where the building or work outlined in the contract will remain.

For example: Truck drivers delivering asphalt are covered under prevailing wage while “engaged to wait” on the site and when directly involved in the paving operation, provided the total time is not “de minimus”

Truck Drivers are not covered in the following instances:

- Material delivery truck drivers while off “the site of the work”
- Truck Drivers traveling between a prevailing wage job and a commercial supply facility while they are off the “site of the work”
- Truck drivers whose time spent on the “site of the work” is de minimus, such as under 15 minutes at a time, merely to drop off materials or supplies, including asphalt.

These guidelines are similar to U.S. Labor Department policies. The application of these guidelines may be subject to review based on factual considerations on a case by case basis.

For example:

- Material men and deliverymen are not covered under prevailing wage as long as they are not directly involved in the construction process. If, they unload the material, they would then be covered by prevailing wage for the classification they are performing work in: laborer, equipment operator, etc.
- Hauling material off site is not covered provided they are not dumping it at a location outlined above.
- Driving a truck on site and moving equipment or materials on site would be considered covered work, as this is part of the construction process.

Any questions regarding the proper classification should be directed to:

*Public Contract Compliance Unit
Wage and Workplace Standards Division
Connecticut Department of Labor
200 Folly Brook Blvd, Wethersfield, CT 06109
(860) 263-6543*

**Connecticut Department of Labor
Wage and Workplace Standards Division
FOOTNOTES**

⇒ Please Note: If the “Benefits” listed on the schedule for the following occupations includes a letter(s) (+ a or + a+b for instance), refer to the information below.

Benefits to be paid at the appropriate prevailing wage rate for the listed occupation.

If the “Benefits” section for the occupation lists only a dollar amount, disregard the information below.

Bricklayers, Cement Masons, Cement Finishers, Concrete Finishers, Stone Masons
(Building Construction) and
(Residential- Hartford, Middlesex, New Haven, New London and Tolland Counties)

- a. Paid Holiday: Employees shall receive 4 hours for Christmas Eve holiday provided the employee works the regularly scheduled day before and after the holiday. Employers may schedule work on Christmas Eve and employees shall receive pay for actual hours worked in addition to holiday pay.

Elevator Constructors: Mechanics

- a. Paid Holidays: New Year’s Day, Memorial Day, Independence Day, Labor Day, Veterans’ Day, Thanksgiving Day, Christmas Day, plus the Friday after Thanksgiving.
- b. Vacation: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

Glaziers

- a. Paid Holidays: Labor Day and Christmas Day.

Power Equipment Operators
(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year’s Day, Good Friday, Memorial day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday. Holidays falling on Saturday may be observed on Saturday, or if the employer so elects, on the preceding Friday.

Ironworkers

- a. Paid Holiday: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

Laborers (Tunnel Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

Roofers

- a. Paid Holidays: July 4th, Labor Day, and Christmas Day provided the employee is employed 15 days prior to the holiday.

Sprinkler Fitters

- a. Paid Holidays: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

Truck Drivers

(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas day, and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

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SECTION 011000 – SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work performed by Owner.
5. Multiple Work Packages.
6. Work under Owner’s separate contracts.
7. Future work not part of this Project.
8. Owner’s product purchase contracts.
9. Owner-furnished/Contractor-installed (OFICI) product.
10. Owner-furnished/Owner-installed (OFOI) products.
11. Contractor-furnished/Owner-installed (CFOI) products.
12. Contractor’s use of site and premises.
13. Coordination with occupants.
14. Work restrictions.
15. Specification and Drawing conventions.
16. Miscellaneous provisions.

- B. Related Requirements:

1. Section 017300 “Execution” for coordination of Owner-installed products.

1.3 DEFINITIONS

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

- A. Project Identification: Town of Stafford Wastewater Treatment Plant SCADA Upgrade

1. Project Location: 50 River Road, Stafford Springs, CT 06076.

- B. Owner: Town of Stafford WPCA.

1. Owner's Representative: Richard Hartenstein, Jr., Superintendent, Stafford WPCA
- C. Engineer: CDM Smith, Inc., 77 Hartland Street, East Hartford, CT 06108.
1. Engineer's Representative: Daniel R. Murphy, P.E., Project Manager, (860) 808-2265

1.5 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
1. Furnish and install an upgrade of the Water Treatment Plant's Supervisory Control and Data Acquisition (SCADA) system consisting of a SCADA Rack, servers, Programmable Logic Controller processors, software, communications systems, system configuration and integration, cybersecurity, and other Work indicated in the Contract Documents.
- B. Type of Contract:
1. Project will be constructed under a single prime contract.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits on Use of Site: Confine construction operations to limits shown on contract drawings.
 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.
- E. Coordinate use of premises with Engineer and Town of Stafford WPCA.

- F. Contractor shall assume full responsibility for security of all his and his subcontractors' materials and equipment stored at the site.
- G. If directed by Owner or Engineer, move any stored items or containers that interfere with operations of Owner, other contractors, or the public.
- H. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.7 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Project site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between 7:00 a.m. to 3:30 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 - 1. Weekend Hours: Not permitted without prior authorization from Owner.
 - 2. Early Morning Hours: Coordinate with Owner.
 - 3. Work in Existing Building: Coordinate with Owner and get approval from Owner.
 - 4. Hours for Utility Shutdowns: No more than 4 hours at a time. Must obtain prior
 - 5. authorization, preferably a week in advance, but no less than 48 hours prior to shutdowns.
 - 6. Hours for any noisy activity: Obtain prior approval from Owner.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify Engineer and Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Engineer's and Owner's written permission before proceeding with utility interruptions.

- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Engineer and Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Engineer's and Owner's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011000

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SECTION 012001 - PRICE AND PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Lump sum prices.

1.3 LUMP SUM PRICES

- A. Payment of the lump sum price bid shall constitute full compensation for all labor, materials, tools, equipment and incidentals necessary for constructing the SCADA Upgrade Work, complete, as shown and as specified in Divisions 01 through 40.

1.4 EXTRA WORK

- A. Extra work, if any, will be performed in accordance with Article 11 of the General Conditions and will be paid for in accordance with the provisions of Article 13 of the General Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012001

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 013100 “Project Management and Coordination” for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

- A. Engineer will issue Field Orders authorizing minor changes in the Work, not involving adjustment to the Contract Price or the Contract Time, on EJCDC Form C-942 or other form acceptable to Owner.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Price or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Requests For Proposal (RFP) issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of RFP, submit a quotation estimating adjustments to the Contract Price and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- e. Quotation Form: Use forms acceptable to Engineer.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Price and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Proposal Request Form: Use form acceptable to Engineer.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Change Order Request, Engineer will issue a Change Order for signatures of Owner and Contractor on EJCDC Form C-941 or other form acceptable to Owner.

1.6 WORK CHANGE DIRECTIVE

- A. Work Change Directive: Engineer may issue a Work Change Directive on EJCDC Document C-940 or other form acceptable to Owner. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Price or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012600

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Engineer at earliest possible date, but no later than ten days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
 - 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
 - 5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract, as described in Section 011000 "Summary."

- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Owner's name.
 - c. Owner's Project number.
 - d. Name of Engineer.
 - e. Engineer's Project number.
 - f. Contractor's name and address.
 - g. Date of submittal.
 2. Arrange schedule of values consistent with format of EJCDC Document C-620.
 3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 6. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
 7. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
 8. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
 9. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
 10. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

11. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
- B. Payment Application Times: Submit Application for Payment to Engineer by the 15th day of the month for the prior month. The period covered by each Application for Payment is one month, ending on the last day of the month.
 1. Submit draft copy of Application for Payment ten days prior to due date for review by Engineer.
- C. Application for Payment Forms: Use EJCDC Document C-620 as form for Applications for Payment.
 1. Other Application for Payment forms proposed by the Contractor may be acceptable to Engineer and Owner. Submit forms for approval with initial submittal of schedule of values.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed.
 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.

- b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Maintain an updated set of drawings to be used as record drawings in accordance with Section 017839 "Project Record Documents." As a prerequisite for monthly progress payments, exhibit the updated record drawings for review by Owner and Engineer for completeness and accuracy.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Contractor's construction schedule.
 - 4. Products list (preliminary if not final).
 - 5. Submittal schedule.
 - 6. List of Contractor's staff assignments.
 - 7. List of Contractor's principal consultants.
 - 8. Copies of building permits.
 - 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 10. Initial progress report.
 - 11. Report of preconstruction conference.
- I. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work proceeding this application, as described in Section 017700 "Closeout Procedures."
 - 2. Include initial submittal of closeout record drawings in accordance with Section 017839 "Project Record Documents."
 - 3. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Final submittal of closeout record drawings in accordance with Section 017839 “Project Record Documents.”
5. Updated final statement, accounting for final changes to the Contract Sum.
6. Evidence that claims have been settled.
7. Final liquidated damages settlement statement.
8. Proof that taxes, fees, and similar obligations are paid.
9. Waivers and releases.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Web-based Project management software package.
 - 6. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 011200 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
 - 2. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 3. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 4. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.
 - 5. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and in prominent location in each built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Engineer will return without response those RFIs submitted to Engineer by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.

2. Owner name.
 3. Owner's Project number.
 4. Name of Engineer.
 5. Engineer's Project number.
 6. Date.
 7. Name of Contractor.
 8. RFI number, numbered sequentially.
 9. RFI subject.
 10. Specification Section number and title and related paragraphs, as appropriate.
 11. Drawing number and detail references, as appropriate.
 12. Field dimensions and conditions, as appropriate.
 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 14. Contractor's signature.
 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.
1. Attachments shall be electronic files in PDF format.
- D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Engineer's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.
 3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Change Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within 5 days of receipt of the RFI response.

- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Engineer.
 - 4. RFI description.
 - 5. Date the RFI was submitted.
 - 6. Date Engineer's response was received.
 - 7. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 - 8. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

- F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Engineer's Digital Data Files: Digital data files of Engineer's CAD drawings will be provided by Engineer for Contractor's use during construction.
 - 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 - 2. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 - 3. Digital Drawing Software Program: Contract Drawings are available in CAD.
 - 4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer.
 - a. Subcontractors, and other parties granted access by Contractor to Engineer's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Engineer.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within three days of the meeting.

- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Sustainable design requirements.
 - o. Preparation of Record Documents.
 - p. Use of the premises and existing building.
 - q. Work restrictions.
 - r. Working hours.
 - s. Owner's occupancy requirements.
 - t. Responsibility for temporary facilities and controls.
 - u. Procedures for moisture and mold control.
 - v. Procedures for disruptions and shutdowns.
 - w. Construction waste management and recycling.
 - x. Parking availability.
 - y. Office, work, and storage areas.
 - z. Equipment deliveries and priorities.
 - aa. First aid.
 - bb. Security.
 - cc. Progress cleaning.
 - dd. List of major subcontractors and suppliers.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Progress Meetings: Conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these

- meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Status of sustainable design documentation.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.
 - 9) Site use.
 - 10) Temporary facilities and controls.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Status of RFIs.
 - 16) Status of Proposal Requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Unusual event reports.
- B. Related Requirements:
 - 1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
 - 2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
 - 3. Two paper copies, of sufficient size to display entire period or schedule, as required.
- B. Startup construction schedule.
 - 1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- E. Site Condition Reports: Submit at time of discovery of differing conditions.
- F. Unusual Event Reports: Submit at time of unusual event.

1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.6 STARTUP CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.7 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.
 1. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.8 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Testing and inspection.
 8. Accidents.
 9. Meetings and significant decisions.
 10. Unusual events.
 11. Stoppages, delays, shortages, and losses.
 12. Meter readings and similar recordings.

13. Emergency procedures.
 14. Orders and requests of authorities having jurisdiction.
 15. Change Orders received and implemented.
 16. Work Change Directives received and implemented.
 17. Services connected and disconnected.
 18. Equipment or system tests and startups.
 19. Partial completions and occupancies.
 20. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Submittal schedule requirements.
- 2. Administrative and procedural requirements for submittals.

- B. Related Requirements:

- 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
- 2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
- 3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
- 4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
- 5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
- 6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
- 7. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
- 8. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
- 9. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with

requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

- C. Mass Submittals: Six or more submittals or items in one day or 15 or more submittals or items in one week.

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Engineer's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL FORMATS

- A. Numbering System: Utilize the following example submittal identification numbering system to identify submittals and as file names for PDF submissions:
 1. First Identifier - Alphabet Character: D, S, M or I which represents Shop Drawing (including working drawings and product data), Sample, Manual (Operating & Maintenance) or Informational, respectively.
 2. Second Identifier - Next 6 or 8 Digits: Applicable Specification Section Number. Do not mix submittals from different specification sections into a single submittal.

3. Third Identifier - Next Three Digits: Sequential number of each separate item or drawing submitted under each Specification Section, in chronological order submitted, starting at 001.
 4. Fourth Identifier - Last Alphabet Character: A to Z, indicating the submission (or resubmission) of the same submittal, i.e., "A" = 1st submission, "B" = 2nd submission, "C" = 3rd submission, etc.
 5. EXAMPLE: D-033000.13-008-B.
 - a. D = Shop Drawing.
 - b. 03 30 00.13 = Section; use only 6 digits for sections that do not include 8 digits.
 - c. 008 = the eighth different submittal under this Section.
 - d. B = the second submission (first resubmission) of that particular shop drawing.
- B. Submittal Information: Include the following information in each submittal:
1. Project name.
 2. Date.
 3. Name of Engineer.
 4. Name of Construction Manager.
 5. Name of Contractor.
 6. Name of firm or entity that prepared submittal.
 7. Names of subcontractor, manufacturer, and supplier.
 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 9. Category and type of submittal.
 10. Submittal purpose and description.
 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 12. Drawing number and detail references, as appropriate.
 13. Indication of full or partial submittal.
 14. Location(s) where product is to be installed, as appropriate.
 15. Other necessary identification.
 16. Remarks.
 17. Signature of transmitter.
- C. Options: Identify options requiring selection by Engineer.
- D. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- E. Paper Submittals:
1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
 3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Engineer will return one copies.

4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Engineer will not return copies.
 5. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using Contractor's transmittal form.
- F. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package and transmit to Engineer by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Engineer.
 - a. Engineer will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 2. Paper: Prepare submittals in paper form and deliver to Engineer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 30 days for initial review of each submittal (and 45 days for multi-discipline reviews). Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
 4. Repetitive Reviews: Shop drawings, O&M manuals, and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at the Contractor's expense. Reimburse the Owner for all costs invoiced by Engineer for the third and subsequent reviews.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 - a. Two opaque (bond) copies of each submittal. Engineer will return one copy.
- C. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- E. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- F. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Contractor's Certification: Each shop drawing, working drawing, product data, and sample shall have affixed to it the following Certification Statement:
 - a. "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria,

materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements. "

3. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
4. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
5. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
6. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
7. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

G. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 PROPOSED PRODUCT LIST

- A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Contractor Responsible for:
 - 1. Determination and verification of materials including manufacturer's catalog numbers.
 - 2. Determination and verification of field measurements and field construction criteria.
 - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
 - 4. Determination of accuracy and completeness of dimensions and quantities.
 - 5. Confirmation and coordination of dimensions and field conditions at Site.
 - 6. Construction means, techniques, sequences, and procedures.
 - 7. Safety precautions.
 - 8. Coordination and performance of Work of all trades.
 - 9. Other requirements enumerated in Contract Documents.
- C. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ENGINEER'S REVIEW

- A. Do not make mass submittals to Engineer. If mass submittals are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review mass submittals based on priority determined by Engineer after consultation with Owner and Contractor.
- B. Action Submittals: Engineer will review each submittal, indicate corrections or revisions required.
 - 1. PDF Submittals: Engineer will indicate, via markup on each submittal, the appropriate action.

2. Paper Submittals: Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
 - D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
 - E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
 - F. Engineer will return without review submittals received from sources other than Contractor.
 - G. Submittals not required by the Contract Documents will be returned by Engineer without action.
 - H. Shop drawings will be returned to the Contractor with one of the following codes.
 1. "APPROVED" - This code is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
 2. "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
 3. "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. The resubmittal is to address all comments, omissions and non-conforming items that were noted. An additional box is checked to indicate whether the resubmission is for the complete package, or for parts of the package. If no box is checked, a complete resubmittal shall be provided. Review code may designate if a partial or full submittal is required. If full submittal is required, a complete resubmittal package addressing all comments shall be provided. If a partial submittal is designated, resubmittal shall only include information pertaining to those items noted in review comments requiring clarification and any portions of submittal impacted as a result of the response. Resubmittal is to be received by the Engineer within 30 calendar days of the date of the Engineer's transmittal requiring the resubmittal.
 4. "REJECTED" - This code is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the Contract Documents.
 5. "RECEIPT ACKNOWLEDGED (Not subject to Engineer's Approval)" - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer's approval. This code is generally used with submittals involving the Contractor's means and methods of construction work plans, and health and safety plans.

1.11 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

- A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.
- B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:
 - 1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
 - 2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
 - 3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
 - 4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
 - 5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
 - 6. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013300

SECTION 013513.24 – SPECIAL PROCEDURES FOR MAINTENANCE OF PLANT OPERATION AND SEQUENCE OF CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental General Conditions and other Division 01 Specification Sections, apply to this Section.
- B. General Provisions for Process Control are included in Section 406100.
- C. Testing of Process Control Systems are included in Section 406121.

1.2 SUBMITTALS

- A. Submit a Maintenance of Plant Operations (MOPO) Workplan before beginning any work. Provide the following in accordance with Section 013300 Submittal Procedures:
 - 1. List of proposed variances from this Section, along with the benefit of the proposed variance, such as shorter downtime duration or scheduling of the Contractor's normal or complimentary operations personnel.
 - 2. Chronologically ordered work tasks for the execution of the major work included in the Contract. The description of each work sequence shall include the following:
 - a. General description of each phase of work.
 - b. Prerequisites before work may begin.
 - c. Proposed date and time of execution and estimated duration of each phase of work, including downtime. Downtime of a control panel, if needed, is limited to four hours in any 24-hours period.
 - d. Tasks requiring Owner/Operator participation or approval.
 - e. Description of equipment that is out of service for the duration of each task/phase.
 - f. Means of ensuring access of Owner's staff/operators to the Electrical Room throughout the construction phases to ensure continued Plant operations.
 - 3. Agendas for MOPO Workshop and/or MOPO Meetings as specified herein.
 - 4. Sample Notice of Need. The Notice of Need will be a written notice prepared by the Contractor and submitted to the Engineer requesting that existing facilities be taken out of service to complete the work of this Contract
 - 5. Description and schedule of common area use if normal access areas are disrupted.
 - 6. Shop drawings showing details of all temporary services, bypasses, and tie-ins to existing systems. Additional details on these requirements are specified herein.
 - 7. The MOPO Workplan shall be submitted and approved prior to the start of work. Submit updates to the Workplan before each subsequent phase for review and approval prior to performing any work on the next phase.

1.3 SITE CONDITIONS

- A. Several areas of construction under this contract must be coordinated with the Plant Operating Personnel and accomplished in a logical order to maintain the process flow through the plant and to allow construction to be completed within the time allowed by Contract Documents. Coordinate the activities with the other contractors, if any, to allow orderly and timely completion of all the work.
- B. When access through construction areas must be disrupted, provide alternate acceptable access for the plant operators or other contractors.
- C. Coordinate the activities in the interface or common areas with these other contractors and the plant operators. Submit to the Engineer a description and schedule as to how the common areas will be utilized, recognizing the required coordination with other contractors and the plant operators.
- D. Various interconnections within the plant may require temporary partial power shutdown. Make every effort necessary to minimize the shutdown time and coordinate with the Plant Operating Personnel and/or utility authorities prior to attempting any such power shutdown. Furthermore, provide any corrective measure or temporary facilities necessary to perform the work at no additional cost to the Owner and without interrupting the plant operation.
- E. When the work requires an existing facility to be taken out of operation temporarily, notify the Engineer, Owner, and plant operators one week in advance. Coordination meetings involving the Contractor, Owner, and Engineer shall be held two weeks prior to any control panel work.
- F. The intent of this section is to provide a framework for the Contractor to perform the work in a sequence and manner such that continuous, uninterrupted treatment of waste flows are maintained operational throughout the construction period.
- G. During Start Up Testing, make available the manpower, equipment and manufacturer's representatives required to make any necessary adjustments and training.
- H. In addition to the project schedule requirements listed in Section 013200 "Construction Progress Documentation", develop a detailed description of the complete sequence of construction. The sequence shall be submitted to the Engineer and Owner for review and approval 45 days following the execution of the Contract Agreement.
- I. The existing Plant Network and Supervisory Control and Data Acquisition (SCADA) System shall remain in operation until the final phase of construction. The Applications Engineering System Supplier (AESS) shall update the existing SCADA System and the new SCADA System concurrently allowing the owner to continue to perform operations using the existing SCADA System until the AESS makes the final cutover during the final phase of construction.

1.4 CONSTRUCTION CONSTRAINTS

- A. The following is a list of constraints to consider in developing the overall plan of construction. This list is not intended to release the Contractor from the responsibility to coordinate the work in any manner which will ensure uninterrupted operation of the plant and project completion within the time allowed. The following areas are not necessarily listed in their required sequence of construction. A suggested sequence within each area, where necessary, is included.

- B. To maintain continuous plant operations during construction, a phased construction sequence similar to that described herein shall be required. Specific constraints and steps are outlined and are intended to suggest a sequence for specific activities. This sequence shall be coordinated with the Owner and the Engineer and submitted for approval in accordance with the requirements of Paragraph 1.2. Work shall not commence unless the sequence has been accepted and approved.
- C. The detailed sequence of construction shall be based upon the schedule submitted by the Contractor and approved by the Engineer as specified above. However, as a guide for bidders in the preparation of their bid and for the Contractor in the preparation of his schedule, a suggested sequence of construction is described below. The Contractor may alter the sequence as approved by the Engineer, providing plant operations are maintained.
- D. The order of construction shall be subject to the approval of the Engineer; such approval or direction, however, shall in no way relieve the Contractor's responsibility to perform the work in strict accordance with the Contract Documents. The construction plans and specifications have been developed to minimize the construction impacts on the operation of the treatment facility. The Contractor shall note the requirements of this Section about the operation of the facility and the phasing of construction when developing his work sequence. The Contractor's work sequence shall be specifically detailed in the schedule that is required under Section 013200 "Construction Progress Documentation."
- E. The following work sequence provides for completing the construction of the project within the requirements of the Owner's plant operation and scheduling limitations. It does not intend to cover all sequences necessitated by the actual construction methods. This is a partial outline only. Portions of the work not specifically itemized must be scheduled by the Contractor in accordance with the requirements of the approved construction sequence. The Contractor is required to account for all details in formulating his own complete plan for implementation of the project.
- F. All Areas
 - 1. No control panel may be taken out of service for more than a single 4-hour period in each 24 hours, unless specifically excepted below.
 - 2. No more than one control panel may be taken out of service in any 24-hour period.
 - 3. Always maintain the integrity of the plant network. Always maintain integrity of the plant network ring structure with the exception of 4-hour intervals for switchover.
 - 4. Notify Owner, Engineer and Owner's operations staff 48-hours prior to each shutdown and transition.
 - 5. Do not shut down any panel without written approval from Owner.
 - 6. All new PLC controls for each process shall be in place before equipment can be fully checked out.
- G. Sequence of Construction – Preparation
 - 1. The central SCADA system software and hardware will be upgraded. A new SCADA rack will be installed in the Electrical Room with new SCADA servers as shown on the Drawings. A careful sequence of construction is needed to minimize downtime and ensure a careful transition from the existing to the new SCADA system.

- a. Ensure new control and networking rooms in the Plant Control and Pretreatment Building are adequately prepared and ready for new SCADA equipment. Ensure all furniture (consoles/tables/chairs) are established. Ensure all applicable cable/conduit has been run/tested as necessary.
- b. The new SCADA servers are to be located in the Electrical Room in the new SCADA rack. Conduit and cable to the PTCP PLC panel and OT wall-mounted rack is to be run in preparation for installation of the servers. All cabling to be tested and confirmed prior to the transition.
- c. Install the cell router antenna, coaxial cable/couplings, and associated conduit in the remote pump stations and at the Electrical Room in preparation for the transition to the new cell routers. Coaxial cable to be tested/confirmed prior to the SCADA transition. Cell routers are to be configured and the VPN tunnels established prior to the switchover to the new routers.
- d. Ensure new workstations and wall-mounted display monitors are installed with proper power and connection cabling run to appropriate locations. This may require the use of temporary tables, Ethernet cables, power strips and extension cables to connect new workstations. Coordinate locations with Owner.
- e. Install the new SCADA rack in the Electrical Room, including the servers, switches and other equipment, with proper power and connection cabling run to appropriate locations. Install cellular modem in the PTCP control panel.
- f. Power on all new equipment and test all connections and equipment to the greatest extent possible without connecting new equipment to the running SCADA system network.
- g. Inform and coordinate transition date/time with owner and operations staff. Outage of 4-8 hours is anticipated for monitoring and control of plant and remote site processes of the central SCADA HMI system. Plant operations staff should perform local control/monitoring of plant and remote stations as required.

H. Sequence of Construction – SCADA Transition

1. At this step, all new equipment, excluding panel-mounted industrial computers, are installed, and powered but not connected to the existing SCADA network.
 - a. Inform the AESS, operations staff and Owner of the transition plan and estimated network downtime. Before any Contractor cutover, operation staff, Owner and AESS shall be contacted for approval. Hold a transition meeting on the morning of the transition with all relevant parties to confirm sequence of operation and duties of all parties.
 - b. Connect new SCADA switches to the existing SCADA ring network and confirm communication is operational with data populating at the new SCADA computers.
 - c. Ensure the SCADA systems, both existing and new, are fully functional. Ensure all nodes and stations, both local to the plant and remote, can be accessed and are successfully integrated to the SCADA network.
 - d. Replace the PLC processors in each PLC panel identified one panel at a time. Remove the PLC processor and replace with the new PLC processor. Confirm the PLC is operational, and communication is maintained to the head end HMI system.
 - e. Transition each remote site, each with a new cellular router, over to the new SCADA system one site at a time. Confirm remote site information can be seen on SCADA HMI.
 - f. Connect and test new panel-mounted HMIs and upgraded HMI screens in each control panel.

- g. Install SCADA workstations in their final location.
- h. Hand over legacy PLCs, computers, switches, and other antiquated SCADA equipment to the owner.
- i. The Contractor shall submit a Certification Statement for review by the Engineer that the SCADA upgrade is completed. The Engineer shall respond in four business days.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION – 013513.24

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of [five] <Insert number> previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

- D. **Preconstruction Testing:** Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- E. **Product Tests:** Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. **Source Quality-Control Tests and Inspections:** Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- G. **Testing Agency:** An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
- H. **Quality-Assurance Services:** Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- I. **Quality-Control Services:** Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Engineer.

1.4 CONFLICTING REQUIREMENTS

- A. **Conflicting Standards and Other Requirements:** If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Engineer regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Engineer for clarification before proceeding.
- B. **Minimum Quantity or Quality Levels:** The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. **Contractor's Quality-Control Plan:** For quality-assurance and quality-control activities and responsibilities.
- B. **Qualification Data:** For Contractor's quality-control personnel.

- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement of whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- 1.7 QUALITY ASSURANCE
- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- E. Design Professional Qualifications: A professional engineer / registered architect who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Design / engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect, demonstrate, repair and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.8 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payments.
 1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 2. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Engineer.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's and authorities' having jurisdiction reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
 - 2. Section 017700 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycle contract materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in PART 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant

qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in PART 2 "Comparable Products" Article.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.

e. Ratings.

3. See individual identification Sections in Divisions 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

- B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

- C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection for wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. **Manufacturer's Warranty:** Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - 2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
 - 2. **Specified Form:** When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. **General Product Requirements:** Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. **Standard Products:** If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Engineer will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 6. **Or Equal:** For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

- a. Submit additional documentation required by Engineer in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Engineer, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer that complies with requirements.

- a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance the following requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of Engineers and owners, if requested.
 5. Samples, if requested.
- B. Engineer's Action on Comparable Products Submittal: If necessary, Engineer will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 2. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Engineer of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 016000

SECTION 017300 – EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner's portion of the Work.
6. Coordination of Owner-installed products.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.

- B. Related Requirements:

1. Section 011000 "Summary" for coordination of limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. **Field Measurements:** Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. **Space Requirements:** Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. **Review of Contract Documents and Field Conditions:** Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer in accordance to requirements in Section 013100 "Project Management and Coordination."

3.3 FIELD ENGINEERING

- A. **Identification:** Owner will identify existing benchmarks, control points, and property corners.

3.4 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Engineer. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items onsite and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Engineer. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.5 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.

- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Engineer. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- I. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
 - 3. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 4. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 5. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Engineer's use prior to Engineer's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer's signature for receipt of submittals.
 - 4. Submit testing, adjusting, and balancing records.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Complete startup and testing of systems and equipment.
 - 2. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."

4. Advise Owner of changeover in utility services.
 5. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 7. Complete final cleaning requirements.
 8. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial

Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit on digital media acceptable to Engineer.
- E. Warranties in Paper Form:
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - c. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - d. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - e. Clean flooring, removing debris, dirt, and staining: clean according to manufacturer's recommendations.
 - f. Vacuum and mop concrete.
 - g. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - i. Remove labels that are not permanent.
 - j. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - k. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - l. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - m. Leave Project clean.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Engineer will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Engineer. Enable reviewer comments on draft submittals.
 - 2. Submit three paper copies. Engineer will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Engineer will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Engineer will return copy with comments.
 - 1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Engineer.
 7. Name and contact information for Commissioning Authority.
 8. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 9. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor has delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.

- D. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.
 - 9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.8 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

- a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of maintenance manuals.

1.9 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for maintaining and exhibiting project record documents as a prerequisite for progress payments.
 - 2. Section 017300 "Execution" for final property survey.
 - 3. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
 - 3) Submit Record Digital Data Files and one set(s) of plots.
 - 4) Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.

- 2) Submit Record Digital Data Files and three set(s) of Record Digital Data File plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Work Change Directive.

- k. Changes made following Engineer's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Engineer.
 - e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

- B. Format: Submit Record Specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
 - 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours. As a prerequisite for monthly progress payments, exhibit the updated record documents for review by Owner and Engineer for accuracy and completeness.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017839

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Engineer.

- d. Name of Contractor.
 - e. Date of video recording.
2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
 3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
 4. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Engineer.

1.7 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Systems and equipment operation manuals.
 - b. Systems and equipment maintenance manuals.
 - c. Product maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.

- d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.

1.8 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Engineer will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Engineer, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017900

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SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Owner's Project Requirements and Basis-of-Design Document are included by reference for information only.

1.2 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning activities.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of commissioning process test equipment, instrumentation, and tools.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.

B. Related Requirements:

1. Section 011000 "Summary" for Commissioning Authority responsibilities.
2. Section 011200 "Multiple Contract Summary" for Commissioning Authority responsibilities.
3. Section 013300 "Submittal Procedures" for submittal procedure requirements for commissioning process.
4. Section 017700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
5. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal requirements.

1.3 DEFINITIONS

- A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- B. Basis-of-Design Document: A document prepared by Engineer that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.

- C. Commissioning Authority: An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.
- D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation of commissioning requirements.
- E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of the commissioning process is defined in Section 011000 "Summary."
- F. Construction-Phase Commissioning-Process Completion: The stage of completion and acceptance of commissioning process when resolution of deficient conditions and issues discovered during commissioning process and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date construction-phase commissioning-process completion is achieved. See Section 017700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
 - 1. Commissioning process is complete when the Work specified of this Section and related Sections has been completed and accepted, including, but not limited to, the following:
 - a. Completion of tests and acceptance of test results.
 - b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
 - c. Comply with requirements in Section 017900 "Demonstration and Training."
 - d. Completion and acceptance of submittals and reports.
- G. Owner's Project Requirements: A document that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. This document is prepared either by the Owner or for the Owner by the Engineer or Commissioning Authority.
- H. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Engineer-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.
- I. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.
- J. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- K. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.4 COMPENSATION

- A. If Engineer, Commissioning Authority, other Owner's witness, or Owner's staff perform additional services or incur additional expenses due to actions of Contractor listed below, compensate Owner for such additional services and expenses.
 - 1. Failure to provide timely notice of commissioning activities schedule changes.
 - 2. Failure to meet acceptance criteria for test demonstrations.
- B. Contractor shall compensate Owner for such additional services and expenses as follows:
 - 1. Overtime costs for the Owner's personnel shall be based on the individual's current overtime wage rate for extended work hours outside of 7:00 AM to 3:30 PM Monday through Friday.
 - 2. Overtime costs for personnel employed by the Engineer and Engineer's subcontractors shall be calculated at a rate of \$150.00 per hour for extended work hours incurred as a result of overtime work in excess of eight regular working hours.
 - 3. Expenses for personnel travelling more than 100 miles round trip: the current Internal Revenue Service (IRS) business mileage rate and per diem allowances for meals and lodging, as applicable, according to current U.S. General Services Administration (GSA) Per Diem Rates.

1.5 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s):
 - 1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning process.
 - 2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning process.
 - 3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning process.
 - 4. Appointed team members shall have the authority to act on behalf of the entity they represent.
- B. Members Appointed by Owner:
 - 1. Commissioning Authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning process.
 - 2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning process.
 - 3. Engineer, plus employees and consultants that Engineer may deem appropriate for a particular portion of the commissioning process.

1.6 INFORMATIONAL SUBMITTALS

- A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedure general requirements for commissioning process.

- B. Commissioning Plan Information:
1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors performing the various commissioning requirements.
 2. Schedule of commissioning activities, integrated with the Construction Schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for the Construction Schedule general requirements for commissioning process.
 3. Contractor personnel and subcontractors participating in each test.
 4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.
- C. Commissioning schedule.
- D. Two-week look-ahead schedules.
- E. Commissioning Coordinator Letter of Authority:
1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:
 - a. Make inspections required for commissioning process.
 - b. Coordinate, schedule, and manage commissioning process of Contractor, subcontractors, and suppliers.
 - c. Obtain documentation required for commissioning process from Contractor, subcontractors, and suppliers.
 - d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.
- F. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.
1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- G. List test instrumentation, equipment, and monitoring devices. Include the following information:
1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
 2. Brief description of intended use.
 3. Calibration record showing the following:
 - a. Calibration agency, including name and contact information.
 - b. Last date of calibration.
 - c. Range of values for which calibration is valid.
 - d. Certification of accuracy.
 - e. Certification for calibration equipment traceable to NIST.
 - f. Due date of the next calibration.

H. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issue Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit printout of log of alarms that occurred since the last log was printed.

I. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.7 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction-Phase Commissioning Completion, include the following:
 - a. Pre-startup reports.
 - b. Approved test procedures.
 - c. Test data forms, completed and signed.
 - d. Progress reports.
 - e. Commissioning issue report log.
 - f. Commissioning issue reports showing resolution of issues.
 - g. Correspondence or other documents related to resolution of issues.
 - h. Other reports required by commissioning process.
 - i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction-Phase Commissioning Completion.
 - j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction-Phase Commissioning Process Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:

1. Documented experience commissioning systems of similar complexity to those contained in these documents on at least five projects of similar scope and complexity.
2. Certification of commissioning-process expertise. The following certifications are acceptable. Owner reserves the right to accept or reject certifications as evidence of qualification.
 - a. Certified Commissioning Authority, by AABC Commissioning Group (ACG).
 - b. Commissioning-Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.
 - c. Certified Commissioning Professional, by Building Commissioning Association.
 - d. Accredited Commissioning-Process Authority Professional, by University of Wisconsin.
 - e. Accredited Commissioning-Process Manager, by University of Wisconsin.
 - f. Accredited Green Commissioning-Process Provider, by University of Wisconsin.
- B. Calibration Agency Qualifications: Certified by The American Association for Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Test equipment and instrumentation required to perform the commissioning process shall remain the property of Contractor unless otherwise indicated.
- B. Test equipment and instrumentation required to perform commissioning process shall comply with the following criteria:
 1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
 2. Calibrated and certified.
 - a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags shall be permanently affixed.
 - b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.
 3. Maintain test equipment and instrumentation.
 4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.
1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
 2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders.
2. Label the front cover and spine of each binder with the report title, volume number, project name, Contractor's name, and date of report.
3. Record report on compact disk.
4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:
 - a. Test specification.
 - b. Pre-startup reports.
 - c. Approved test procedures.
 - d. Test data forms, completed and signed.
 - e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

- A. Construction checklists cannot modify or conflict with the Contract Documents.
- B. Create construction checklists based on actual systems and equipment to be included in Project.
- C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment if applicable.
 - 1. Service connection requirements, including configuration, size, location, and other pertinent characteristics.
 - 2. Included optional features.
 - 3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness, and lack of damage.
 - 4. Installation Checks:
 - a. Location according to Drawings and approved Shop Drawings.
 - b. Configuration.
 - c. Compliance with manufacturers' written installation instructions.
 - d. Attachment to structure.
 - e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
 - f. Utility connections are of the correct characteristics, as applicable.
 - g. Correct labeling and identification.
 - h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.
- D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum.
- E. Performance Tests:
 - 1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
 - 2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
 - 3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
 - 4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
 - 5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.
- F. Deferred Construction Checklists: Obtain Owner approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist,

before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, deferred construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify deferred construction checklists by number and title.
2. Provide a target schedule for completion of deferred construction checklists.
3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.

G. Delayed Construction Checklists: Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, delayed construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify delayed construction checklist by construction checklist number and title.
2. Provide a target schedule for completion of delayed construction checklists.
3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.3 GENERAL EXECUTION REQUIREMENTS

- A. Schedule and coordinate commissioning process with the Construction Schedule.
- B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.
- C. Perform test demonstrations for Owner's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies. In some instances, demonstration of a random sample of other than 100 percent of the results of a test is specified.
 1. Where sampling is specified, the sampling plan and procedure for the test demonstration shall be determined using ASQ Z1.4.
 2. The "lot size" in ASQ Z1.4 is the sum of the number of items to which the test demonstration applies, as described in the scope subparagraph of each test.
 3. On determination of the sample size, the samples shall be selected randomly by Owner's witness at the time of the test demonstration.
 4. Include in the Commissioning Plan a detailed list of the test demonstrations with lot and sample quantities for each test.
- D. Report test data and commissioning issue resolutions.
- E. Schedule personnel to participate in and perform Commissioning-Process Work.
- F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:
 1. Operating the equipment and systems they install during tests.

2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

- A. Management and Coordination: Manage, schedule, and coordinate commissioning process, including, but not limited to, the following:
 1. Coordinate with subcontractors on their commissioning responsibilities and activities.
 2. Obtain, assemble, and submit commissioning documentation.
 3. Attend periodic on-site commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."
 4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the Construction Schedule. Update Construction Schedule at specified intervals.
 5. Review and comment on preliminary test procedures and data forms.
 6. Report inconsistencies and issues in system operations.
 7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
 8. Direct and coordinate test demonstrations.
 9. Coordinate witnessing of test demonstrations by Owner's witness.
 10. Coordinate and manage training. Be present during training sessions to direct video recording, present training, and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."
 11. Prepare and submit specified commissioning reports.
 12. Track commissioning issues until resolution and retesting is successfully completed.
 13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.
 14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

- A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.
- B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published Commissioning Schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning process.
- C. Construction Checklists:
 1. Complete construction checklists as Work is completed.
 2. Distribute construction checklists to installing contractors before they start work.
 3. Installers:
 - a. Verify installation using approved construction checklists as Work proceeds.

- b. Complete and sign construction checklists weekly for work performed during the preceding week.
 4. Provide Commissioning Authority access to construction checklists.
- D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.
- E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.
- F. Test Procedures and Test Data Forms:
 1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
 2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
 3. Completed test data forms are the official records of the test results.
 4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
 5. Review preliminary test procedures and test data forms, and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:
 - a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
 - b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.
 6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."
 7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.
- G. Performance of Tests:
 1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
 2. Perform and complete each step of the approved test procedures in the order listed.
 3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
 4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and

data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.

5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent unless otherwise indicated in the individual test specification.
2. Notify Owner's witness at least three days in advance of each test demonstration.
3. Perform and complete each step of the approved test procedures in the order listed.
4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.
 - a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.
7. False load test requirements are specified in related sections.
 - a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Engineer's written approval.

I. Deferred Tests:

1. Deferred Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction-Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction-Phase Commissioning Process Completion as follows:
 - a. Identify deferred tests by number and title.
 - b. Provide a target schedule for completion of deferred tests.

2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Engineer and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where deferred tests are specified, coordinate participation of necessary personnel and of Engineer, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Engineer's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. Include the following in the request for Certificate of Construction-Phase Commissioning Process Completion:
 - a. Identify delayed tests by test number and title.
 - b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.
2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Engineer and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where delayed tests are approved, coordinate participation of necessary personnel and of Engineer, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Engineer's approval of the proposed schedule.

K. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.
3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:
 - a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
 - b. Submit commissioning compliance issue report form within 24 hours of the test.
 - c. Determine the cause of the failure.
 - d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.
 - a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.
 - b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
 - c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
 - d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:
 - a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
 - b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
 - c. Record the results of each step of the diagnostic procedure.
 - d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
 - e. Determine and record corrective measures.
 - f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:
 - a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
 - b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.
 - a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.6 COMMISSIONING MEETINGS

- A. Commissioning Authority will schedule and conduct commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."

3.7 SEQUENCING

- A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

- 1. Construction Checklists:

- a. Material checks.
- b. Installation checks.
- c. Startup, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
- d. Performance Tests:
 - 1) Static tests, as appropriate.
 - 2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
 - 3) Equipment and assembly performance tests.
 - 4) System performance tests.
 - 5) Intersystem performance tests.

- 2. Commissioning tests.

- B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.
- C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Engineer if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.
- D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.8 SCHEDULING

- A. Commence commissioning process as early in the construction period as possible.
- B. Commissioning Schedule: Integrate commissioning activities into Construction Schedule. See Section 013200 "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Construction Schedule and short-interval schedule submittals.
2. Schedule the start date and duration for the following commissioning activities:
 - a. Submittals.
 - b. Preliminary operation and maintenance manual submittals.
 - c. Installation checks.
 - d. Startup, where required.
 - e. Performance tests.
 - f. Performance test demonstrations.
 - g. Commissioning tests.
 - h. Commissioning test demonstrations.
3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
4. Determine milestones and prerequisites for commissioning process. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short-interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning process.
2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Engineer.
2. Notify Engineer of commissioning schedule changes at least two work days in advance for activities requiring the participation of Owner's witness.

3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:
 - a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
 - b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.
 - c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly

- installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
- d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
 - e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.
2. Test data reports include the following:
- a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
 - b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
 - c. Signatures of individuals performing and witnessing tests.
 - d. Data trend logs accumulated overnight from the previous day of testing.
3. Commissioning Compliance Issue Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:
- a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
 - b. Action distribution list.
 - c. Report date.
 - d. Test number and description.
 - e. Equipment identification and location.
 - f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
 - g. Diagnostic procedure or plan to determine the cause (include in initial submittal)
 - h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
 - i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.
 - j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
 - k. Schedule for retesting.
4. Weekly progress reports include information for tests conducted since the preceding report and the following:
- a. Completed data forms.

- b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
 - c. Activities scheduled but not conducted per schedule.
 - d. Commissioning compliance issue report log.
 - e. Schedule changes for remaining Commissioning-Process Work, if any.
5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.
- a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
 - b. Attach to the data form printed trend log data collected during the test or test demonstration.
 - c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.
6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."
- a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.10 CERTIFICATE OF CONSTRUCTION-PHASE COMMISSIONING PROCESS COMPLETION

- A. When Contractor considers that construction-phase commissioning process, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Engineer a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to complete commissioning process.
- B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction-phase commissioning process or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction-Phase Commissioning Process Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction-Phase Commissioning Process Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction-phase commissioning process completion.

- C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Engineer's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

- D. When construction-phase commissioning process or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction-Phase Commissioning Process Completion that shall establish the date of completion of construction-phase commissioning process. Certificate of Construction-Phase Commissioning Process Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 019113

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SECTION 260510 – LIMITED ELECTRICAL FOR SMALL PROJECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Copper power and control wire rated 600V or less.
2. Connectors, splices, and terminations.
3. Grounding and bonding components.
4. Support systems for raceways, boxes, and electrical equipment.
5. Metal conduits and fittings.
6. Boxes, enclosures, and cabinets.
7. Identification requirements.
8. Special purpose receptacles.
9. Uninterruptible power supply.

- B. Related Requirements:

1. Division 27 Section 271116 "Communications Racks, Frames, and Enclosures" for additional requirements for UPS enclosure.
2. Division 27 Section 271513 "Communications Copper Horizontal Cabling" for ethernet cables.
3. Division 27 Section 271523 "Communications Optical Fiber Horizontal Cabling" for fiber optic cables.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit. See also RAC.
- B. Duct: A single duct or multiple ducts. Duct may be installed singly or as a component of a duct bank.
- C. Duct Bank:
 1. Two or more ducts installed in parallel, with or without additional casing materials.
 2. Multiple duct banks.
- D. EMI: Electromagnetic interference.

- E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50V or for remote-control and signaling power-limited circuits.
- F. RAC: Rigid aluminum conduit. See also ARC.
- G. RoHS: Restriction of Hazardous Substances.
- H. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.
- I. UPS: Uninterruptible Power Supply.
- J. National Electrical Code (NEC) / NFPA conduit types:
 - 1. RMC – rigid metal conduit
 - 2. FMC – flexible metal conduit
 - 3. LFMC – liquidtight flexible metal conduit
 - 4. PVC – rigid polyvinyl chloride conduit
 - 5. LFNC – liquidtight flexible nonmetallic conduit
 - 6. RNC – rigid nonmetallic conduit
 - 7. EMT – Electrical metallic tubing

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product used on this project.
- B. Shop Drawings:
 - 1. Precast Handholes: Include plans, elevations, sections, and details.
- C. Installation Working Drawings: For underground conduit routing.
- D. Battery Sizing Calculations: For runtime of UPS.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 ELECTRICAL MATERIALS

- A. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with associated UL Standards as applicable and listed in this specification.

2.2 WIRE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Alpha Wire Company.
 - 2. Encore Wire Corporations.
 - 3. General Cable Technologies Corporation.
 - 4. Okonite Company (The).
 - 5. Service Wire Co.
 - 6. Southwire Company.
- B. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V.
- C. Standards:
 - 1. RoHS compliant.
 - 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Size: Minimum No. 12 AWG for power circuits, minimum No. 14 AWG for control circuits.
- F. Stranding: Refer to Part 3 "Conductor Applications" Article.
- G. Conductor Insulation: Refer to Part 3 "Conductor Applications" Article.
 - 1. Type XHHW-2: Comply with UL 44.
 - 2. Type THHN and Type THWN-2: Comply with UL 83.

2.3 CONNECTORS, SPLICES, AND TERMINATIONS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. 3M Electrical Products.
 - 2. Ideal Industries, Inc.
 - 3. TE Connectivity Ltd.
 - 4. Thomas & Betts Corporation; A Member of the ABB Group.
- B. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: Tin-plated copper.
 - 2. Type:

- a. Locking spade with insulated sleeve for No. 10 AWG and smaller.
 - b. One hole with long barrels for No. 8 AWG to No. 4/0 AWG.
 - c. Two holes with long barrels for 250 kcmil and larger.
3. Termination: Compression for No. 8 AWG and larger.
- D. Connectors:
1. Solderless pressure type (wirenuts) for No. 10 AWG and smaller.
 2. Pre-filled with silicone-based sealant for exterior, wet, or corrosive locations.
 3. Split bolt type for No. 8 AWG and larger splices.

2.4 GROUNDING AND BONDING MATERIALS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. ERICO; a brand of nVent.
 2. Hubbell Incorporated (Construction and Energy Group).
 3. O-Z/Gedney; a brand of Emerson Industrial Automation.
 4. Thomas & Betts Corporation; A Member of the ABB Group.
- B. Standard: Comply with UL 467 for grounding and bonding materials and equipment.
- C. Grounding Conductors:
1. Insulated conductors to match corresponding 600V phase conductor insulation requirements.
- D. Grounding conduit hubs: Malleable iron type, mechanical type, terminal with threaded hub, sized for the associated conduit.

2.5 SUPPORT SYSTEMS

- A. Hot-dipped Galvanized Steel Channel:
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 2. Material for Channel, Fittings, and Accessories: Hot-dipped galvanized steel.
- B. Accessories: conduit clamps, straps, hangers, rods, backplates, anchors, nuts, washers, etc. shall match channel material as listed in the SUPPORT MATERIALS APPLICATION Article. Use of galvanized steel components is only allow with galvanized steel channel.
- C. Threaded rod: 3/8-inch minimum diameter.
- D. Expansion anchors: 3/8-inch minimum diameter.

2.6 METAL CONDUITS AND FITTINGS

- A. Rigid Aluminum Conduit: Comply with ANSI C80.5 and UL 6A.
- B. FMC: Comply with UL 1; zinc-coated steel.
- C. Metallic Fittings: Comply with NEMA FB 1 and UL 514B.
 - 1. Use cast aluminum fittings with RAC.
 - 2. Use malleable iron, three-piece screw in type with LMFC.
 - 3. Use Myers Electric Products, Inc. or equal, grounding type for conduit hubs.
 - 4. Use die cast compression type fittings with EMT, no set-screw type.

2.7 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: Pressed steel. Comply with NEMA OS 1 and UL 514A.
- B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- C. NEMA 1 and NEMA 12 Pull and Junction Boxes:
 - 1. Material: Sheet steel, minimum 14 gauge, without knockouts.
 - 2. Construction: flanged box, galvanized with continuous weld seams that are ground smooth.
 - 3. Cover: Gasketed, hanged, fastened with quick connect door clamp.

2.8 IDENTIFICATION

- A. Factory applied insulation color for No. 8 AWG conductors and smaller. Factory applied insulation color or field applied colored electrical tape for No. 6 AWG conductors and larger:
 - 1. Color for 208/120V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Neutral: White.
 - 2. Color for Equipment Grounds: Green.
 - 3. Color of Individual Control Conductors:
 - a. AC: Red.
 - b. DC: Blue.
- B. Nameplates and Labels:
 - 1. Equipment Identification and Source Nameplates:
 - a. Black letters on a white field.

- b. Engraved, laminated plastic, 3/16-inch-high lettering.
 - c. Provide for all electrical equipment. Match Drawing designation.
 - d. Include power source information, i.e., “FED FROM MCC-2” or provide separate nameplate.
2. Device Identification Labels:
- a. Black letters on a white field.
 - b. Machine generated, self-adhesive, 1/4-inch-high lettering.
 - c. Provide for all receptacles, wall switching, lighting fixtures, photocells, exit lights, instruments, etc.
 - d. Include power source and branch circuit information, i.e., “LP-2/15” indicates panelboard LP-2, branch circuit 15.
3. Wire and Cable Labels:
- a. Black letters on a white field.
 - b. Wraparound or sleeve type.

2.9 SPECIAL PURPOSE RECEPTACLES

- A. General Requirements: Heavy duty, specification grade and conform to Fed Spec WC596-F.
- B. Single twist-lock receptacle, 30 amp, 125 volt, 2 pole, 3 wire, NEMA L5-30R.
- C. Mount all new receptacles at 18” above finished floor.
- D. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Hubbell Wiring Devices.
 2. Arrow Hart.
 3. Pass & Seymour.
 4. Or approved equal.

2.10 UNINTERRUPTIBLE POWER SUPPLY (UPS)

- A. Performance Requirements:
 1. Ratings:
 - a. Output Power: 120/208 V, 10 kVA / 9 kW, hard-wired.
 - b. Battery Runtime: 30 minutes minimum at full load, 0.9 power factor, with ambient temperature of 25 degrees C.
 - c. Topology: Double-conversion online.
 - d. Configuration: Rack.
 2. Environment:
 - a. Operating Temperature: 0 to 40 degrees C.

- b. Elevation: Up to 1000-ft above mean sea level.
 - c. Relative Humidity: 0 to 90% non-condensing.
 3. System Input – Primary Source:
 - a. Dual Input (normal and bypass): Nominal Input Voltage: 208V, single-phase, hard-wired.
 - b. Frequency: 60 Hz, plus or minus 10 hertz.
 - c. Input Power Factor: 0.9 lag minimum.
 - d. Input Current Total Harmonic Distortion (THD): 5% maximum.
 4. AC to AC Efficiency: 93% with resistive load.
 5. Acoustical Noise: 45 dB max at 1 meter.
 6. EMI Suppression: Meet FCC Rules and Regulation 47, Part 15, Subpart J, for Class A devices.
- B. General Requirements:
 1. UPS manufacturer to provide all cabling required to interconnect all components of the UPS system.
 2. Provide input protection with an input circuit breaker (for the double-conversion path) and surge suppression circuitry.
 3. UPS and Battery Enclosure:
 - a. Suitable for installation at the location as shown on the Drawings.
 - b. NEMA 1 enclosure mounted on casters.
 - c. Suitable for hard-wired connections.
- C. Battery:
 1. Description: Sealed, lead-acid; maintenance free.
 2. Management: ABM technology.
 3. Replacement: Hot-swappable internal batteries and EBMs.
 4. Start on Battery: Cold-start enabled.
- D. Rack
- E. Manufacturer: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. UPS: Eaton # 9PX10KSP or approved equal.
 2. Extended Battery Module (EBM): Eaton # 9PXEBM360SP or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the applicable National Electrical Contractors Association (NECA) documents for installation requirements except where requirement on Drawings or in this specification are stricter.

1. NECA 1: Standard for Good Workmanship in Electrical Construction.
2. NECA 101: Standard for Installing Steel Conduits.
3. NECA 102: Standard for Installing Aluminum Rigid Metal Conduit.
4. NECA 111: Standard for Installing Nonmetallic Raceways.
5. NECA 331: Standard for Installing Building and Service Entrance Grounding and Bonding.
6. NECA / NEMA 605: Recommended Practice for Installing Underground Nonmetallic Utility Duct.

3.2 CONDUCTOR APPLICATIONS

- A. Wires and Cables: Copper, stranded, except for lighting and receptacle wiring which may be solid.
- B. Wire for lighting, receptacles, and other circuits not exceeding 150 volts to ground shall be NEC type XHHW-2.
- C. Wire for power circuits over 150 volts to ground shall be NEC type XHHW-2 for sizes No. 4/0 AWG and smaller, and shall be NEC type RHW-2 for sizes 250 kcmil and larger.
- D. Equipment grounding conductors shall be the same NEC type as the phase conductors described previously, green and sized per NEC Table 250.122.
- E. Wire for control, status, and alarm shall be NEC type THWN-2/THHN.

3.3 CONDUCTOR INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Use of steel fish tapes and/or steel pulling cables in PVC conduit or raceways that terminate into energized enclosures is prohibited.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Adequately support cables.
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

- H. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors. Do not splice service or feeder cables without prior written approval of Engineer.
- I. Wiring at Outlets:
 - 1. Install conductor at each outlet, with at least 6 inches of slack.
 - 2. Form solid wire into loop to fit around device terminal screw. Do not overlap wire.
- J. Identify and color-code conductors and cables.
- K. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.
- L. Identify circuit number associated with lights, receptacles, and other miscellaneous loads to panelboards. Identify phase and neutral conductors with circuit number.
- M. Separation from EMI Sources:
 - 1. Separation between open instrumentation cables or cables in non-metallic or non-ferrous raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Equipment or circuits rated less than 2 kVA: Minimum 5 inches.
 - b. Equipment or circuits rated between 2 and 5 kVA: Minimum 12 inches.
 - c. Equipment or circuits rated more than 5 kVA: Minimum 24 inches.

3.4 GROUNDING

- A. Comply with NEC Article 250.
- B. Install insulated green equipment grounding conductor in all power and control raceways.
- C. For instrumentation wiring, ground shield at one end only as recommended by instrument manufacturer and in accordance with Owner's standard.
- D. Install grounding conductors in conduit or sleeves when passing through floor slabs.

3.5 SUPPORT MATERIALS APPLICATION

- A. Dry, indoor, conditioned, non-process space: Hot-dipped galvanized steel.

3.6 RACEWAY APPLICATIONS

- A. Refer to Appendix Table 260510-1 for specific raceway application requirements.
- B. Minimum Raceway Size: 3/4-inch trade size.

3.7 BOX APPLICATIONS

- A. All boxes shall be metallic unless specified herein or indicated on the Drawings.
- B. Use cast malleable iron for boxes and conduit fittings for exposed switch, receptacle, and lighting outlets.
- C. Use pressed steel boxes for concealed switch, receptacles, and lighting outlets.
- D. Pull boxes, junction boxes, cabinets, etc. shall be suitable for the location and conform to the NEMA enclosure rating and material descriptions as indicated on the Drawings.
- E. Where no size is indicated for junction boxes, pull boxes, or terminal cabinets, size in accordance with NEC Article 314.

3.8 RACEWAY INSTALLATIONS

- A. Complete raceway installation before starting conductor installation.
- B. Tightly plug ends of conduits during construction to exclude dust and moisture.
- C. Arrange conduit system to allow liquids such as water, condensation, etc. will drain away from equipment served. If conduit drainage is not possible, plug conduits using conduit seals.
- D. Install no more than the equivalent of three 90-degree bends in any conduit run. Support within 12 inches of changes in direction.
- E. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- F. Support conduit within 12 inches of enclosures to which attached.
- G. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- I. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits. Install Meyers grounding type hubs when conduits terminate at gasketed enclosures.
- J. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- K. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

- L. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- O. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways using “Duxseal” or seal fitting at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Conduit extending from interior to exterior of building.
 - 4. Conduit extending into pressurized duct and equipment.
 - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - 6. Where otherwise required by NFPA 70.
- P. Install expansion joint fittings where necessary to compensate for thermal expansion and contraction.
- Q. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission or movement; and for transformers and motors.
- R. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- S. A maximum continuous run of conduit shall not exceed 300 feet and shall be reduced by 75 feet for each 90-degree elbow.

3.9 ELECTRICAL PENETRATIONS

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc.
- B. Locate all slots and concealed conduits and stub-ups for electrical work and place and form as required before concrete is poured.
- C. Use conduit wall seals where underground conduits penetrate walls or at other locations indicated on the Drawings.

- D. Seal openings where conduits pass through walls or floors to prevent passage of flame and smoke. Maintain fire rating of walls.
- E. Patch and paint interior wall penetrations to match original.

3.10 IDENTIFICATION INSTALLATION

- A. Self-Adhesive Identification Products: Before applying identification product, prepare and clean attachment surface with manufacturer recommended product to allow for effective bond.
- B. Verify and coordinate identification names and other features.
- C. Nameplate Attachment:
 - 1. Screw mounted for NEMA 1 enclosures.
 - 2. Epoxy or similar waterproof adhesive for all other enclosure types.
- D. Install identification and power source nameplates for electrical equipment. Refer to Part 2 “Identification” Article for requirements.
- E. Install circuit identification labels for cables and conductors at each termination location and within pull boxes and handholes. Refer to PART 2 “Identification” Article for color code and additional requirements.
- F. Install device identification labels for receptacles, light switches, etc. Refer to Part 2 “Identification” Article for requirements.
- G. Install underground warning tape during backfilling of trenches for underground conduits and duct banks in accordance with details on the Drawings.
- H. Panelboard Identification
 - 1. Provide equipment and power source nameplates as previously described.
 - 2. Label branch circuit phase and neutral wires with associated pole number.
 - 3. Install typed as built circuit directory giving location and nature of load served.

3.11 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections for the UPS.
 - 1. Inspect interiors of enclosures, including the following:
 - a. Inspect anchorage, alignment, grounding, and required clearances.
 - b. Component type and labeling verification.
 - c. Ratings of installed components.
 - 2. Test electrical and mechanical interlock systems for correct operation and sequencing.
 - 3. Inspect bolted electrical connections for high resistance using one or more of the following methods:

- a. Use of low-resistance ohmmeter according to Section 7.22.2.2 of NETA ATS.
 - b. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or Table 100.12 of NETA ATS.
 - c. Perform thermographic survey according to Section 9 of NETA ATS.
4. Test static transfer from inverter to bypass and back. Use normal load, if possible.
 5. Test DC undervoltage trip level on inverter input breaker. Set according to manufacturer's published data.
 6. Verify synchronizing indicators for static switch and bypass switches.
 7. Test direct current system's batteries.
 - a. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
 - b. Verify all charger functions and alarms.
 - c. Perform a load test according to manufacturer's published data or IEEE 450.
- B. The UPS system will be considered defective if it does not pass test and inspections.
- C. Perform the following tests and inspections for conductors and cables.
1. Visually inspect for correct installation.
 2. Perform continuity test.
 3. Perform insulation-resistance test for power and control conductors in accordance with NETA standards.
 4. Verify uniform resistance of parallel conductors.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Conduct fall-of-potential grounding electrode system test in accordance with IEEE 81.
- F. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria. Include results of tests, inspections, and retests.
- G. Prepare test and inspection reports.
- 3.12 CLEANING / PROTECTION
- A. Protect coatings, finishes, and cabinets from damage and deterioration. Repair damage as recommended by manufacturer.
 - B. Remove all rubbish and construction debris from inside electrical equipment and enclosures.

3.13 APPENDICES

A. Table 260510-1: Raceway Application Guidelines

Table 260510-1 Raceway Application Guidelines	
Raceway Type	Location / Application
Aluminum Rigid Conduit (ARC)	All indoor and outdoor applications, except where other types are listed. All exposed, non-corrosive areas. All concealed, non-corrosive areas. Under slabs in slab on grade construction. Stub-ups through slabs. Use LFMC for flexible connections. When installed underground or in contact with concrete, paint with two coats of bitumastic paint.

END OF SECTION 260510

SECTION 271116 - COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. 19-inch freestanding equipment cabinets.
2. Power strips.
3. Grounding.
4. Labeling.

- B. Related Requirements:

1. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.
2. Section 271523 "Communications Optical Fiber Horizontal Cabling" for optical-fiber data cabling associated with system panels and devices.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. LAN: Local area network.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.

- B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.

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

2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding and its mounting detail showing standoff insulators and wall-mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of Technician.
 2. Installation Supervision: Installation shall be under direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. UL listed.
- B. RoHS compliant.

2.2 19-INCH EQUIPMENT CABINETS

- A. Description: Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch (482.6-mm) equipment mounting with an opening of 17.72 inches (450 mm) between rails.
- B. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Tripp-Lite.
 2. Dell
 3. Rittal
 4. Hoffman
 5. Or equal.
- C. General Cabinet Requirements:
 1. Modular units designed for SCADA terminal support and coordinated with dimensions of units to be supported.
 2. Material: Extruded steel.

3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color: Black.

D. Modular Freestanding Cabinets:

1. Overall Height: As indicated on Drawings.
2. Overall Depth: As indicated on Drawings.
3. Load Rating: 3000 lb (1362 kg).
4. Number of Rack Units: 42 As indicated on Drawings.
5. Threads: 10-32.
6. Removable and lockable side and top panels.
7. Hinged and lockable front and rear doors.
8. Adjustable feet for leveling.
9. Screened ventilation openings in roof and rear door.
10. Cable access provisions in roof and base.
11. Grounding bus bar.
12. Two Rack-mounted, 550-cfm (260-L/s) fans with filter.
13. Power strip.

2.3 POWER DISTRIBUTION UNIT

- A. The power distribution unit (PDU) shall provide power distribution to equipment powered from UPS and function as an automatic transfer switch.
- B. Input and output voltage shall be 120 VAC, 60Hz
- C. The power cords will be terminated with L5-30P plugs.
- D. Units shall have 16 NEMA 5-15/20R receptacles.
- E. The PDU shall have SNMP capability and the ability to individually power on or off the outlets.
- F. Multiple PDUs at the same location shall be configured in a cascade configuration. Provide daisy-chain cable where required.
- G. Manufacturer:
 1. Tripp-Lite
 2. Or equal.

2.4 GROUNDING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Chatsworth Products, Inc.
 2. Harger Lightning & Grounding; business of Harger, Inc.
 3. Panduit Corp.
 4. Or equal.

- B. Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-606-B. Predrilling shall be with holes for use with lugs specified in this Section.
 - 1. Cabinet-Mounted Grounding Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to cabinet.
 - 2. Rack-Mounted Horizontal Grounding Busbar: Designed for mounting in 19- or 23-inch (482.6- or 584.2-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
 - 3. Rack-Mounted Vertical Grounding Busbar: 72 or 36 inches (1828.8 or 914.4 mm) long, with stainless-steel or copper-plated hardware for attachment to rack.

2.5 LABELING

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- C. Coordinate layout and installation of SCADA equipment in racks and room.
 - 1. Meet jointly with equipment suppliers and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
 - 2. Record agreements reached in meetings and distribute them to other participants.
 - 3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
 - 4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.
- D. Coordinate location of power raceways and receptacles with locations of SCADA equipment requiring electrical power to operate.

3.2 GROUNDING

- A. Comply with NECA/BICSI 607.
- B. Connect the cabinet grounding busbar to the nearest building grounding busbar.

3.3 IDENTIFICATION

- A. Coordinate system components, wiring, and cabling complying with TIA-606-B.
- B. Labels shall be machine printed. Type shall be 3/16 inch (5 mm) in height.

END OF SECTION 271116

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SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Category 6 twisted pair cable.
 - 2. Twisted pair cable hardware, including plugs and jacks.
 - 3. Cable management system.
 - 4. Cabling identification products.
 - 5. Grounding provisions for twisted pair cable.
 - 6. Source quality control requirements for twisted pair cable.
- B. Related Requirements:
 - 1. Section 260510 "Limited Electrical for Small Projects."

1.3 DEFINITIONS

- A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- B. EMI: Electromagnetic interference.
- C. FTP: Shielded twisted pair.
- D. F/FTP: Overall foil screened cable with foil screened twisted pair.
- E. F/UTP: Overall foil screened cable with unscreened twisted pair.
- F. IDC: Insulation displacement connector.
- G. LAN: Local area network.
- H. Jack: Also commonly called an "outlet," it is the fixed, female connector.
- I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
- J. RCDD: Registered Communications Distribution Designer.

- K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- M. S/FTP: Overall braid screened cable with foil screened twisted pair.
- N. S/UTP: Overall braid screened cable with unscreened twisted pairs.
- O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER HORIZONTAL CABLING DESCRIPTION

- A. A work area is approximately 100 sq. ft. (9.3 sq. m) and includes the components that extend from the equipment outlets to the station equipment.
- B. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Twisted pair cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, installation supervisor, and field inspector.
- B. Product Certificates: For each type of product.
- C. Source quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Jacks: Ten of each type.
 - 2. Plugs: Ten of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installation Supervision: Installation shall be under the direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
2. Testing Supervisor: Currently certified as a RCDD to supervise on-site testing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.11 PROJECT CONDITIONS

- ### A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- ### A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

2.2 GENERAL CABLE CHARACTERISTICS

- ### A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
2. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

- ### B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

- ### C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M.
 - 2. Belden Inc.
 - 3. General Cable; Prysmian Group North America.
 - 4. Or equal.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100-ohm, 23 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP).
- F. Cable Rating: Plenum.
- G. Jacket: White thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M.
 - 2. Belden Inc.
 - 3. General Cable; Prysmian Group North America.
 - 4. Or equal.
- C. General Requirements for Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 6.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables shall be terminated with connecting hardware of same category or higher.
- D. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, from single source.
- E. Connecting Blocks:
 - 1. 110-style IDC for Category 6.

2. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.
 - d. 24 or 48 ports.
 2. Construction: 16-gauge steel and mountable on 19-inch (483 mm) equipment racks.
 3. Number of Jacks per Field: One for each four-pair cable indicated plus 25 percent spare.
- G. Patch Cords: Factory-made, four-pair cables in 48-inch (1200-mm) lengths; terminated with an eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
- H. Plugs and Plug Assemblies:
1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 2. Standard: Comply with TIA-568-C.2.
 3. Marked to indicate transmission performance.
- I. Jacks and Jack Assemblies:
1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 2. Designed to snap-in to a patch panel or faceplate.
 3. Standard: Comply with TIA-568-C.2.
 4. Marked to indicate transmission performance.
- J. Legend:
1. Machine printed, in the field, using adhesive-tape label.
 2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.

- B. Factory test cables on reels according to TIA-568-C.1.
- C. Factory test twisted pair cables according to TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
- B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

- A. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

- A. General Requirements for Cabling:
 - 1. Install 110-style IDC termination hardware unless otherwise indicated.
 - 2. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
 - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 5. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified by the manufacturer. Use lacing bars and distribution spools.
 - 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

9. Pulling Cable: Comply with manufacturer recommendations. Monitor cable pull tensions.
- B. Group connecting hardware for cables into separate logical fields.
- C. Separation from EMI Sources:
 1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
 4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GROUNDING

- A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- B. Comply with TIA-607-B and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B.
- B. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 - 4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- C. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in SCADA equipment cabinets for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 271513

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SECTION 271523 - COMMUNICATIONS OPTICAL FIBER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. 50/125 micrometer, multimode, optical fiber cable (OM2).
2. Optical fiber cable connecting hardware, patch panels, and cross-connects.
3. Grounding.
4. Cabling identification products.

- B. Related Requirements:

1. Section 260510 "Limited Electrical for Small Projects."
2. Section 271513 "Communications Copper Horizontal Cabling" for cable and asset management software.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

1.4 OPTICAL FIBER HORIZONTAL CABLING DESCRIPTION

- A. A work area is approximately 100 sq. ft. (9.3 sq. m) and includes the components that extend from the equipment outlets to the equipment.
- B. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Fiber optic cable testing plan.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of product.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Jacks: Ten of each type.
 - 2. Plugs: Ten of each type.

1.9 QUALITY ASSURANCE

- A. The cable manufacturer shall be ISO 9001 certified and registered.
- B. The fiber optic cabling system materials furnished under this Section shall be provided by Fiber Optic Suppliers who have been providing these types of materials for the past three years. The Fiber Optic Suppliers shall provide personnel capable of providing technical assistance during installation.
- C. The installation of fiber optic cabling system materials furnished under this Section shall be performed by an installation Contractor who has been installing these types of materials and systems for the past three years.
- D. Supplier shall furnish five working installation references.
- E. The Engineer shall determine whether a product is an equal based upon the information listed herein and the manufacturer's data sheets regarding the models specified. Alternate equipment shall meet the criteria listed herein and all additional information in the manufacturer's data sheets in order to be accepted as an equal.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.

2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.12 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-B.

2.2 50/125 MICROMETER, MULTIMODE, OPTICAL FIBER CABLE (OM2)

- A. Description: Multimode, 50/125-micrometer, 2strand-fiber, nonconductive, tight buffer, optical fiber cable.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Belden Inc.
 2. Corning Optical Communications; Corning Incorporated.
 3. General Cable; Prysmian Group North America.
 4. Hitachi Cable America Inc.
 5. Or equal.
- C. Standards:
 1. Comply with ICEA S-83-596 for mechanical properties.
 2. Comply with TIA-568-C.3 for performance specifications.
 3. Comply with TIA-492AAAB for detailed specifications.

- D. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
- E. Minimum Overfilled Modal Bandwidth-length Product: 500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- F. Jacket:
 - 1. Jacket Color: Orange.
 - 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
 - 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).
- G. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - 1. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

2.3 OPTICAL FIBER CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden Inc.
 - 2. CommScope, Inc.
 - 3. Corning Optical Communications; Corning Incorporated.
 - 4. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - 5. Or equal.
- B. Standards:
 - 1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.
 - 2. Comply with TIA-568-C.3.
- C. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
 - 1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- D. Patch Cords: Factory-made, single-fiber cables in 36-inch (900-mm) lengths.
- E. Connector Type: Type LC complying with TIA-604-10-B, connectors.
- F. Plugs and Plug Assemblies:
 - 1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
 - 2. Insertion loss not more than 0.75 dB.
 - 3. Marked to indicate transmission performance.

G. Jacks and Jack Assemblies:

1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
2. Insertion loss not more than 0.75 dB.
3. Marked to indicate transmission performance.
4. Designed to snap-in to a patch panel or faceplate.

2.4 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.5 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test multimode optical fiber cables according to TIA-526-14-B and TIA-568-C.3.
- C. Factory test pre-terminated optical fiber cable assemblies according to TIA-526-14-B and TIA-568-C.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
1. Install plenum cable in environmental air spaces, including plenum ceilings.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

- A. General Requirements for Optical Fiber Cabling Installation:
1. Comply with TIA-568-C.1 and TIA-568-C.3.

2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
 3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified by the manufacturer. Use lacing bars and distribution spools.
 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 9. In the communications equipment room, provide a 10-foot- (3-m-) long service loop on each end of cable.
 10. Pulling Cable: Comply with manufacturer recommendations. Monitor cable pull tensions.
 11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
- B. Group connecting hardware for cables into separate logical fields.

3.3 FIRESTOPPING

- A. Comply with TIA-569-D, Annex A, "Firestopping."
- B. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.4 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
 1. Administration Class: Class 1.
 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets,

horizontal pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-B, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and Multimode Horizontal Link Measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
 - 2) Attenuation test results for horizontal links shall be less than 2.0 dB. Attenuation test results shall be less than those calculated according to equation in TIA-568-C.1.

- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- D. Remove and replace cabling where test results indicate that it does not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 271523

SECTION 406100 - PROCESS CONTROL AND ENTERPRISE MANAGEMENT SYSTEMS GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes procurement of the services of a Process Control System Supplier (PCSS) to provide all materials, equipment, labor, and services required to achieve a fully integrated and operational system as specified herein, in “Related Requirements” under this Article, and in related drawings, except for those services and materials specifically noted.
- B. Applications Engineering System Supplier (AESS) programming services will be performed by CDM Smith.
 - 1. Coordination with the AESS during construction is required to successfully integrate PCSS provided equipment with control system programming by the AESS. Reserve the appropriate time for coordinating with AESS in the PCSS project schedule as specified throughout Division 40.
 - 2. AESS will program the following: PLCs, firewall equipment, network switches (including KVM), servers, workstations, industrial computers, tablets, protocol converters, and cellular routers.
- C. Items specifically excluded from the PCSS scope include the following:
 - 1. Installation, programming and startup of the four Blower Control Panel HMIs, PLCs, and associated panel components which will be completed by the blower vendor (Neuros).
 - 2. The following software and service will be provided by the client:
 - a. Two (2) new Aveva HMI Client Licenses
 - b. Aveva Historian Software
 - c. Verizon Private Mobile Network service to be used for the cellular router communication
- D. Include auxiliary and accessory devices necessary for system operation or performance, such as transducers, relays, signal amplifiers, intrinsic safety barriers, signal isolators, software, and drivers to interface with existing equipment or equipment provided by others under other Sections of these specifications, whether indicated on the Drawings or not.
- E. All equipment and installations to satisfy applicable Federal, State and local codes. Refer to Electrical drawings for area classifications for Class and /Division ratings.

- F. Use the equipment, instrument, and loop numbering scheme indicated on the Drawings and in the specifications in the development of the submittals. Do not deviate from or modify the numbering scheme.
- G. Related Requirements:
 - 1. 406100A CDM - Appendix A - Hardware & Software Matrix
 - 2. 406100B CDM - Appendix B - SCADA Control Panel Drawings
 - 3. Section 27XXX “Sections for Communications Equipment and Cabling.”
 - 4. Section 4062XX “Sections for Computer System Hardware.”
 - 5. Section 4063XX “Sections for Control System Equipment”
 - 6. Section 4066XX “Sections for Network and Communication Equipment.”
 - 7. Section 4067XX “Sections for Control System Equipment Panels and Racks.”
 - 8. Section 4068XX “Sections for Process Control Software.”

1.3 DEFINITIONS

- A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.
- B. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.
- C. Maintenance of Plant Operations (MOPO): A construction plan which prevents or limits process disruptions during construction.
- D. Section 4062XX “Sections for Computer System Hardware”: The XX in the number indicates all spec sections starting with the first 4 numbers (indicating a category described in the accompanying text) are included in the reference.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Conduct a project kickoff coordination meeting within two weeks after submitting the Project Plan. The purpose of the meeting is to discuss the PCSS's Project Plan, to summarize the PCSS's understanding of the project; discuss any proposed substitutions or alternatives; schedule testing and delivery deadline dates; provide a forum to coordinate hardware and software related issues; and request any additional information required from the Owner. The meeting will last up to 4 hours.
- C. Conduct a submittal review coordination meeting after the Hardware, Panel Drawing, and Loop Drawing Submittal package has been reviewed by the Engineer and returned to the PCSS. The purpose of this meeting is to review comments made on the submittal package; to refine scheduled deadline dates; coordinate equipment installation activities; and provide a forum for any further required coordination between the PCSS and AESS. The meeting will last up to one business day.

- D. Attendance at MOPO workshop.
- E. Bi-Weekly on-site or conference call coordination meetings with Engineer, Contractor, Vendors, and AESS as required prior to any field start-up or activity testing begins.
- F. Schedule the mandatory coordination meetings as described herein. Hold the meetings at the Owner's designated location and include attendance by the Owner, the Engineer, the Contractor, the PCSS's Project Engineer, and the AESS Project Engineer, if applicable. Other Division 40 specifications may require additional meetings. Prepare and distribute an agenda for this meeting a minimum of one week before the scheduled meeting date. Schedule the meeting for a minimum of one week before the requested meeting date.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, mountings, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Detail fabrication and assembly of control equipment, control panels, and instrumentation as specified herein.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Qualifications Submittal:
 - 1. For non-listed PCSS', submit, within 30 calendar days after Notice to Proceed, detailed information on staff and organization to indicate compliance with the Quality Assurance requirements of this Section. The Qualifications submittal is required to be submitted and approved before any further submittals will be accepted. Failure to meet the minimum requirements is grounds for rejection as a PCSS. The Qualifications Submittal to contain the following:
 - a. Copies of ISA CCST Level 1 certificates for all field technicians or resumes demonstrating field experience.
 - b. Notarized statement from the firm's financial institution demonstrating ability for the firm to meet the obligations necessary for the performance of the work.
 - c. Copy of UL-508 certificate for panel fabrication facilities.
 - d. Project references for water or wastewater projects as defined in the "Quality Assurance" paragraphs.
 - e. Documentation to demonstrate the ability to complete this project including resumes of key staff, financial capacities, details on engineering, design,

fabrication, and field service capacity, and location of staff responsible for responding to the site within four hours to resolve startup issues.

D. Project Plan, Deviation List, and Schedule Submittal:

1. Submit, within 45 calendar days after Notice to Proceed, a Project plan. Submit for approval the Project Plan before further submittals are accepted. The Project Plan to contain the following:
 - a. Overview of the proposed control system describing the understanding of the project work, a preliminary system architecture drawing, interfaces to other systems, schedule, startup, and coordination. Include a general discussion of startup, replacement of existing equipment with new, switchover (Maintaining Plant Operations during system transition), approach to testing and training, and other tasks as required by these specifications.
 - b. Preliminary list of HMI software, PLC software, and PLC hardware, including version numbers, solely to determine compliance with the requirements of the Contract Documents prior to beginning development of system programming. The review and approval of software and hardware systems as part of this Project Plan stage does not relieve the PCSS of meeting all the functional and performance requirements of the system as specified herein. Substitution of manufacturer or model of these systems after the submittal is approved is not allowed without Engineer's approval. Refer to "406100A CDM - Appendix A - Hardware & Software Matrix" for list of computers and required licensing for all terminals.
 - c. Project personnel and organization including the PCSS project manager, project engineer, and lead project technicians. Include resumes of each of these individuals and specify in writing their commitment to this project. These do not need to be submitted again if already submitted in the Qualification submittal.
 - d. Sample formats of the shop drawings to be submitted and in conformance with the requirements of the Specifications. At a minimum include samples of, control system architecture.
2. Define Exceptions to the Specifications or Drawings in a Deviation List consisting of a paragraph-by-paragraph review of the Specifications indicating acceptance or any proposed deviations, the reason for exception, the exact nature of the exception and the proposed substitution so that an evaluation may be made by the Engineer. Specifically state if no exceptions are taken to the specifications or drawings. If there is no statement by the PCSS, then it is acknowledged that no exceptions are taken.
3. The PCSS must coordinate their work with the General Contractor's overall schedule. PCSS schedule incorporates all PCSS milestones including but not limited to the following:
 - a. Schedule for all subsequent project submittals. Include the time required for Contractor's submittal preparation, Engineer's review time, and a minimum of two complete review cycles.
 - b. Proposed dates for all project coordination meetings.
 - c. Hardware purchasing, fabrication, and assembly (following approval of related submittals).
 - d. Software purchasing and configuration (following approval of related submittals).
 - e. Shipment of instrument and control system equipment.
 - f. Installation of instrument and control system equipment.

- g. Testing: Schedule for all testing.
 - h. Schedule for system cutover, startup, and/or going on-line for each major system. At a minimum include the schedule for each process controller and HMI server/workstation provided under this Contract.
 - i. Schedule for all training including submittal and approval of O&M manuals, factory training, and site training.
 - j. Arrange project schedule to accommodate requirements of AESS to develop, test, troubleshoot, and train Owner on PLC and HMI systems. Timing of these coordination efforts to be determined by PCSS; however, include all necessary costs to accommodate the following minimum time slots in their overall project schedule. Exclude on all time allotments any legal holidays, or days lost due to delays caused by Contractor or PCSS. For additional testing and training requirements, refer to Section 406121.20 "Process Control System Testing" and Section 406126 "Process Control System Training."
4. Component and Wiring Identification and Tagging Plan:
- a. All components provided by PCSS require a tag, label, or nameplate. Review drawings and specifications and adhere to the established conventions.
 - b. Provide detailed information so Engineer can review the following characteristics for each type of tag, label, or nameplate for the different types of components provided above:
 - 1) Size or range of size of the tag, label or nameplate.
 - 2) Font style.
 - 3) Material.
 - 4) Color(s).
- E. MOPO and Sequencing Submittal
- 1. Develop a MOPO and sequencing submittal to ensure an orderly transition from the existing control system to the new control system. Refer to Section 013513.24 "Special Procedure for MOPO" for site conditions, constraints, and planning-level transitional steps. The PCSS may not proceed with the submission of any hardware and software submittals until this submittal is approved.
 - 2. Include step-by-step procedures and required durations to install, commission, and place into operation the new control system. Include a minimum 2 week notification to the Owner for any system alterations that affect operation of the facility including parties involved at each phase.
 - 3. Provide network architecture phasing plans showing the condition of the new and existing network at each phase of construction.
- F. Control System Architecture, SCADA Equipment Rack, Hardware and Software Packages Submittal:
- 1. Refer to the sections below for equipment required as part of the Hardware and Software Packages submittal:
 - a. Section 271116 "Communications Racks, Frames, and Enclosures."
 - b. Section 406213 "Server Computers."
 - c. Section 406216 "Operator Workstation Computers."

- d. Section 406219 "Industrial Computer."
 - e. Section 406229 "Tablet Computers and Mobile Devices."
 - f. Section 406243 "Large Display Screens."
 - g. Section 406343 "Programmable Logic Controllers."
 - h. Section 406613 "Switches and Routers."
 - i. Section 406616 "Firewall Hardware."
 - j. Section 406626 "Device Network Equipment."
 - k. Section 406643 "Wireless Network Equipment."
 - l. Section 406733 "Panel Wiring."
 - m. Section 406823 "Reporting Software."
 - n. Section 406895 "System Support Software."
2. For each hardware and software packages component specified in the sections above, submit a cover page that lists date, specification number, product name, manufacturer, model number, location(s), and power required. Preferred format for the cover page is ISA-TR20.00.01-2001 (updated in 2004-2006), general data sheet; however, other formats will be acceptable provided they contain all required information.
 3. Complete system architecture drawing(s) showing in schematic form the interconnections between major hardware components including, control panels, computers, networking equipment, control panels with PLC systems and I/O modules, local operator interfaces, process equipment vendor panels with PLCs, and networked peripherals such as power monitors, security cameras, etc.
 4. Develop the system architecture drawing(s) in accordance with the following information and guidelines:
 - a. Show power connections to each piece of equipment or grouping of equipment with voltage and power sources noted such as 120VAC UPS battery, 24VDC battery, or 120VAC from LP (lighting panel). Indicate specific UPS number or circuit number whenever possible.
 - b. All communication cable types should be uniquely identified with a specific linetype and cable characteristics clearly indicated in a key or legend located on drawing(s). For example, 50/125-micron multimode mode fiber, or CAT6 Ethernet copper cabling. Any multiconductor communication cables will be clearly labeled above each individual communication with a note added to drawing that states if no quantity exists above a linetype, there is only one communication cable between devices. If a multi-conductor cable has multiple colors, legend to clearly indicate which colors are used for which networks (i.e., a multi-pair fiber optic cable used for dedicated networks such as SCADA, Electrical, Security, HVAC, etc.)
 - c. All communication cables need to be assigned a unique cable identification label and shown in either a table or above the communication line.
 - d. Identify network protocols for each communication path or for system indicated in a key or legend as appropriate. Examples are Allen-Bradley EtherNet/IP, Modbus TCP/IP, or DNP3.
 - e. Indicate which port or connection number the communication cable is terminating at any device that has multiple ports or connection points. For multiple devices, this could be shown once in a key or legend and noted on architecture as appropriate.
 - f. Use symbology and/or icons whenever possible to represent a device and differentiate between devices that are different form factors (i.e. tower computer

- vs. desktop computer vs. rack mounted). Vendor CAD libraries are preferred for symbols.
- g. Develop a diagram that will allow a qualified technician to interconnect all equipment without having to refer to additional manuals or literature.
 - h. Use a minimum sheet size of 11"x17" and use of more than one sheet is acceptable with a logical breakout between sheets (i.e., head end on one sheet and plant control system on another). Clearly identify line continuations between drawings.
5. Provide an itemized list with quantities for all items that are to be shipped to the AESS as part of the Application Development Submittal in section 406121.10 – Process Control System Testing.
 6. Provide a software schedule or spreadsheet for project which clearly indicates which software packages and operating systems are loaded onto which computers and servers.
 - a. For each software requiring a license, indicate on the spreadsheet the party responsible for licensing the software. Indicate if each client license is new, existing, or upgraded.

G. Panel Layout Drawings and Wiring Diagrams Submittal:

1. Panel Layout Drawings: Submit As-Built Drawings for the PLC panels specified showing panel modifications. Refer to “406100B CDM - Appendix B - SCADA Control Panel Drawings” for existing SCADA panel drawings. Existing SCADA panel drawings may be used for pdf redline mark-ups to show PLC panel modifications. Draw to scale panel assembly and elevation drawings and detail all equipment in or on the panel. Use 11"x17" sheet size for panel drawings and include the following:
 - a. Clearly indicate a legend sheet with all symbols used on drawings and with voltage, color and size of each wire and in accordance with requirements of Section 406733 “Panel Wiring.”
 - b. Interior and exterior panel elevation drawings to scale.
 - c. Nameplate schedule.
 - d. Conduit access locations.
 - e. Panel construction details.
 - f. Cabinet assembly and layout drawings to scale. Include a bill of material on the assembly drawing with each panel component clearly defined. Cross-reference the bill of material to the assembly drawing so that a non-technical person can readily identify all components of the assembly by manufacturer and model number.
2. SCADA Rack Layout Drawings: Submit As-Built Drawings for the SCADA rack. Provide new As-Built drawings of the SCADA rack in AutoCAD ".dwg" format and in Adobe Acrobat format. Draw to scale panel assembly and elevation drawings and detail all equipment in or on the panel. Use 11"x17" sheet size for panel drawings and include the following:
 - a. Clearly indicate a legend sheet with all symbols used on drawings and with voltage, color and size of each wire and in accordance with requirements of Section 406733 “Panel Wiring.”
 - b. Interior and exterior panel elevation drawings to scale.
 - c. Nameplate schedule.
 - d. Ethernet port assignments.

- e. Port and cable labels.
- f. Conduit access locations.
- g. Power access locations.
- h. PDU assignments and power designations.
- i. Panel construction details.
- j. Cabinet assembly and layout drawings to scale. Include a bill of material on the assembly drawing with each panel component clearly defined. Cross-reference the bill of material to the assembly drawing so that a non-technical person can readily identify all components of the assembly by manufacturer and model number.

3. Wiring Diagrams Submittal:

- a. Panel wiring diagrams depicting wiring within and on the panel as well as connections to external devices. If ISA Loop Wiring Diagrams are specified below, equipment external to the control panel and related external connections do not need to be shown on the Panel Wiring Diagrams. Panel wiring diagrams include power and signal connections, UPS and normal power sources, all panel ancillary equipment, protective devices, wiring and wire numbers, and terminal blocks and numbering. Field device wiring includes the device ISA-tag and a unique numeric identifier. Diagrams identify all device terminal points that the system connects to, including terminal points where I/O wiring lands on equipment not supplied by the PCSS. Wiring labeling used on the drawings match that shown on the Contract Documents or as developed by the PCSS and approved by the Engineer. I/O wiring numbered with rack number, slot number, and point number. Two-wire and four-wire equipment to be clearly identified, and power sources noted. Submit final wire numbering scheme. Provide panel drawings that are 11-inch x 17-inch in size.

H. Testing Plan Submittals:

- 1. Refer to Section 406121.20 “Process Control System Testing” for specific testing submittal requirements.

I. Training Plan Submittals:

- 1. Refer to Section 406126 “Process Control System Training” for specific training submittal requirements.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For any named PCSS, submit a statement on company letterhead indicating that the requirements in the “Quality Assurance” paragraph below are met by the firm.
- B. Product Test Reports: Refer to individual instrument, component or hardware specifications for specific requirements.
- C. Evaluation Reports: Refer to individual instrument, component or hardware specifications for specific requirements.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For all PCSS supplied hardware to include in operation and maintenance manuals.
1. Submit in accordance with Section 017823 “Operation and Maintenance Data.”
 2. Include the following information on the operations and maintenance manuals:
 - a. Table of Contents:
 - 1) Provide a Table of Contents for the entire manual with the specific contents of each volume clearly listed. Include the complete Table of Contents in each volume.
 - b. Equipment Lists:
 - 1) Develop the following lists in Microsoft Excel format:
 - a) An equipment list or spreadsheet for all non-instrument devices supplied listing description, specification section and paragraph number, manufacturer, model number, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.
 - c. Equipment Operations and Maintenance Information:
 - 1) Provide ISA-TR20.00.01-2001(updated in 2004-2006) data sheets for all field instruments. For non-field instrumentation devices, provide a cover page for each device, piece of equipment, and OEM software that lists date, specification number, product name, manufacturer, model number, Location(s), and power required. Preferred format for the cover page is ISA-TR20.00.01-2001(updated in 2004-2006), general data sheet; however, other formats will be acceptable provided they contain all required information.
 - 2) Provide either new documentation written specifically for this project or modified standard vendor documentation to the vendor O&M documentation for each device, piece of equipment, or OEM software. Indicate with arrows or circles all portions that apply to all standard vendor documentation furnished. Neatly line out or cross out all portions that do not apply. Remove groups of pages or sections that do not apply to the specific model supplied.
 - 3) Provide the record documentation of the system audit and completed test forms with sign-offs as specified in Section 406121.20 “Process Control System Testing.”
 - 4) Include instrument/equipment calibration and configuration forms.
 - d. As-Built Drawings:
 - 1) Complete as-built drawings, including all drawings and diagrams specified in this section under the "Submittals" section. Include on the drawings all termination points on all equipment the system is connected to, including terminal points of equipment not supplied by the PCSS. Provide electronic files for all drawings produced.

- 2) Include on as-built documentation information from submittals, as described in this Specification, updated to reflect the as-built system. Incorporate errors in or modifications to the system resulting from the Factory and/or Functional Acceptance Tests.

B. Software and Firmware Operational Documentation:

1. Original Licensed Software:

- a. Submit original software licenses and keys for all software provided under this Contract. Submit original paper based and electronic documentation for all software provided. Submit license agreement information including serial numbers, license agreements, User Registration Numbers, and related information. Provide licenses for all software under this Contract to the Owner at the time of purchase. Provide media in software sleeves within O&M manual.

C. Electronic O&M Information:

1. In addition to the hard copy of O&M data, provide an electronic version of all equipment manuals and data sheets, along with any software back-up of configuration files, on DVD or USB thumb drive. Supply electronic documents in Adobe Acrobat format. Provide electronic files for all custom-developed manuals including training manuals. Supply text in Microsoft Office and Adobe Acrobat formats. Provide electronic files for all drawings produced. Provide drawings in AutoCAD ".dwg" format and in Adobe Acrobat format for control system architecture and rack layout drawing and just Adobe Acrobat format for existing panel modifications.
2. Provide drawings using the AutoCAD eTransmit feature to bind external references, pen/line styles, fonts, and the drawing file into individual zip files.
3. Back up each computer system hardware device onto DVD or USB thumb drive after Substantial Completion and turn over to the Owner.
4. If specified in the training section, provide digital copies of all training videos. Format videos so they are readable by standard DVD players and by standard PC DVD drives, a minimum of 800 by 600 pixels, and include sound.

- D. Include information as specified in Section 017823 "Operation and Maintenance Data" on the cover and edge of each volume.

1.8 MAINTENANCE MATERIAL SUBMITTAL

- A. Furnish extra materials from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Refer to individual specification sections in Division 27 and Division 40 for spare equipment requirements and provide one comprehensive spare parts submittal for project.
2. Submit unit and total costs for the additional spare items specified or recommended for each subsystem.

- B. Pack all spare parts and test equipment in individual cartons and label with indelible markings clearly indicating component(s) inside. Supply with the required spare parts complete ordering

information paperwork including manufacturer's contact information (address and phone number), part name, part number, equipment name and tag number(s) for which the part is to be used (if applicable). Deliver and store the spare parts in a location directed by the Owner or Engineer.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Responsible for the technical supervision of the installation by providing on-site supervision to the installers of the various components.
- C. The Process Control System Supplier (PCSS) to be a “systems integrator” regularly engaged in the design and the installation of instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry. For the purposes of this Specification Section, a “systems integrator” means an organization that complies with all of the following criteria:
 - 1. Employs personnel on this project who have successfully completed ISA or manufacturer’s training courses on general process instrumentation and configuration and implementation of the specific programmable controllers, computers, and software proposed for this project. Key personnel to hold ISA CCST Level 1 certification or have a minimum of 10 years of verifiable plant startup experience. Key personnel includes, as a minimum, the lead field technician.
 - 2. Has successfully completed work of similar or greater complexity on at least three previous projects within the last five years. Successful completion is defined as a finished project completed on time, without any outstanding claims or litigation involving the PCSS. Potential references for projects where the PCSS's contract was of similar size to this project.
 - 3. Has been actively engaged in the type of work specified in this Section for a minimum of five years.
- D. Maintain a permanent, fully staffed and equipped service facility within 200 miles of the project site with full-time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified herein. Respond to on-site problems within 12 hours of notice. Provide an on-site response within four hours of notification starting at two months before scheduled startup to two months after startup completion.
- E. Select a PCSS from one of the following:
 - 1. R.E. Erickson, 595 Providence Hwy, Walpole, MA 02081. Contact: Gary Roy, 508-668-9330, groy@reericksonco.com.
 - 2. Elm Electric, 184 Falcon Dr, Westfield, MA 01085. Contact: 413-568-0905.
 - 3. NIC Systems Corporation, 51 Belamose Ave, Rocky Hill, CT 06067. Contact: 860-529-0110.
 - 4. Aaron Associates, 478 W. Main St, Waterbury, CT 06702. Contact: Carmen Corvigno, 203-753-1536
 - 5. Harbor Controls Corporation, P.O. Box 263, 85 Commerce Park Rd, North Kingstown, RI 02852. Office Phone: 401-667-0930. Contact: Paul Ouellette, 401-580-9566.

6. or equal.

- F. Being listed in this specification does not relieve any potential PCSS from meeting the qualifications specified in this Section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 "Product Requirements" for delivery, storage, and handling requirements.

1.11 FIELD CONDITIONS

- A. Environmental Requirements: Refer to Electrical Drawings for specific environmental and hazardous area classifications.
- B. Elevation: Design equipment to operate at the project ground elevation.
- C. Temperature:
1. Outdoor area equipment to operate between -4 to 122 degrees F (-20 to 50 degrees C) ambient.
 2. Equipment in indoor locations operate between 50 to 95 degrees F (10 to 35 degrees C) degrees ambient minimum.
 3. Storage temperatures range from 32 to 122 degrees F (0 to 50 degrees C) degrees ambient minimum.
 4. Furnish additional cooling or heating if required by the equipment specified herein.
 5. Relative Humidity. Air-conditioned area equipment operate between 20 to 95 percent relative, non-condensing humidity. All other equipment operates between 5 to 100 percent relative, condensing humidity.
- D. Do not ship control system equipment located in the control room until the control room areas comply with specified ambient temperature and humidity and free of dust and debris.

1.12 WARRANTY

1. Warranty Period: 1 year from date of Substantial Completion unless noted otherwise in individual specification sections.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Electrical Requirements for Control System:
1. Operate equipment on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where specifically noted. Regulators and power supplies required for compliance with the above to be provided between power supply and

- interconnected instrument loop. Supply constant voltage transformers where equipment requires voltage regulation.
2. With the exception for field device network connected devices, all electronic instrumentation utilize linear transmission signals of isolated 4 to 20 mA DC (milliampere direct current) capable of driving a load up to 750 ohms, unless specified otherwise. However, signals between instruments within the same panel or cabinet may be 1-5 VDC (volts direct current).
 3. Outputs of equipment that are not of the standard signals as outlined, have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero-based signals will be allowed.
 4. All switches have double-pole, double-throw (DPDT) contacts rated at a minimum of 600 VA, unless noted otherwise.
 5. Switches and/or signals indicating an alarm, failure or upset condition wired in a fail-safe manner, as indicated on the I/O list. A fail-safe condition is when an open circuit generates an alarm state (i.e. contact opens).
 6. Materials and equipment UL approved whenever such approved equipment and materials are available.
 7. All equipment furnished designed and constructed so that in the event of power interruption, the systems specified all go through an orderly shutdown with no loss of memory and resume normal operation without manual resetting when power is restored, unless otherwise noted.
 8. Surge protection requirements for control system power, signal, and communication lines are specified in Section 407856 "Isolators, Intrinsically Safe Barriers, and Surge Suppressors."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.
- B. Examine products before installation. Reject products that are wet, moisture damaged, or mold damaged.
- C. Examine walls, floors, roofs, and process area for suitable conditions where computers and equipment will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION

- A. The shield on each process instrumentation cable to be continuous from source to destination and be grounded at only one ground point for each shield.

- B. Provide sunshades for equipment mounted outdoors in direct sunlight. Include sunshades standoffs to allow air circulation around the cabinet. Orient equipment outdoors to face to the North to minimize the impact of glare and ultraviolet exposure on digital readouts.

3.3 IDENTIFICATION

- A. Provide identification system for all PCSS provided hardware, instrumentation, and communication cabling.

3.4 FIELD QUALITY CONTROL

- A. Refer to individual hardware and instrument specification sections.

3.5 STARTUP SERVICE

- A. Refer to Section 406121.20 “Process Control System Testing.”
- B. Refer to Section 406126 “Process Control System Training.”
- C. Engage a factory-authorized service representative to perform startup service as specified in individual hardware and instrument specification sections.
- D. Bi-weekly on-site coordination meetings with Engineer, Contractor, Vendors, and AESS as required during active construction period.

3.6 PCSS MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service includes 12 months' full maintenance by skilled employees of systems and equipment Installer. Parts and supplies to be manufacture's authorized replacement parts and supplies.
- B. Provide a written proposal for a maintenance contract executed by the PCSS to the Owner for on-site preventive maintenance services related to the Instrumentation and Control system. Do not include the cost of this maintenance contract in the Contract Price.
- C. Provide a proposal within 30 days after Substantial Completion for the purpose of entering a contract for annual maintenance subsequent to the first year of maintenance. Set forth standard per diem rates to provide breakdown service in the contract. Such rates to be fair and reasonable and reflect the lowest rates offered to most favored customers. The fee quoted to be firm for a minimum of 90 days from date of issue.
- D. Include on maintenance contract all labor, parts, and emergency calls providing on-site response within 24 hours, to provide complete system maintenance for a period of one year after the date of Substantial Completion of the system for all equipment, instrumentation and software provided as part of the PCSS scope of work.
- E. Include on maintenance contract a minimum of 4 preventive maintenance visits by qualified service personnel of the Supplier who is familiar with the type of equipment provided for this

project. Include in each preventive maintenance visit routine adjustment, calibration, cleaning and lubrication of system equipment and verification of correct operation.

- F. Visits to the sites to correct deficiencies under warranty are not included in this preventive maintenance service contract.
- G. Emergency maintenance procedures or plant visits may coincide with a preventive maintenance visit; however, they do not replace the work intended to be performed during a preventive maintenance visit. The Supplier has full responsibility for the system hardware preventive and corrective maintenance.
- H. Provide observation of maintenance operations by plant personnel and the instruction of said personnel in the details of the maintenance work performed during the one-year maintenance period.

3.7 SOFTWARE SERVICE AGREEMENT

- A. Refer to individual hardware and software specifications for specific requirements.

3.8 ATTACHMENTS

- A. Hardware & Software Matrix
- B. SCADA Control Panel Drawings

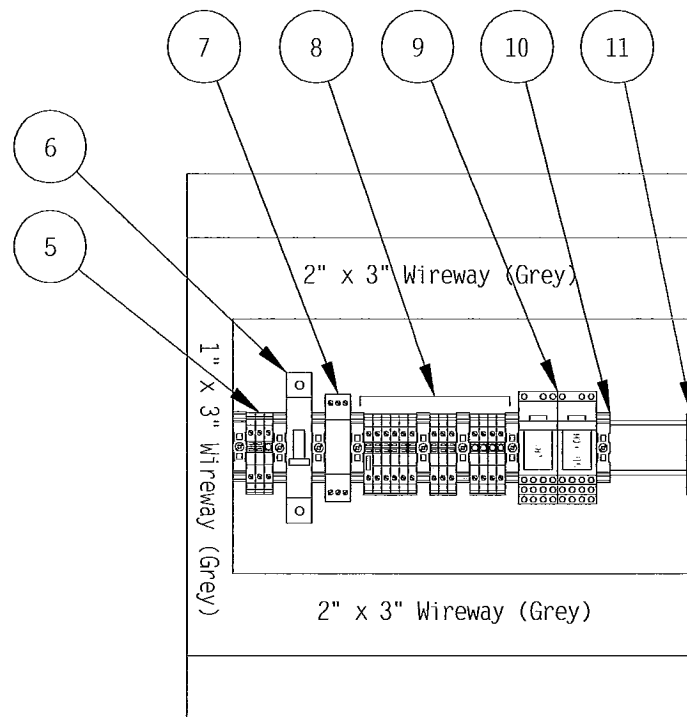
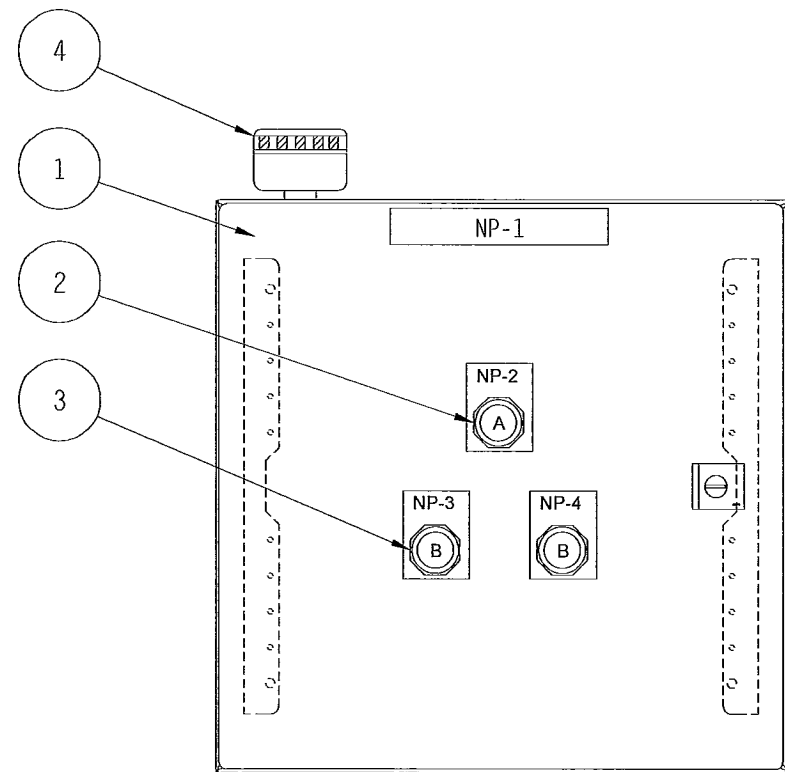
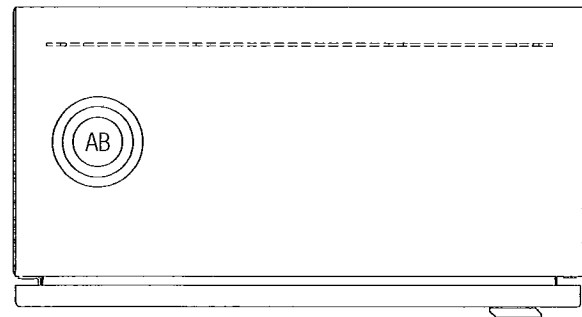
END OF SECTION 406100

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406100A CDM - Appendix A - Hardware & Software Matrix																						
Machine	Hardware					Operating System			SCADA Software													
	Server	Engineering Workstation	HMI Client Workstation	Industrial Computer	Tablet	Latest Windows Professional	Latest Windows Server	Latest Tablet OS	Aveva Plant SCADA HMI Server	Aveva HMI Client*	SCADA Historian*	SCADA Historian Client	Backup Software	Dreamreports Server	Dreamreports Client	Alarm Dialer (WIN 911)	Proficy Machine Edition (PLC Program)	RealVNC Server and Client	Antivirus software	Adobe Reader	Latest MS Office Professional	Duo Authentication Proxy
WWTP-CPB-SR-SVR-1	X						X		X			X	X		X			X	X	X	X	
WWTP-CPB-SR-SVR-2	X						X		X			X	X		X			X	X	X	X	
WWTP-CPB-SR-DMN	X						X					X						X	X			X
WWTP-CPB-SR-HST	X						X			X		X	X					X	X	X	X	
WWTP-CPB-PTCP-IC				X		X			X			X						X	X	X		
WWTP-EB-STCP-IC				X		X			X			X						X	X	X		
WWTP-FB-STCP-IC				X		X			X			X						X	X	X		
WWTP-CPR-ER-TB					X			X										X	X	X		
WWTP-CPB-LAB-OWS		X				X			X		X	X		X	X	X		X	X	X	X	
WWTP-CPB-BRK-OWS			X			X			X			X						X	X	X	X	

* New Aveva HMI clients and Aveva Historian Software are to be provided by the Owner separate from the contract and configured by the AESS under this contract.

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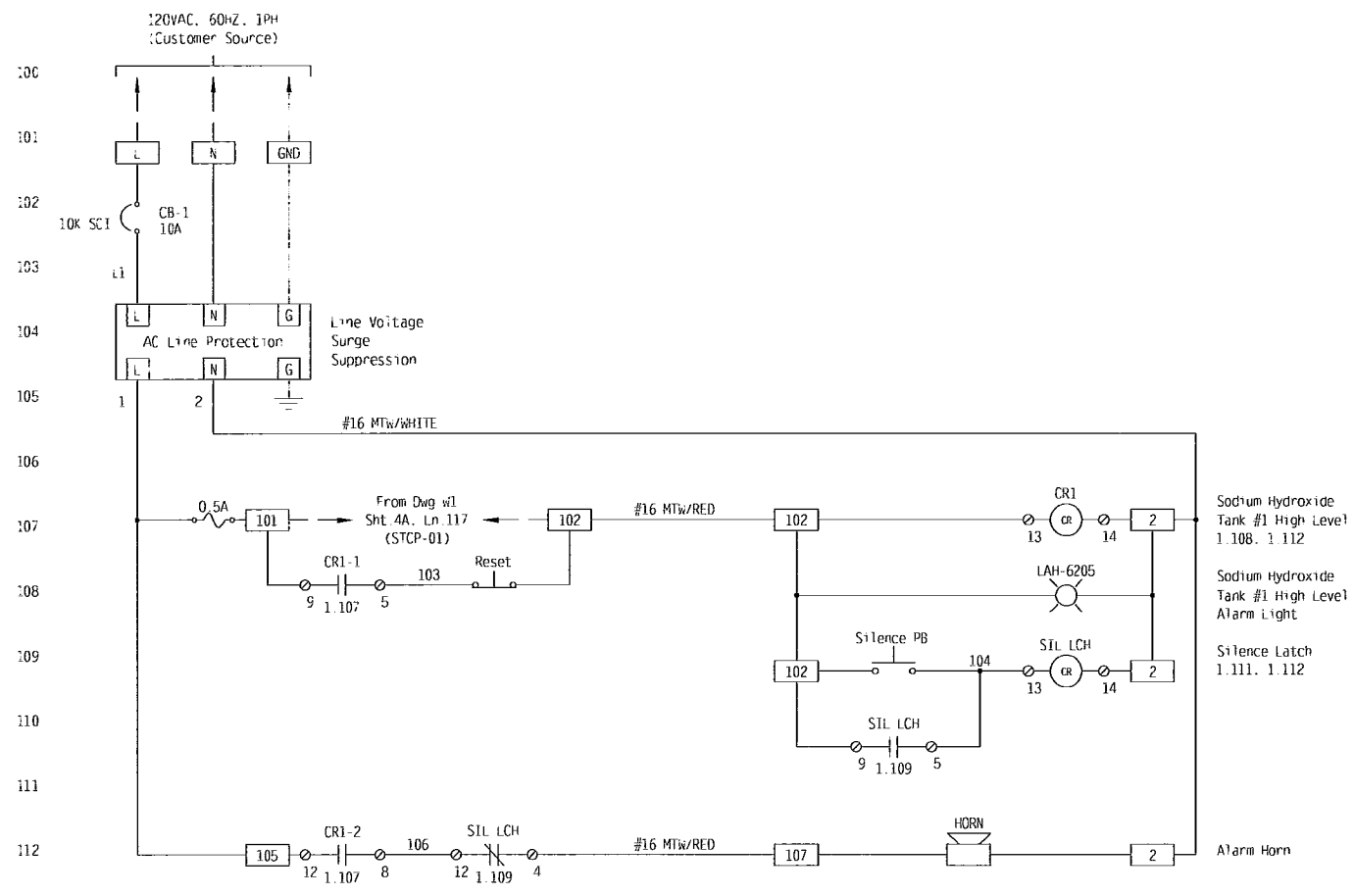


ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
1	Rittal	1	WM161608NC	Wall Mount Enclosure, NEMA 12 16"H x 16"W x 08" D
2	Allen Bradley	1	800H-PR16A	30.5mm Pilot Light, 120VAC, Amber
3	Allen Bradley	2	800H-AR2A	30.5mm Push button, Flush, Black
4	Allen Bradley	1	855P-B-10-LI-22	65mm Sounder, 120VAC
5	Phoenix Contact	2	30 46 18 4	Incoming Power Distribution UT 4 MTD Feed Through Terminal Block
		1	30 46 20 7	UT 4 MID PL/S Grounding Terminal Block
6	Allen-Bradley	1	1489-A1C-100	Circuit Breakers for 120VAC Power Distribution 10A Circuit Breakers (CB-1)
7	Phoenix Contact	1	28 56 81 2	120VAC Surge Suppressor (26 Amp)
8	Phoenix Contact	1	30 46 03 2	Terminal Blocks for Field/Relay Wiring UT 4 HLSI Fused Terminal Block
		8	30 46 18 4	UT 4-MTD Feed Through Terminal Block
		4	30 46 20 7	UT4-MID PL/S Grounding Terminals
9	Phoenix Contact	2	28 34 72 4	120VAC Interposing Relay for Alarm Control PR2-RSC3 LV-120AC/4x21
10	Phoenix Contact	8	08 00 88 6	End Retainers L/NL 35 N
11	Phoenix Contact	1	30 46 20 7	Din Rail Bonding Terminals UT4-MID PL/S Grounding Terminals

ENGRAVING TEXT					
NP #	LINE #1	LINE #2	LINE #3	SIZE	TEXT SIZE
1	Sodium Hydroxide Tank #1	Fill Panel		1" X 6"	5/16"
2	High	Level		Jumbo	Std.
3	Silence			Jumbo	Std.
4	Reset			Jumbo	Std.

AS-BUILT

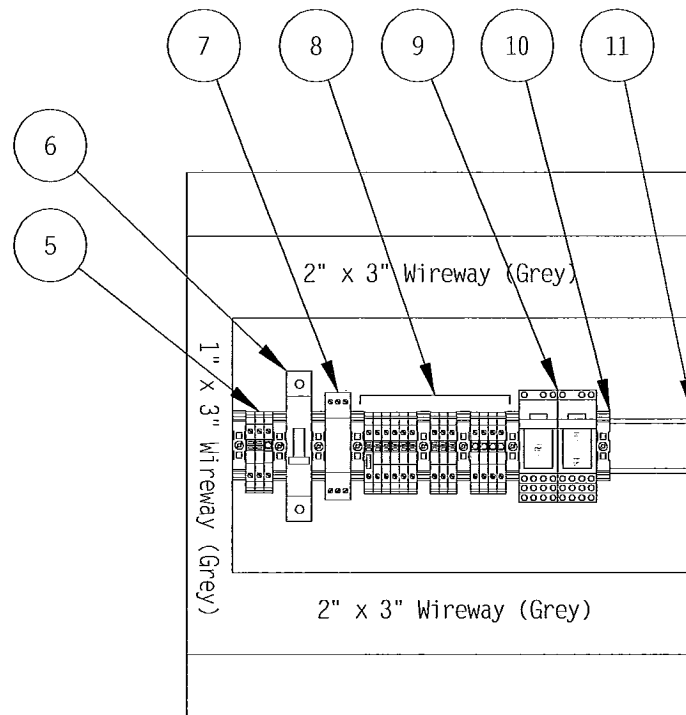
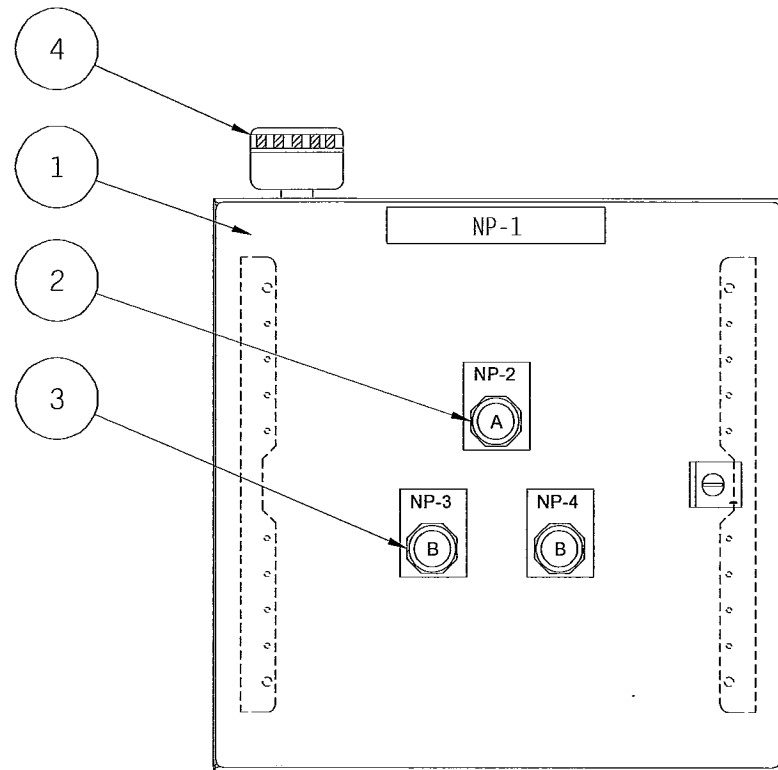
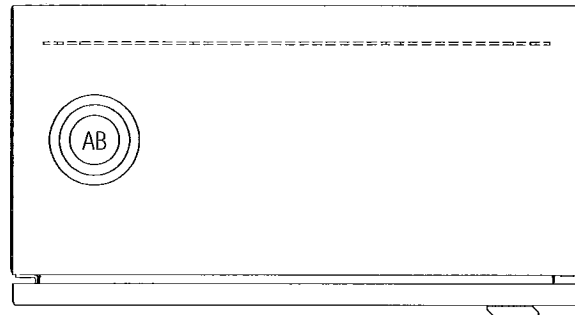
Aaron Associates 478 West Main Street Waterbury, CT 06702				TITLE: Sodium Hydroxide Tank #1 Fill Panel (FP-6205) Panel Layout			
				PROJECT: Stafford Springs Water Pollution Control Upgrade			
3	6/10/11	As Built	CGN	SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:
2	06/08/10	Re-Submittal per Engineers Comments	JPM	CGN	JPM	JPM	JPM
1	01/18/10	Initial Submittal	CGN	DATE:	SHEET	OF SHEETS	DRAWING NO.
REV	DATE	DESCRIPTION	BY	01/18/10	1	1	0904018-A4



Key:
 Field wiring: - - - - -
 Panel wiring: _____

AS-PIUM T

				Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Sodium Hydroxide Tank #1 Fill Panel (FP-6205) Panel Wiring	
				PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:				
	CGN	JPM	JPM				
DATE:	SHEET	OF SHEETS	DRAWING NO.				
01/18/10	1	1	0904018-W4				
REV	DATE	DESCRIPTION	BY				
3	6/10/11	As Built	CGN				
2	06/08/10	Re-Submittal per Engineers Comments	JPM				
1	01/18/10	Initial Submittal	CGN				

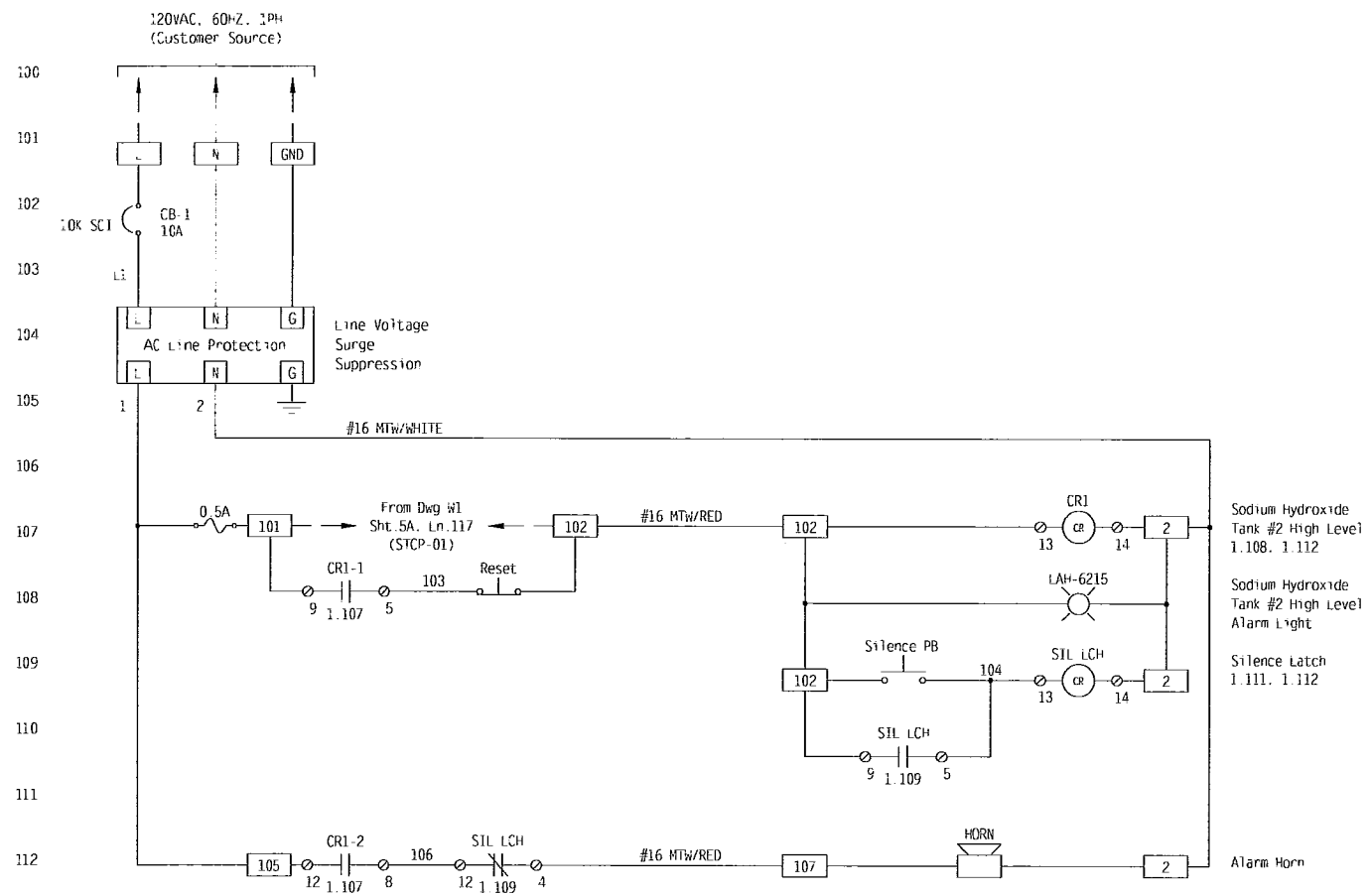


ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
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3	Allen Bradley	2	800H AR2A	30.5mm Push button, Flush, Black
4	Allen Bradley	1	855P B 10 LE 22	65mm Sounder, 120VAC
5	Phoenix Contact	2	30 46 18 4	Incoming Power Distribution
		1	30 46 20 7	UT 4 MTD Feed Through Terminal Block
6	Allen Bradley	1	1489 A1C 100	UT 4 MID PE/S Grounding Terminal Block
				Circuit Breakers for 120VAC Power Distribution
				10A Circuit Breakers (CB 1)
7	Phoenix Contact	1	28 56 81 2	120VAC Surge Suppressor (26 Amp)
8	Phoenix Contact	1	30 46 03 2	Terminal Blocks for Field/Relay Wiring
		8	30 46 18 4	UT 4-HLSI Fused Terminal Block
		4	30 46 20 7	UT 4-MTD Feed Through Terminal Block
				UT4- MTD PE/S Grounding Terminals
9	Phoenix Contact	2	28 34 72 4	120VAC Interposing Relay for Alarm Control
				PR2-RSC3 LV-120AC/4x21
10	Phoenix Contact	8	08 00 88 6	End Retainers L/NE 35 N
11	Phoenix Contact	1	30 46 20 7	Din Rail Bonding Terminals
				UT4- MTD PE/S Grounding Terminals

ENGRAVING TEXT					
NP #	LINE #1	LINE #2	LINE #3	SIZE	TEXT SIZE
1	Sodium Hydroxide Tank #2	Fill Panel		1" X 6"	5/16"
2	High	Level		Jumbo	Std.
3	Silence			Jumbo	Std.
4	Reset			Jumbo	Std.

AS-BUILT

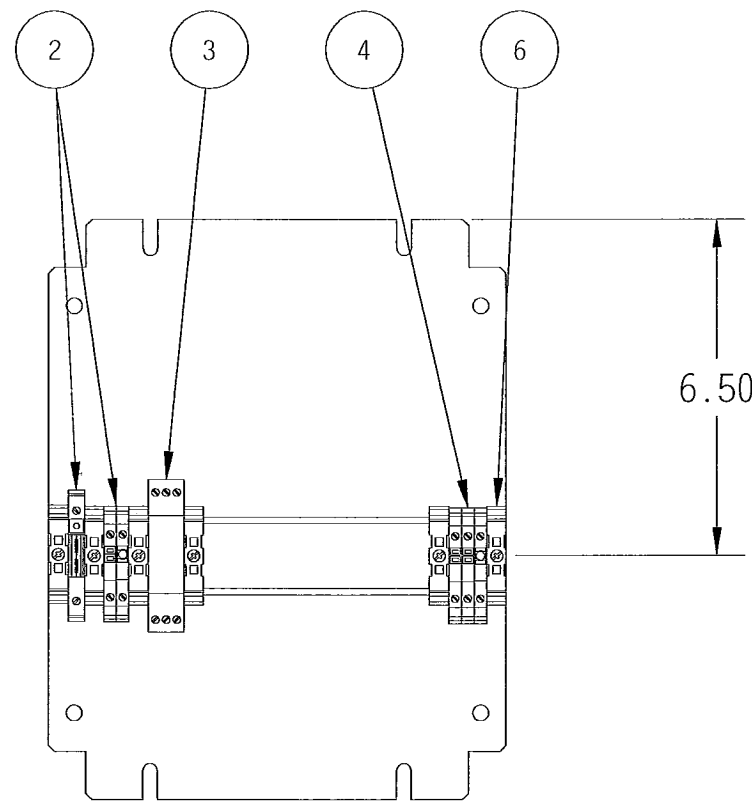
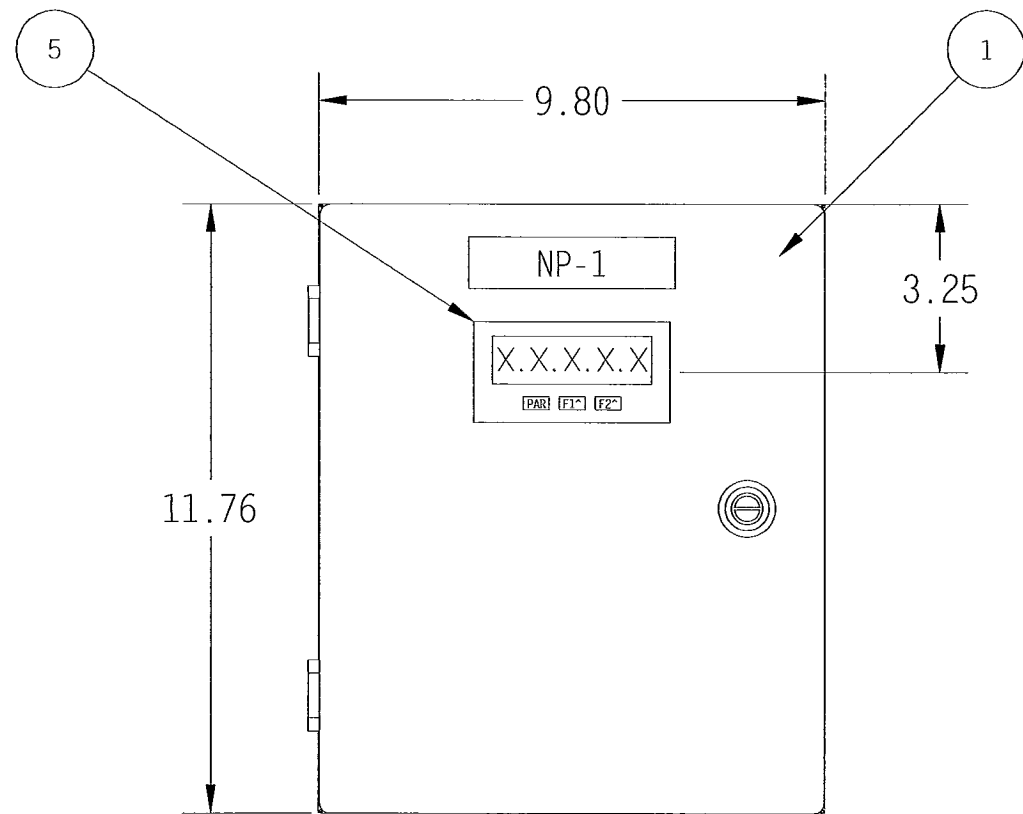
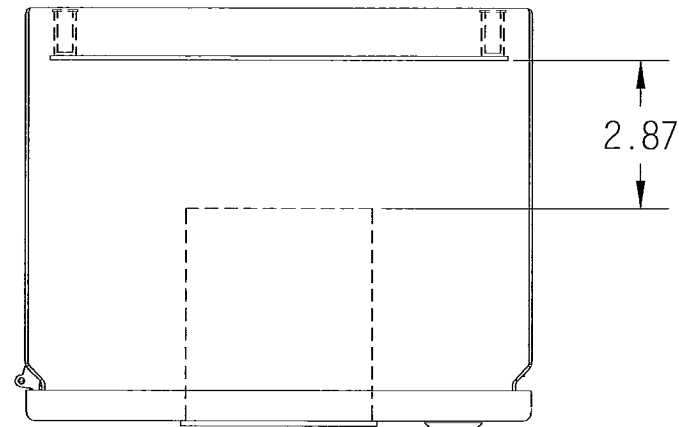
REV	DATE	DESCRIPTION	BY	Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Sodium Hydroxide Tank #2 Fill Panel (FP-6215) Panel Layout
3	6/10/11	As Built	CGN			PROJECT: Stafford Springs Water Pollution Control Upgrade
2	06/08/10	Re-Submittal per Engineers Comments	JPM	SCALE: CGN	CHECKED BY: JPM	APP'D BY: JPM
1	01/18/10	Initial Submittal	CGN	DATE: 01/18/10	SHEET 1 OF SHEETS 1	DRAWING NO. 0904018-A5



Key:
 Field wiring: - - - - -
 Panel wiring: _____

AS-BUILT

				Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Sodium Hydroxide Tank #2 Fill Panel (FP-6215) Panel Wiring	
				PROJECT: Stafford Springs Water Pollution Control Upgrade			
3	6/10/11	As Built	CGN	SCALE: CGN	DRAWN BY: JPM	CHECKED BY: JPM	APP'D BY: JPM
2	06/08/10	Re-Submittal per Engineers Comments	JPM				
1	01/18/10	Initial Submittal	CGN				
REV	DATE	DESCRIPTION	BY	DATE: 01/18/10	SHEET 1	OF SHEETS 1	DRAWING NO. 0904018-W5



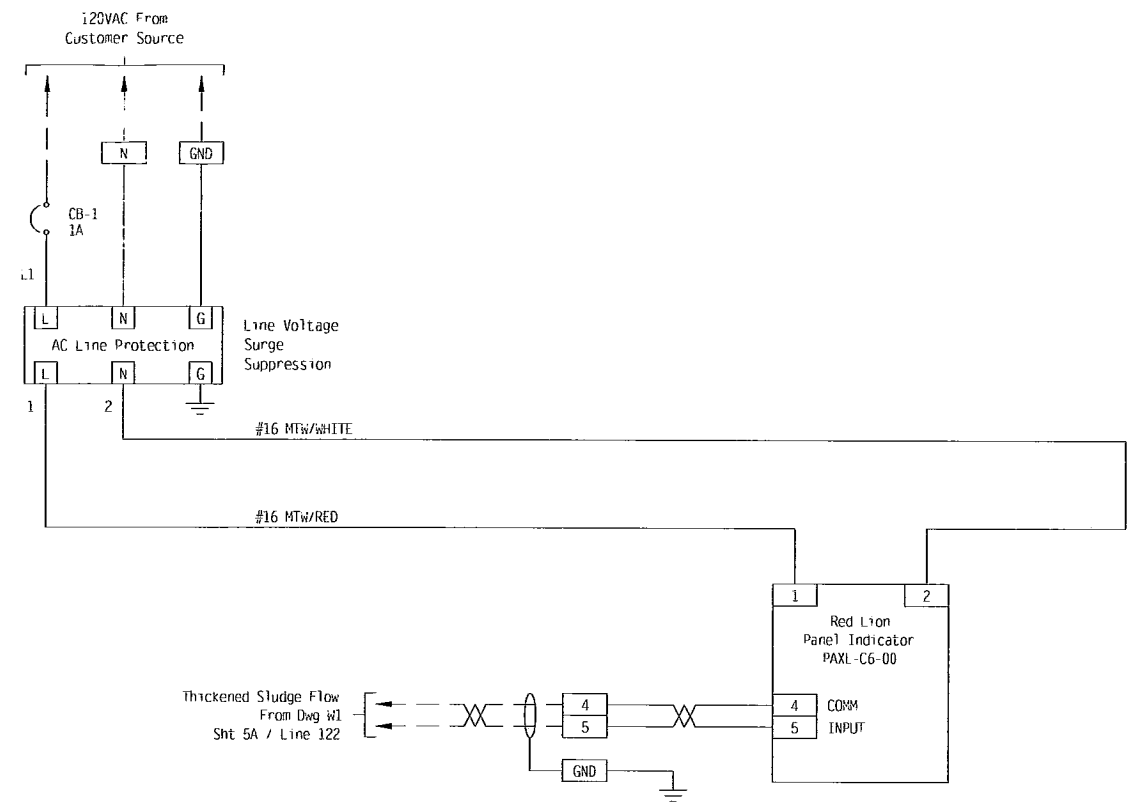
ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
1	Rittal	1	JB121008H6	Wall Mount Enclosure, NEMA 4X, 316SS 12"H x 10"W x 08" D
		1	JBMP1210	12"H x 10"W Mounting Panel for above enclosure
2	Phoenix Contact	1	07 12 19 4	Incoming Power Distribution TCP 1A Miniature Circuit Breaker, 1 amp
		1	31 18 20 3	UK 6-FSI/C Circuit Breaker Base
		1	30 46 18 4	UT 4-MTD Feed Through Terminal Block
		1	30 46 20 7	UT 4-MTD-PE/S Grounding Terminal Block
3	Phoenix Contact	1	27 83 09 5	120VAC Surge Suppressor (2 Amp) UFBK-BE Surge Suppressor Base
		1	27 65 18 1	UMBK 2/2-110AC-ST Surge Suppressor Element
4	Phoenix Contact	2	30 46 18 4	Terminal Blocks for Field/Relay Wiring UT 4-MTD Feed Through Terminal Block
		1	30 46 20 7	UT4-MTD PE/S Grounding Terminals
5	Red Lion	1	PAXL-C6-00	Digital Panel Meter w/ Integral Reset PB, NEMA 4X, 6 digit, .56" Red LED
6	Phoenix Contact	6	08 00 88 6	End Retainers E/NE 35 N

ENGRAVING TEXT					
NP #	LINE #1	LINE #2	LINE #3	SIZE	TEXT SIZE
1	F1-3140			1" x 4"	5/16"

				Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Thickened Sludge Remote Flow Indication Panel Layout			
						PROJECT: Stafford Springs Water Pollution Control Upgrade			
2	6/10/11	As Built	CGN	SCALE:	DRAWN BY: JLR	CHECKED BY: JPM	APP'D BY: JPM		
1	03/28/11	Initial Submittal	JLR	DATE:	03/28/11	SHEET:	1	OF SHEETS:	1
REV	DATE	DESCRIPTION	BY	DRAWING NO.:		0904018-A6			

100
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Red Lion PAXL-C6-00 Configuration Settings	
SETTING	VALUE
Dec pt.	0.0
SC-FAC	9.89999
P-UP	No

Key:
Field Wiring: - - - - -
Panel Wiring: _____

Handwritten signature or initials

				Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Thickened Sludge Remote Flow Indication Panel Wiring	
				PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: JLR	CHECKED BY: JPM	APPD BY: JPM				
DATE: 03/28/11	SHEET 1	OF SHEETS 1	DRAWING NO. 0904018-W6				
REV	DATE	DESCRIPTION	BY				
2	6/10/11	As Built	CGN				
1	03/28/11	Initial Submittal	JLR				

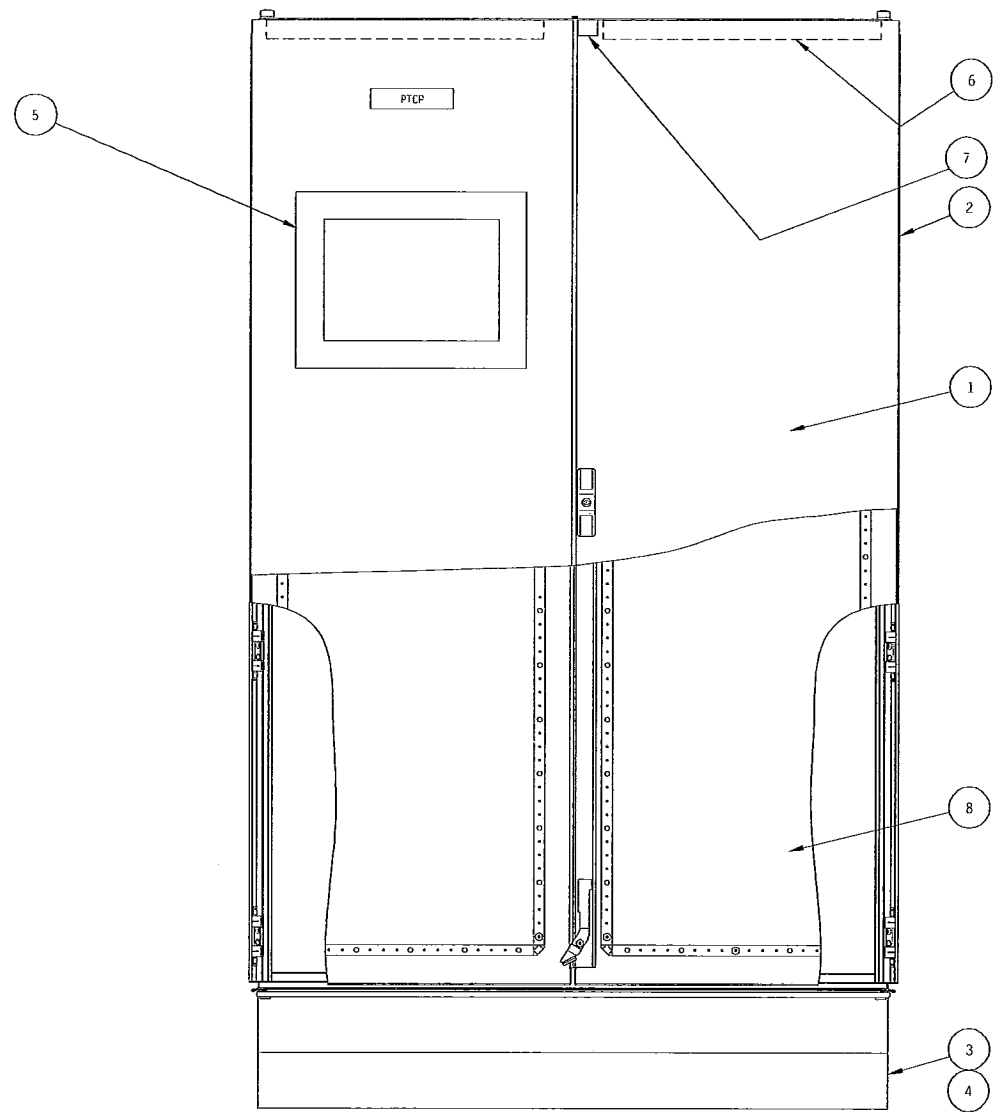
LOOP #	TAG	DESCRIPTION	TYPE	RANGE	ALARM LIMIT	RACK	SLOT	CH	DWG	SHT	LINE	P&ID
1000	LIT-1000	Septage Tank Level	AI	N/A		0	5	4	W-3	1A	112	1
1005	XA-1005	Septage Feed Pump Common Alarm	DI	Normal		0	10	4	W-3	6	106	1
1005	YCI-1005	Septage Feed Pump In Auto	DI	In Auto		0	10	5	W-3	6	107	1
1005	YRI-1005	Septage Feed Pump Running	DI	Running		0	10	6	W-3	6	108	1
1005	HSS-1005	Septage Feed Pump Start/Stop Command	DO	Start		0	14	3	W-3	10	105	1
1006	ZSC-1006	Septage Feed Valve Closed	DI	Closed		0	10	1	W-3	6	102	1
1006	ZSO-1006	Septage Feed Valve Open	DI	Open		0	10	2	W-3	6	103	1
1006	YCI-1006	Septage Feed Valve In Remote	DI	In Remote		0	10	3	W-3	6	105	1
1006	HSC-1006	Septage Feed Valve Close Command	DO	Close		0	14	1	W-3	10	102	1
1006	HSS-1006	Septage Feed Valve Open Command	DO	Open		0	14	2	W-3	10	103	1
1007	ZSC-1007	Septage Recirculation Valve Closed	DI	Closed		0	10	8	W-3	6	111	1
1007	ZSO-1007	Septage Recirculation Valve Open	DI	Open		0	10	9	W-3	6	112	1
1007	YCI-1007	Septage Recirculation Valve In Remote	DI	In Remote		0	10	10	W-3	6	114	1
1007	HSC-1007	Septage Recirculation Valve Close Command	DO	Close		0	14	4	W-3	10	106	1
1007	HSS-1007	Septage Recirculation Valve Open Command	DO	Open		0	14	5	W-3	10	107	1
1010A	LIT-1010A	Upstream Screen Level	AI	N/A		0	5	2	W-3	1A	106	1
1010B	LIT-1010B	Downstream Screen Level	AI	N/A		0	5	7	W-3	1B	102	1
1010B	LIT-1010B	Downstream Screen Level	AI	N/A		0	6	2	W-3	2A	106	1
1011	LSHH-1011	Upstream Screen Level High High	DI	Normal		0	10	7	W-3	6	110	1
1041	AIT-1041	H2S Gas Level	AI	0-100ppm		0	5	8	W-3	1B	106	1
1041	AIT-1041	H2S Gas Level	AI	0-100ppm		0	6	3	W-3	2A	109	1
1042	AIT-1042	LEL Gas Level	AI	0-100% LEL		0	5	3	W-3	1A	109	1
1105	WAH-1105	Grit Bucket Elevator High Torque	DI	Normal		0	10	12	W-3	6	116	2
1105	SAL-1105	Grit Bucket Elevator Speed Alarm	DI	Normal		0	10	13	W-3	6	118	2
1105	YCI-1105	Grit Bucket Elevator In Remote	DI	In Remote		0	10	14	W-3	6	119	2
1105	YRI-1105	Grit Bucket Elevator Running	DI	Running		0	10	15	W-3	6	120	2
1105	ES-1105	Grit Bucket Elevator E-Stop	DI	Normal		0	10	16	W-3	6	122	2
1105	HSS-1105	Grit Bucket Elevator Start/Stop Command	DO	Start		0	14	6	W-3	10	109	1
1110	WAH-1110	Grit Classifier High Torque	DI	Normal		0	11	9	W-3	7	112	2
1110	SAL-1110	Grit Classifier Speed Alarm	DI	Normal		0	11	10	W-3	7	114	2
1110	YCI-1110	Grit Classifier In Remote	DI	In Remote		0	11	11	W-3	7	115	2
1110	YRI-1110	Grit Classifier Running	DI	Running		0	11	12	W-3	7	116	2
1110	ES-1110	Grit Classifier E-Stop	DI	Normal		0	11	13	W-3	7	118	2
1110	HSS-1110	Grit Classifier Start/Stop Command	DO	Start		0	14	9	W-3	10	113	2
1210	SI-1210	Grit Blower No. 1 Speed Indication	AI	0-100%		0	5	1	W-3	1A	102	3
1210	SC-1210	Grit Blower No. 1 Speed Command	AO	0-100%		0	8	1	W-3	4	102	3
1210	TAH-1210A	Grit Blower No. 1 Motor Temp High	DI	Normal		0	11	1	W-3	7	102	3
1210	PDAH-1210A	Grit Blower No. 1 Differential Pressure High	DI	Normal		0	11	2	W-3	7	103	3
1210	YFI-1210	Grit Blower No. 1 Fault	DI	Normal		0	11	3	W-3	7	105	3
1210	YRI-1210	Grit Blower No. 1 Running	DI	Running		0	11	4	W-3	7	106	3
1210	YCI-1210	Grit Blower No. 1 In Auto	DI	In Auto		0	11	5	W-3	7	107	3
1210	TAH-1210B	Grit Blower No. 1 Discharge Temp High	DI	Normal		0	11	6	W-3	7	108	3
1210	PAH-1210B	Grit Blower No. 1 Discharge Pressure High	DI	Normal		0	11	7	W-3	7	110	3
1210	ES-1210	Grit Blower No. 1 E-Stop	DI	Normal		0	11	8	W-3	7	111	3
1210	HSS-1210	Grit Blower No. 1 Start/Stop Command	DO	Start		0	14	7	W-3	10	110	3

LOOP #	TAG	DESCRIPTION	TYPE	RANGE	ALARM LIMIT	RACK	SLOT	CH	DWG	SHT	LINE	P&ID
1220	SI-1220	Grit Blower No. 2 Speed Indication	AI	0-100%		0	5	6	W-3	1A	119	3
1220	SI-1220	Grit Blower No. 2 Speed Indication	AI	0-100%		0	6	1	W-3	2A	102	3
1220	SC-1220	Grit Blower No. 2 Speed Command	AO	0-100%		0	8	2	W-3	4	105	3
1220	TAH-1220A	Grit Blower No. 2 Motor Temp High	DI	Normal		0	12	1	W-3	8	102	3
1220	PDAH-1220A	Grit Blower No. 2 Differential Pressure High	DI	Normal		0	12	2	W-3	8	103	3
1220	YFI-1220	Grit Blower No. 2 Fault	DI	Normal		0	12	3	W-3	8	105	3
1220	YRI-1220	Grit Blower No. 2 Running	DI	Running		0	12	4	W-3	8	106	3
1220	YCI-1220	Grit Blower No. 2 In Auto	DI	In Auto		0	12	5	W-3	8	107	3
1220	TAH-1220B	Grit Blower No. 2 Discharge Temp High	DI	Normal		0	12	6	W-3	8	108	3
1220	PAH-1220B	Grit Blower No. 2 Discharge Pressure High	DI	Normal		0	12	7	W-3	8	110	3
1220	ES-1220	Grit Blower No. 2 E-Stop	DI	Normal		0	12	8	W-3	8	111	3
1220	HSS-1220	Grit Blower No. 2 Start/Stop Command	DO	Start		0	14	8	W-3	10	111	3
2000	SC-2000	Influent Flow to Flow Sampler Setpoint	AO	N/A		0	8	4	W-3	4	110	NEW
2000	FIT-2000	Influent Flow	AI	N/A		0	6	4	W-3	2A	112	4
2001	AIT-2001	Influent pH Level	AI	0-14		0	5	5	W-3	1A	116	4
2002	LSH-2002	Influent Level High Alarm	DI	Normal		0	12	9	W-3	8	112	4
6205	LIT-6205	Sodium Hydroxide Tank No. 1 Level	AI	0-5'		0	6	5	W-3	1A	119	15
6210	SC-6210	Sodium Hydroxide Pump No. 1 Speed Cmd.	AO	0-100%		0	8	3	W-3	4	108	15
6210	HSS-6210	Sodium Hydroxide Pump No. 1 Start/Stop Cmd.	DO	Start		0	14	10	W-3	10	114	15
6215	LIT-6215	Sodium Hydroxide Tank No. 2 Level	AI	0-24"		0	6	5	W-3	2A	116	15
6220	SC-6220	Sodium Hydroxide Pump No. 2 Speed Cmd.	AO	0-100%		0	8	4	W-3	4	110	15
6220	HSS-6220	Sodium Hydroxide Pump No. 2 Start/Stop Cmd.	DO	Start		0	14	11	W-3	10	116	15
6230	LAH-6230	Sodium Hydroxide Tank No. 1 Containment Leak	DI	Normal		0	11	16	W-3	7	122	15
6231	LAH-6231	Sodium Hydroxide Tank No. 2 Containment Leak	DI	Normal		0	12	16	W-3	8	123	15
7021	XA-7021	Managed Ethernet Switch No. 1 Fault	DI	Normal		0	12	10	W-3	8	114	17
7022	XA-7022	Managed Ethernet Switch No. 2 Fault	DI	Normal		0	12	11	W-3	8	115	17
7023	XA-7023	FACP Remote Indication	DI	Normal		0	11	14	W-3	7	119	NEW
7051	FS-7051	Eyewash Station Activation Alarm #2	DI	Normal		0	12	12	W-3	8	117	NEW
7052	FS-7052	Eyewash Station Activation Alarm #3	DI	Normal		0	12	13	W-3	8	118	NEW
7053	FS-7053	Eyewash Station Activation Alarm #4	DI	Normal		0	12	14	W-3	8	119	NEW
8000	TSL-8000	Boiler Low Water Temperature	DI	Normal		0	11	15	W-3	7	121	NEW
8010	FSL-8010	MCC Fan Low Air Flow	DI	Normal		0	12	15	W-3	8	121	NEW

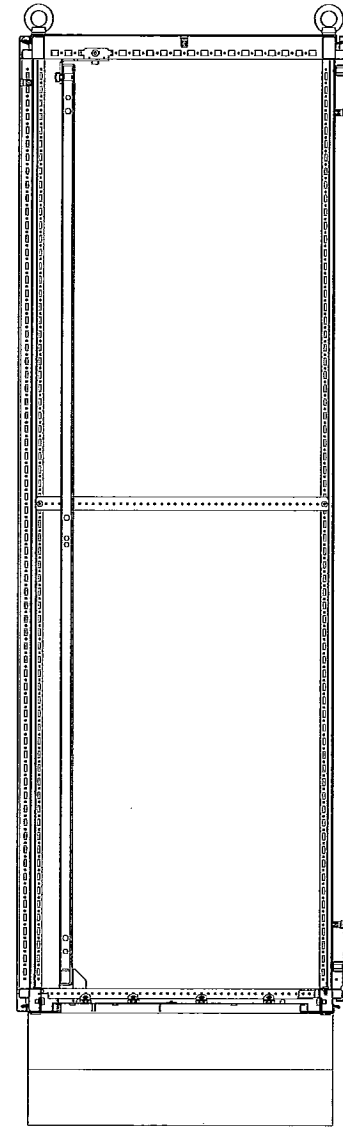
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5	07/29/11	As Built Revised	CGN	Aaron Associates 478 West Main Street Waterbury, CT 06702	TITLE: Pretreatment Control Panel (PTCP) Loop Index PROJECT: Stafford Springs Water Pollution Control Upgrade SCALE: CGN DATE: 01/18/10
4	03/07/11	Revised per Change Order	CGN		
3	12/09/10	As Built	JPM		
2	07/09/10	Revised per Engineer Comments	JPM		
1	01/18/10	Initial Submittal	CGN		
REV	DATE	DESCRIPTION	BY	DRAWING NO. 0904018-L3	SHEET 1 OF SHEETS 1

ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
1	Rittal	1	8286.500	Enclosure, NEMA 12, 71"H x 47" W x 24" D TS Type
2	Rittal	1	8185.235	Cabinet Side Wall
3	Rittal	1	8602.200	Cabinet F/R Base 8"
4	Rittal	1	8602.060	Cabinet Side Base 8"
5	Industrial Computing	1	PM-P-15	Industrial PC
6	Lightolier	2	TSL 0028 W BPR	Interior Cabinet Lighting
7	Rittal	1	PS 4127.000	Door Light Switch
8	Cortec	1	VpCl-110	Corrosion inhibitor



Front View



Right Side View

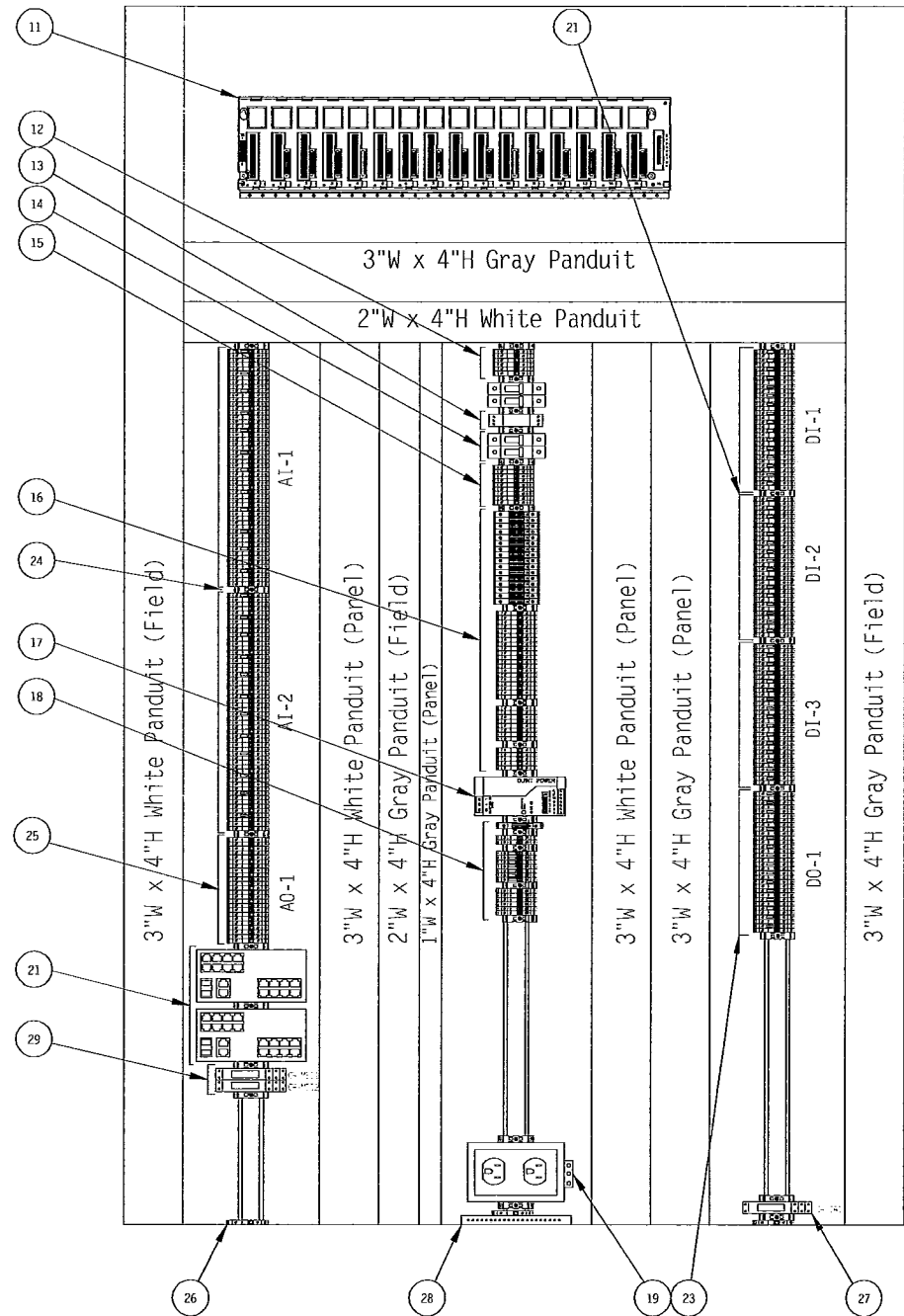
NP #	LINE #1	ENGRAVING TEXT	SIZE	TEXT SIZE
1	PTCP		1 1/2" X 6"	5/8"

Notes:

1. Lamacoids engraved using white letters on black background.
2. Standard size lamacoids have beveled front edges.
3. Lamacoids have adhesive back side.
4. Standard letter heights are 3/16" and 5/16".
5. Letter height adjustable from 3/16" to 9/16" as needed.

AS-BUILT

REV	DATE	DESCRIPTION	BY	Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) Exterior Layout
5	6/10/11	As Built Revised	CGN			PROJECT: Stafford Springs Water Pollution Control Upgrade
4	03/07/11	Revised per Change Order	CGN			
3	12/09/10	As Built	JPM			
2	07/09/10	Revised per Engineer Comments	JPM			
1	01/18/10	Initial Submittal	CGN			
				SCALE: CGN	CHECKED BY: JPM	APPROVED BY: JPM
				DATE: 01/18/10	SHEET 1	OF SHEETS 2
				DRAWING NO. 0904018-A3		



IC695CHS016	IC695PSA040	IC695CPU310	IC695ETM001	IC695ALG112	IC695ALG112	SPARE	IC695ALG808	SPARE	IC694MDL240	IC694MDL240	IC694MDL240	SPARE	IC694MDL916	SPARE	SPARE		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

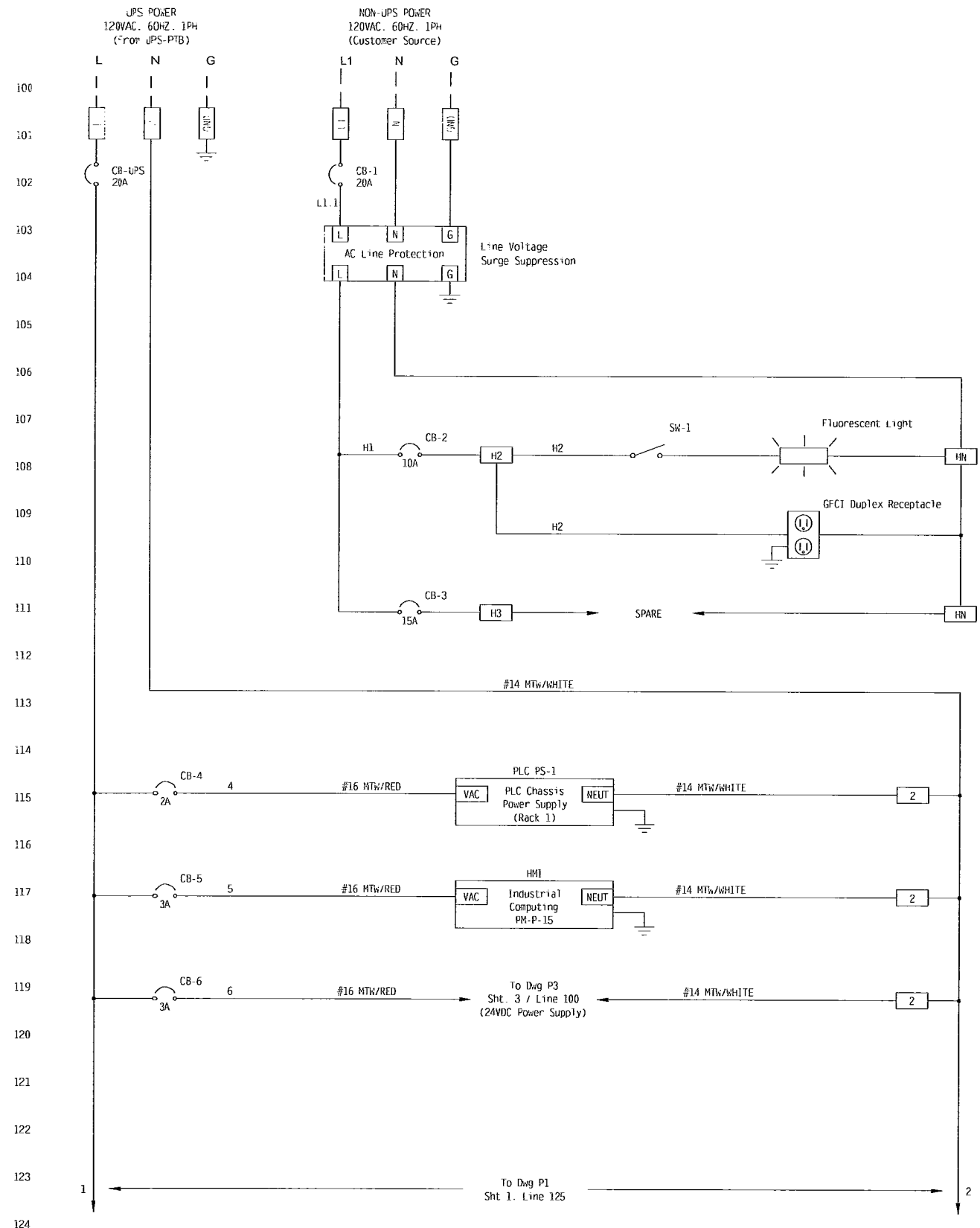
AS BUILT

ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
11	General Electric	1	IC695CHS016	RX3i Main CPU Rack
		1	IC 695PSA040	16 Slot Chassis
		1	IC 695CPU310	Power Supply
		1	IC695ETM001	RX3i CPU
		2	IC695ALG112	Ethernet/IP Module
		1	IC695ALG808	12pt Analog Input Module
		3	IC694MDL240	8pt Analog Output Module
		1	IC694MDL916	16pt 120VAC Digital Input Module
		1	IC694MDL916	16pt Digital Output Relay Module
12	Phoenix Contact	4	30 46 18 4	Incoming Power Distribution
		2	30 46 20 7	UT 4-MTD Feed Through Terminal Block
13	Phoenix Contact	1	28 56 81 2	UT 4-MTD-PE/S Grounding Terminal Block
14	Allen-Bradley	2	1489-A1C-200	120VAC Surge Suppressor (26 Amp)
		1	1489-A1C-100	Circuit Breakers for 120VAC Power Distribution
		1	1489-A1C-150	20A Circuit Breakers (CB-1, CB-UPS)
15	Phoenix Contact	8	30 46 18 4	10A Circuit Breakers (CB-2)
		1	30 46 20 7	15A Circuit Breakers (CB-3)
		1	30 46 20 7	Terminal Blocks for 120VAC for Primary Distribution
16	Phoenix Contact	12	07 12 21 7	UT 4-MTD Feed Through Terminal Block
		2	07 12 23 3	UT 4-MTD-PE/S Grounding Terminal Block
		14	31 18 20 3	Circuit Breakers for 120VAC Power Distribution
		18	30 46 18 4	TCP 2A Miniature Circuit Breaker, 2 Amp, CB's 4, 7-17
		15	30 46 20 7	TCP 3A Miniature Circuit Breaker, 3 Amp, CB 5,6
17	Phoenix Contact	2	29 38 57 8	UK 6-FSI/C Circuit Breaker Base
		2	29 38 57 8	UT 4-MTD Feed Through Terminal Block (Neutral)
		2	29 38 57 8	UT 4-MTD-PE/S Grounding Terminal Block
		2	29 38 57 8	24VDC Power Supply, 2.5A, Quint-PS-100-240AC-24DC-2.5
18	Phoenix Contact	1	07 12 23 3	Terminal Blocks for 24VDC Distribution
		1	31 18 20 3	TCP 3A Miniature Circuit Breaker, 3 Amp (CB-51)
		6	30 46 09 0	UK 6-FSI/C Circuit Breaker Base
		7	30 46 18 4	UT 4-HESILED Indicating Fused Terminal Block 24VDC
		7	30 46 18 4	UT 4-MTD Feed Through Terminal Block
		1	56 00 46 2	Convenience Receptacle w/GFCI EM-DUO
		1	08 00 88 6	End Retainers E/NE 35 N
21	Sixnet	2	SLX-18MG-1	Industrial Ethernet Managed Switch
		4	GM-FIBER-SFP-500	Industrial Ethernet Gigabit Fiber Transceivers
22	Phoenix Contact	48	30 46 10 0	Terminal Blocks for Digital Inputs
		48	30 46 18 4	UT 4-HESILA 250 Indicating Fused Terminal Block 120VAC
23	Phoenix Contact	16	30 46 10 0	UT 4-MTD Feed Through Terminal Block
		16	30 46 18 4	Terminals for Digital Outputs
24	Phoenix Contact	24	30 46 14 2	UT 4-HESILA 250 Indicating Fused Terminal Block 120VAC
		Lot	30 36 81 9	UT4-TG Fused Terminal
		72	30 46 18 4	P-FU 5x20 LED 24 Fuse Plug (qty as shown on drawings)
		12	30 46 20 7	UT4-MTD Terminal Block
25	Phoenix Contact	16	30 46 18 4	UT4-MTD-PE/S
		4	30 46 20 7	Terminal Blocks for Analog Inputs
		4	30 46 20 7	UT4-TG Fused Terminal
26	Phoenix Contact	Lot	30 46 20 7	Terminal Blocks for Analog Outputs
		Lot	30 46 20 7	UT4-MTD Terminal Block
27	Phoenix Contact	1	28 34 48 1	UT4-MTD-PE/S
28	General Electric	1	N/A	Din Rail Bonding Terminals
29	Phoenix Contact	2	28 34 48 1	UT4-MTD PE/S Grounding Terminals
27	Phoenix Contact	1	28 34 48 1	24VDC Interposing Relay PR1-RSC3-LDP-24DC/2x21, CR-IR1
28	General Electric	1	N/A	24 Position Ground Bar
29	Phoenix Contact	2	28 34 48 1	24VDC UPS Relay PR1-RSC3-LDP-24DC/2x21, MES1, MES2

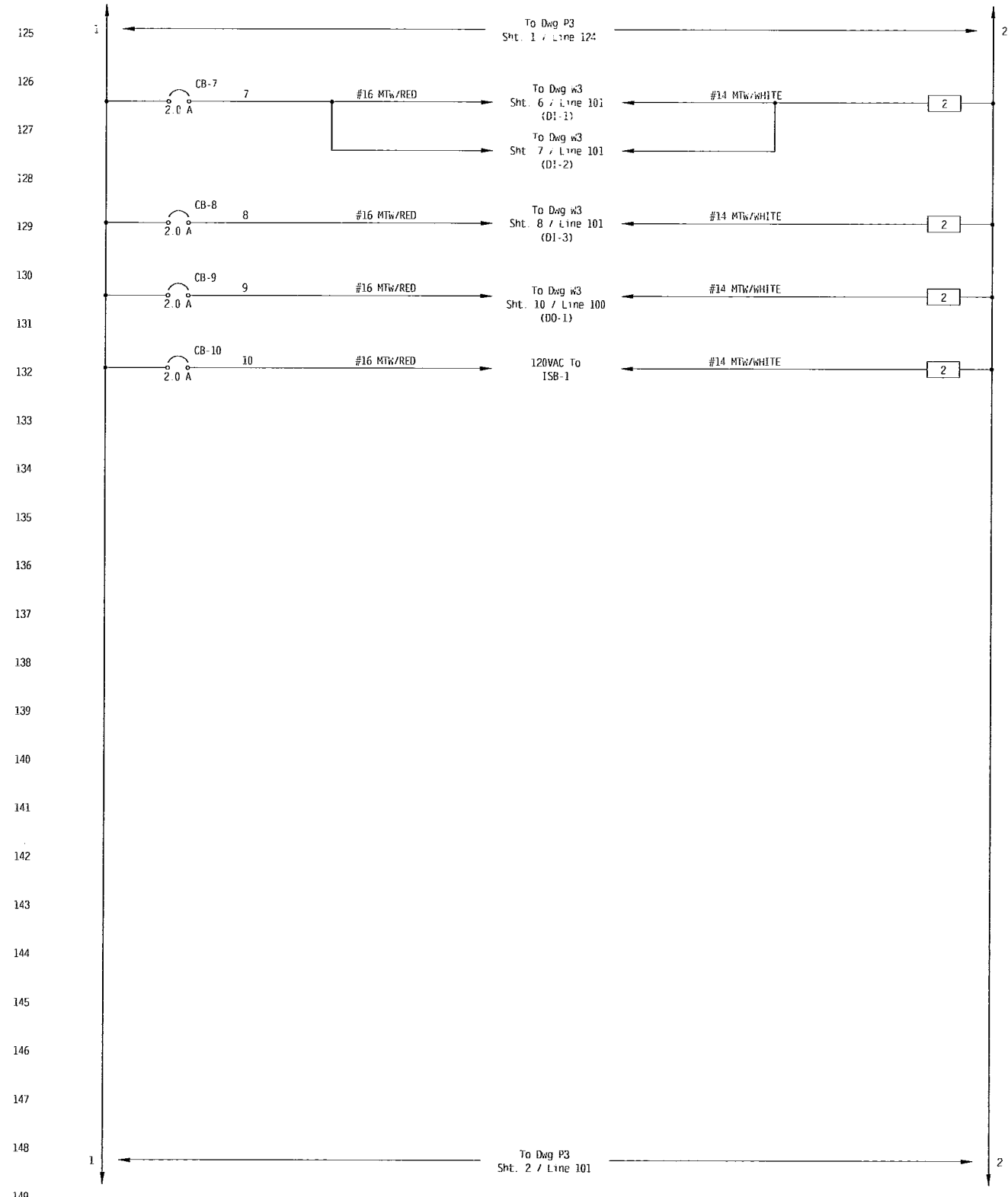
REV	DATE	DESCRIPTION	BY
5	6/10/11	As Built Revised	CGN
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE:	Pretreatment Control Panel (PTCP) Interior Layout		
PROJECT:	Stafford Springs Water Pollution Control Upgrade		
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE:	01/18/10	SHEET 2 OF SHEETS 2	DRAWING NO. 0904018-A3



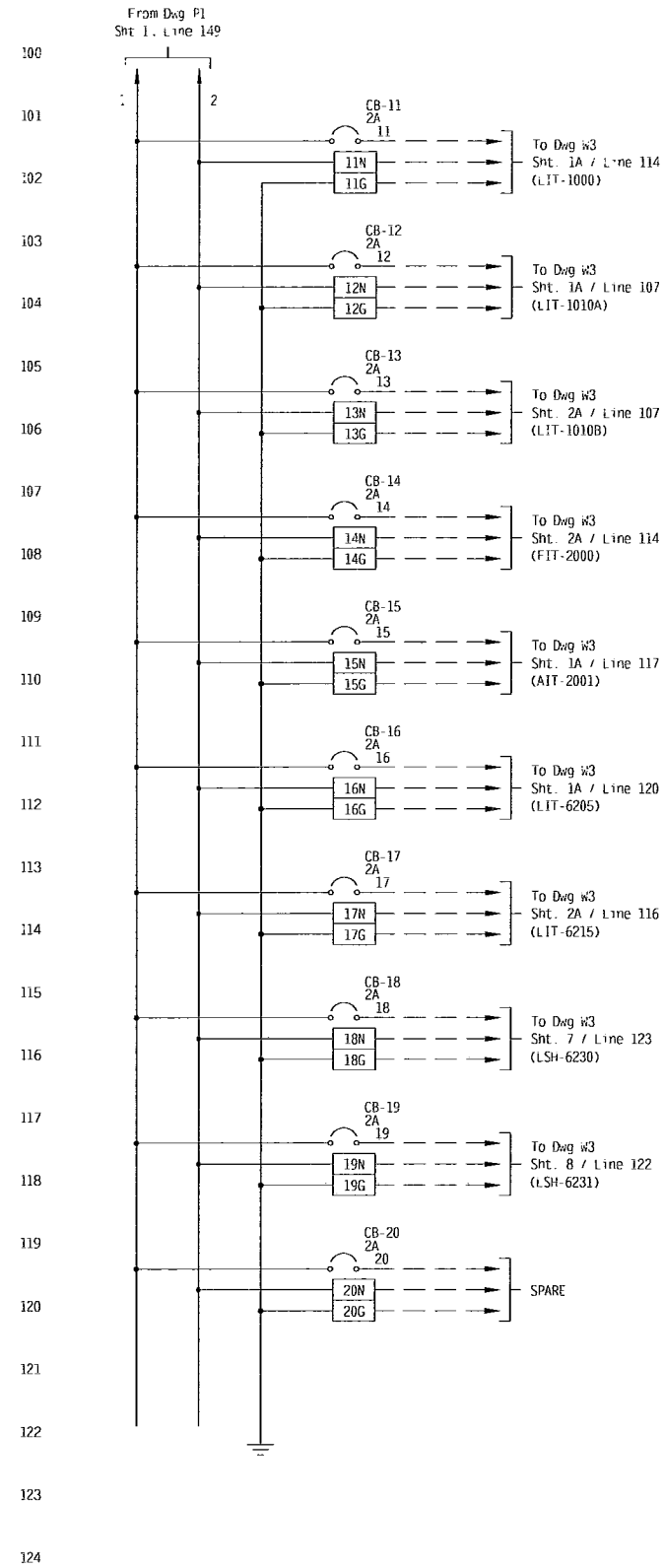
KEY:
 FIELD WIRING - - - - -
 PANEL WIRING —————



REV	DATE	DESCRIPTION	BY
5	6/10/11	As Built Revised	CGN
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates
 478 West Main Street
 Waterbury, CT 06702

TITLE: Pretreatment Control Panel (PTCP) Power Distribution			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/04/10	SHEET 1	OF SHEETS 5	DRAWING NO. 0904018-P3



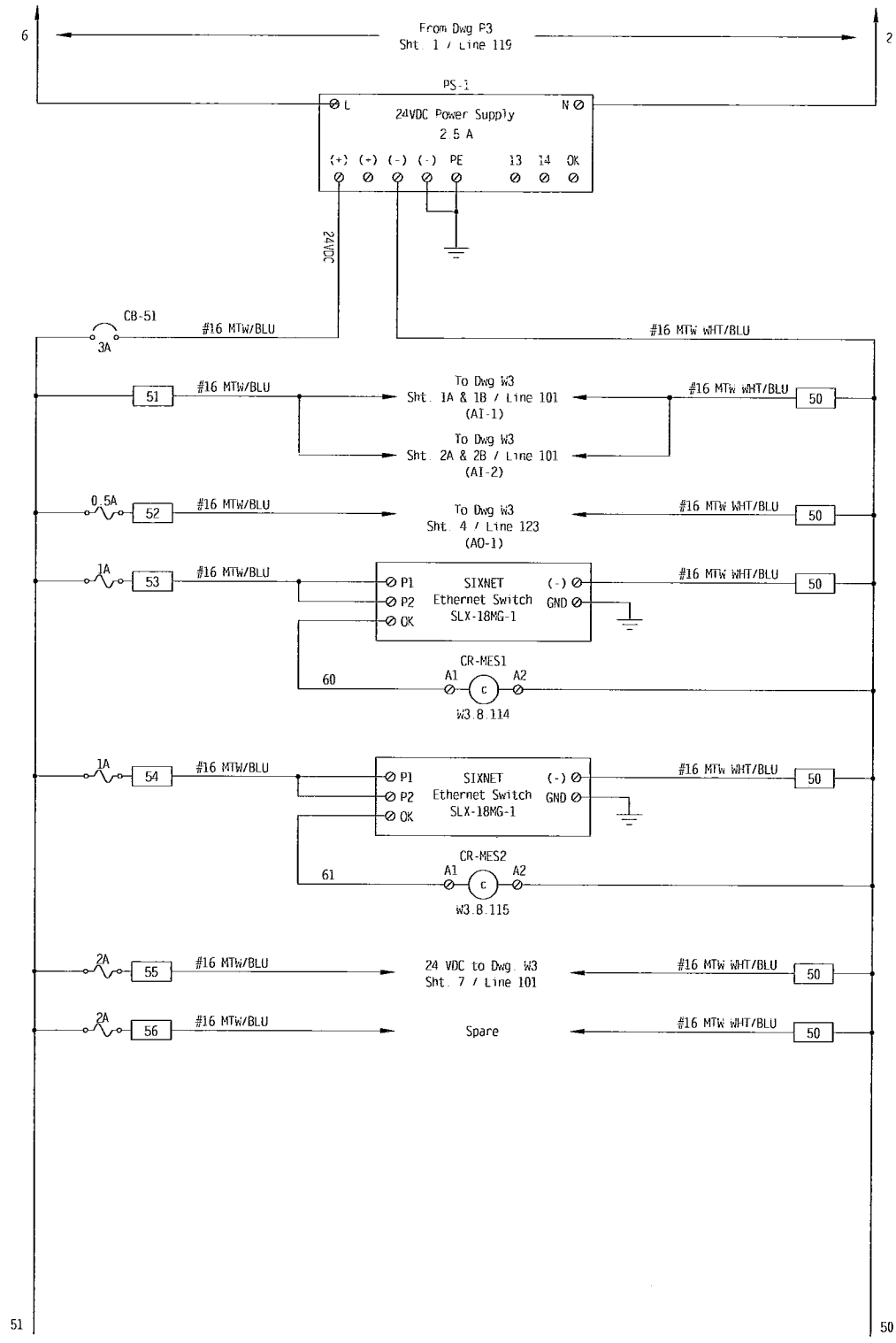
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REV	DATE	DESCRIPTION	BY	Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) Power Distribution	
5	6/10/11	As Built Revised	CGN			PROJECT: Stafford Springs Water Pollution Control Upgrade	
4	03/07/11	Revised per Change Order	CGN				
3	12/09/10	As Built	JPM				
2	07/09/10	Revised per Engineer Comments	JPM				
1	01/18/10	Initial Submittal	CGN				
				SCALE: CGN	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
				DATE: 01/04/10	SHEET 2	OF SHEETS 5	DRAWING NO. 0904018-P3

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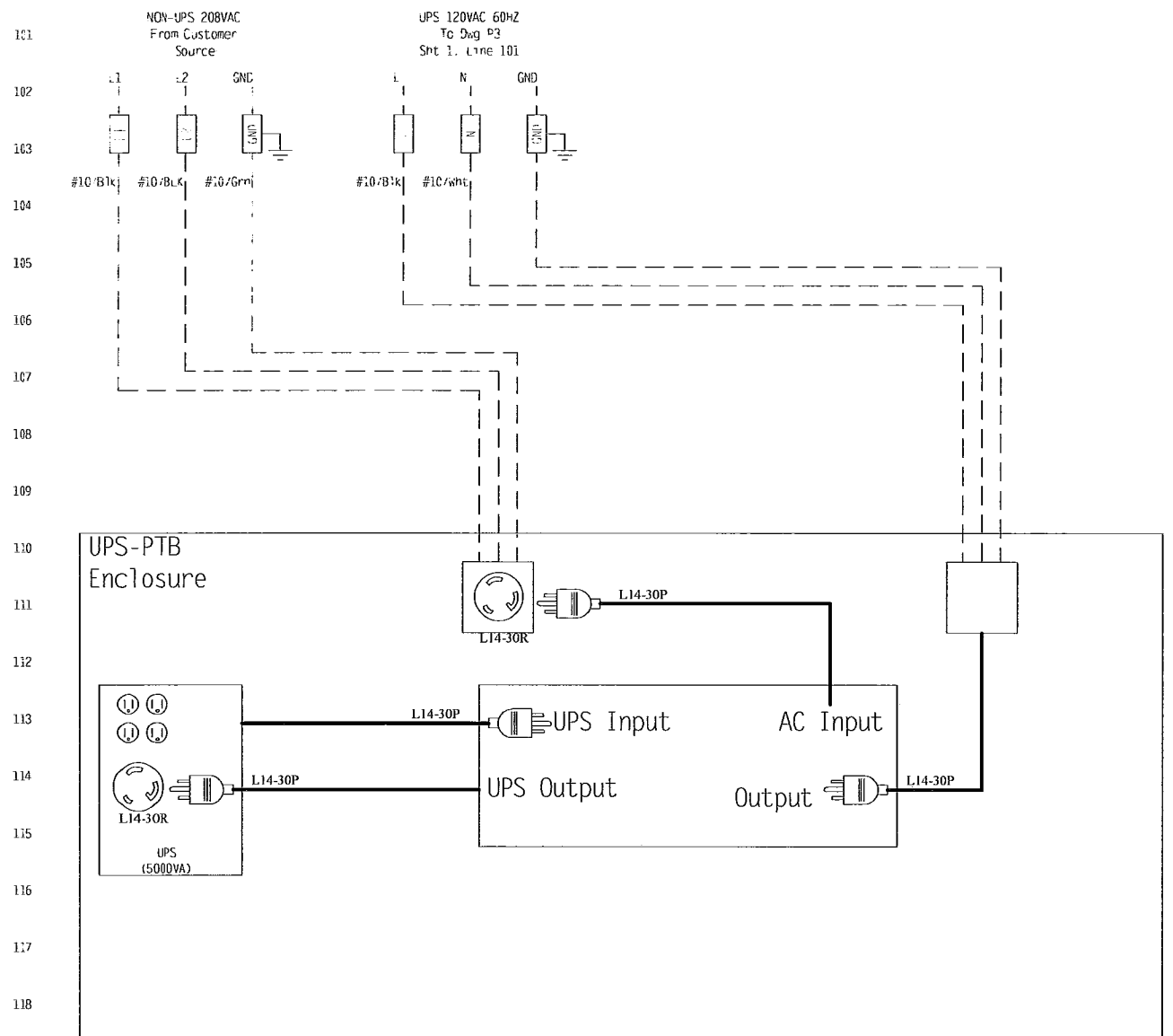


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REV	DATE	DESCRIPTION	BY
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4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) Power Distribution	
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE: CGN	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/04/10	SHEET 3 OF SHEETS 5	DRAWING NO. 0904018-P3	



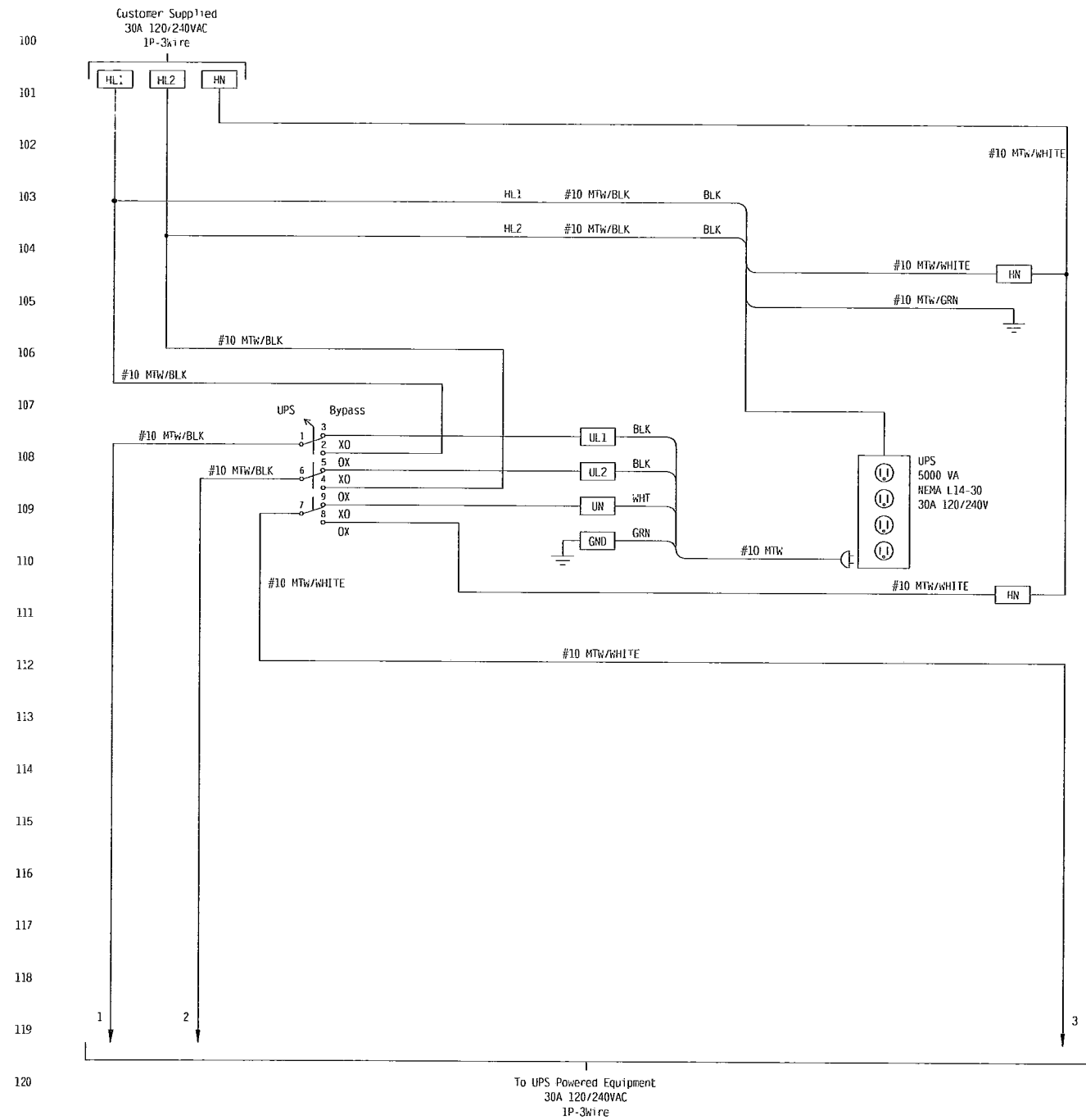
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				Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) UPS-PTB Wiring Layout	
				PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM				
DATE: 01/04/10	SHEET 4	OF SHEETS 5	DRAWING NO. 0904018-P3				
REV	DATE	DESCRIPTION	BY				
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4	03/07/11	Revised per Change Order	CGN				
3	12/09/10	As Built	JPM				
2	07/09/10	Revised per Engineer Comments	JPM				
1	01/18/10	Initial Submittal	CGN				



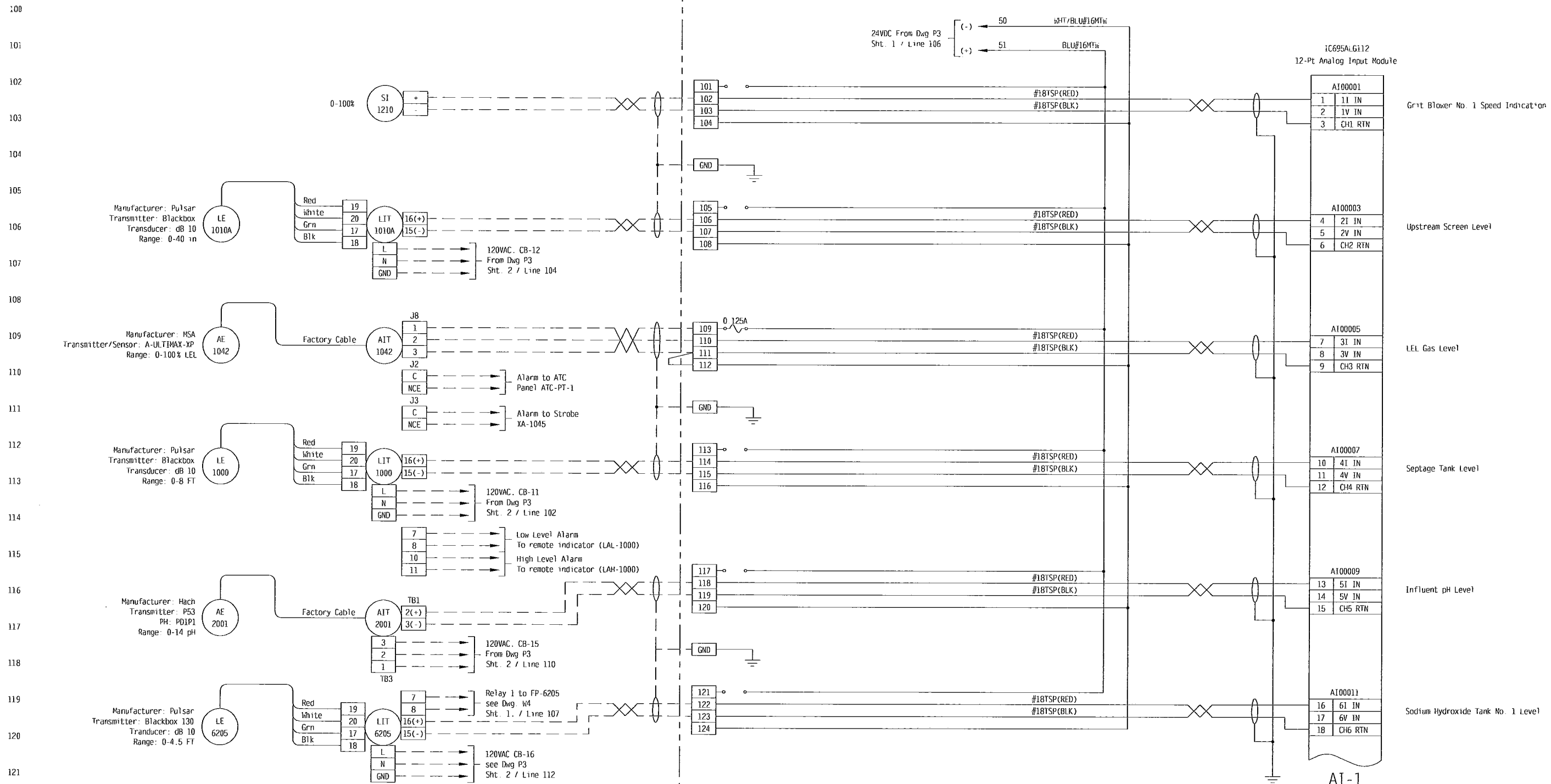
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5	6/10/11	As Built Revised	CGN			PROJECT: Stafford Springs Water Pollution Control Upgrade	
4	03/07/11	Revised per Change Order	CGN				
3	12/09/10	As Built	JPM				
2	07/09/10	Revised per Engineer Comments	JPM				
1	01/18/10	Initial Submittal	CGN				
				SCALE: CGN	DRAWN BY: JPM	CHECKED BY: JPM	APP'D BY: JPM
				DATE: 01/04/10	SHEET 5	OF SHEETS 5	DRAWING NO. 0904018-P3

Field Devices

Cabinet Devices



AS-BUILT

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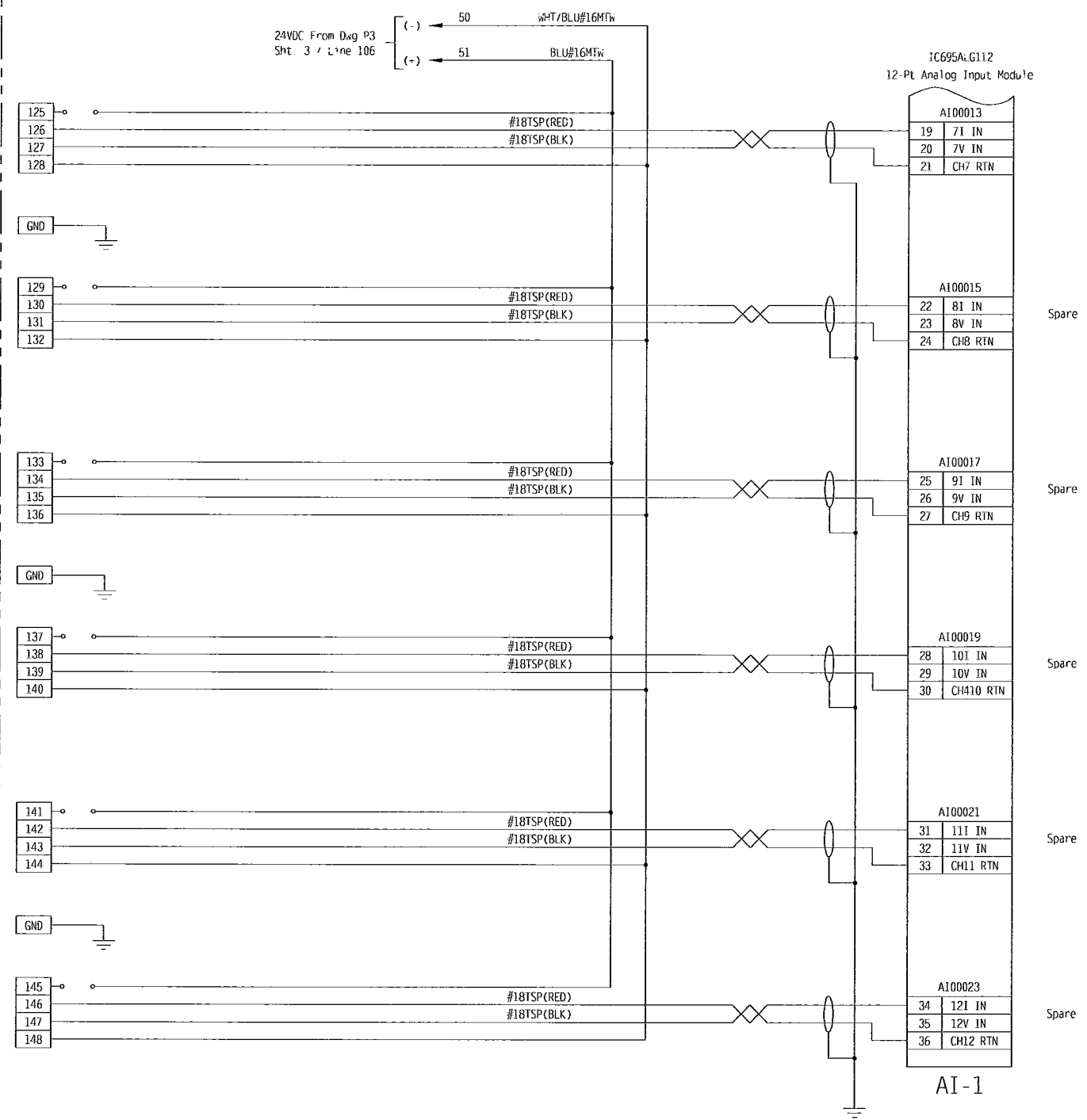
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4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) Analog Input #1	
PROJECT: Stafford Springs Water Pollution Control Upgrade		SCALE: CGN	APPD BY: JPM
DATE: 01/18/10	SHEET 1A	OF SHEETS 11	DRAWING NO. 0904018-W3

Field Devices

Cabinet Devices

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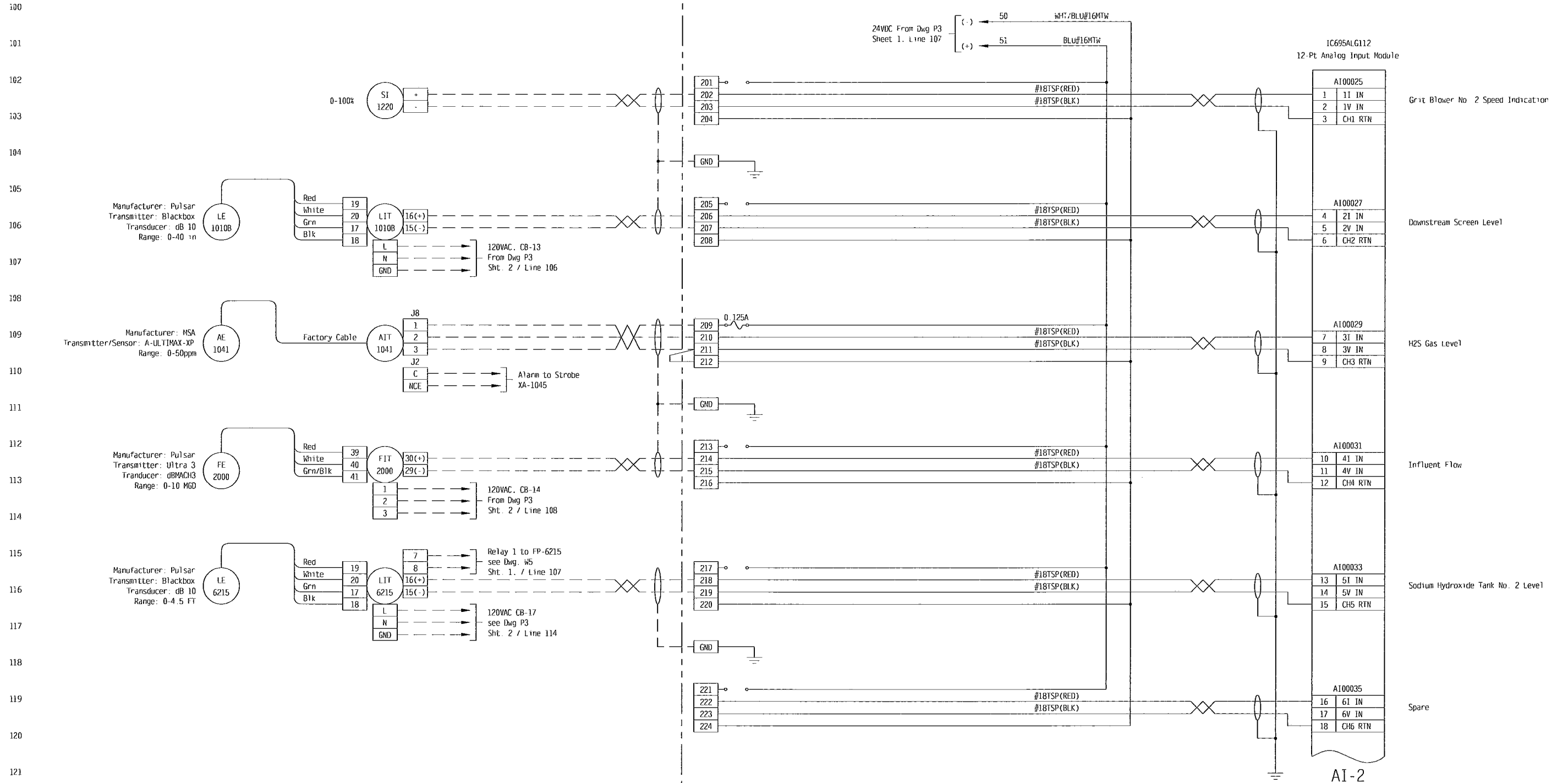
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4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates		TITLE: Pretreatment Control Panel (PTCP) Analog Input #1	
478 West Main Street Waterbury, CT 06702		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE: CGN	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 1B	OF SHEETS 11	DRAWING NO. 0904018-W3

Field Devices

Cabinet Devices



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Grit Blower No. 2 Speed Indication

Downstream Screen Level

H2S Gas Level

Influent Flow

Sodium Hydroxide Tank No. 2 Level

Spare

AI-2

KEY:
FIELD WIRING - - - - -
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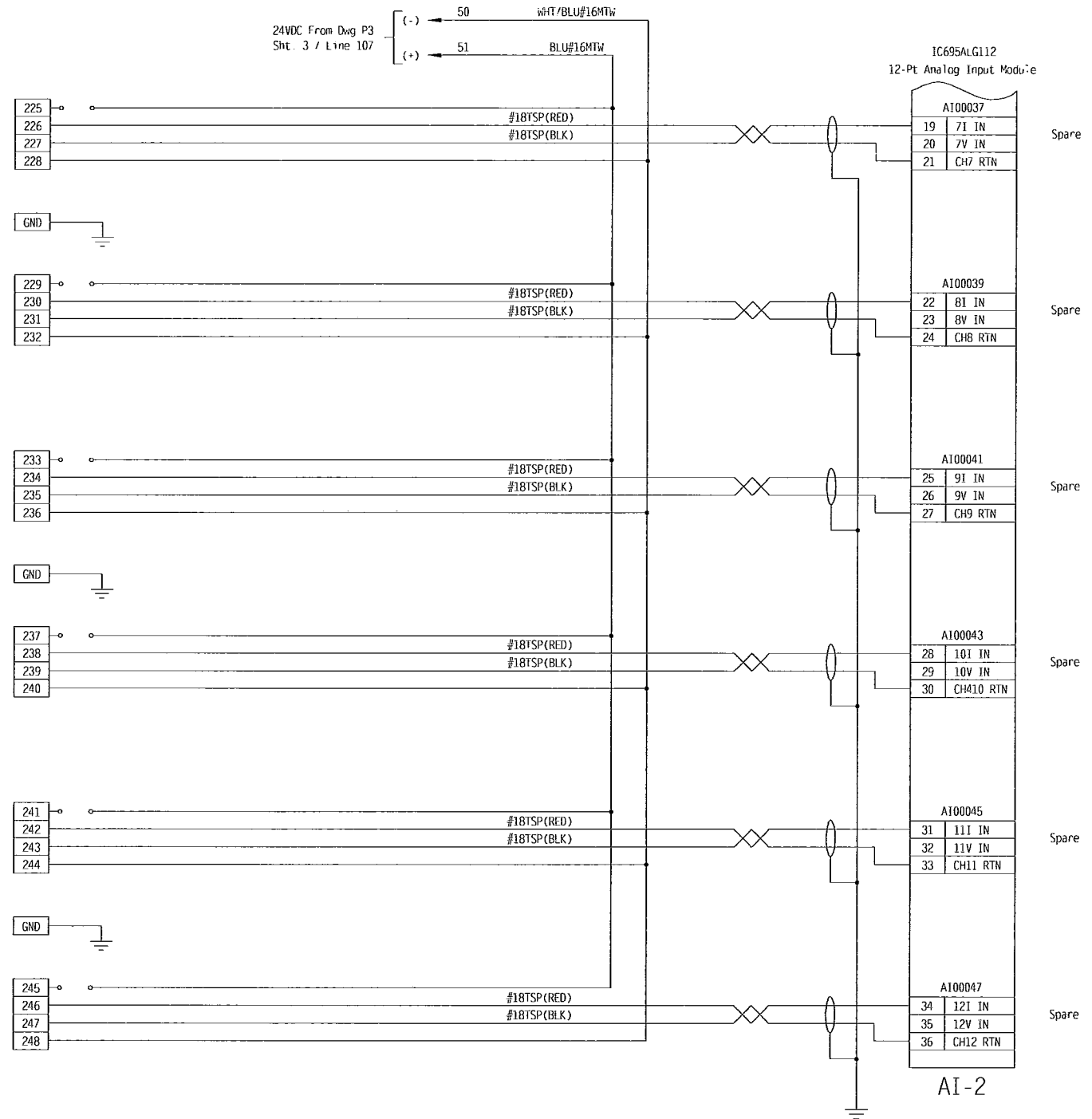
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3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) Analog Input #2
PROJECT: Stafford Springs Water Pollution Control Upgrade		SCALE: CGN DRAWN BY: JPM CHECKED BY: JPM APP'D BY: JPM
DATE: 01/18/10	SHEET 2A OF SHEETS 11	DRAWING NO. 0904018-W3

Field Devices

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AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

REV	DATE	DESCRIPTION	BY
5	6/10/11	As Built Revised	CGN
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Pretreatment Control Panel (PTCP) Analog Input #2			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE: CGN	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET: 2B	OF SHEETS: 11	DRAWING NO.: 0904018-W3

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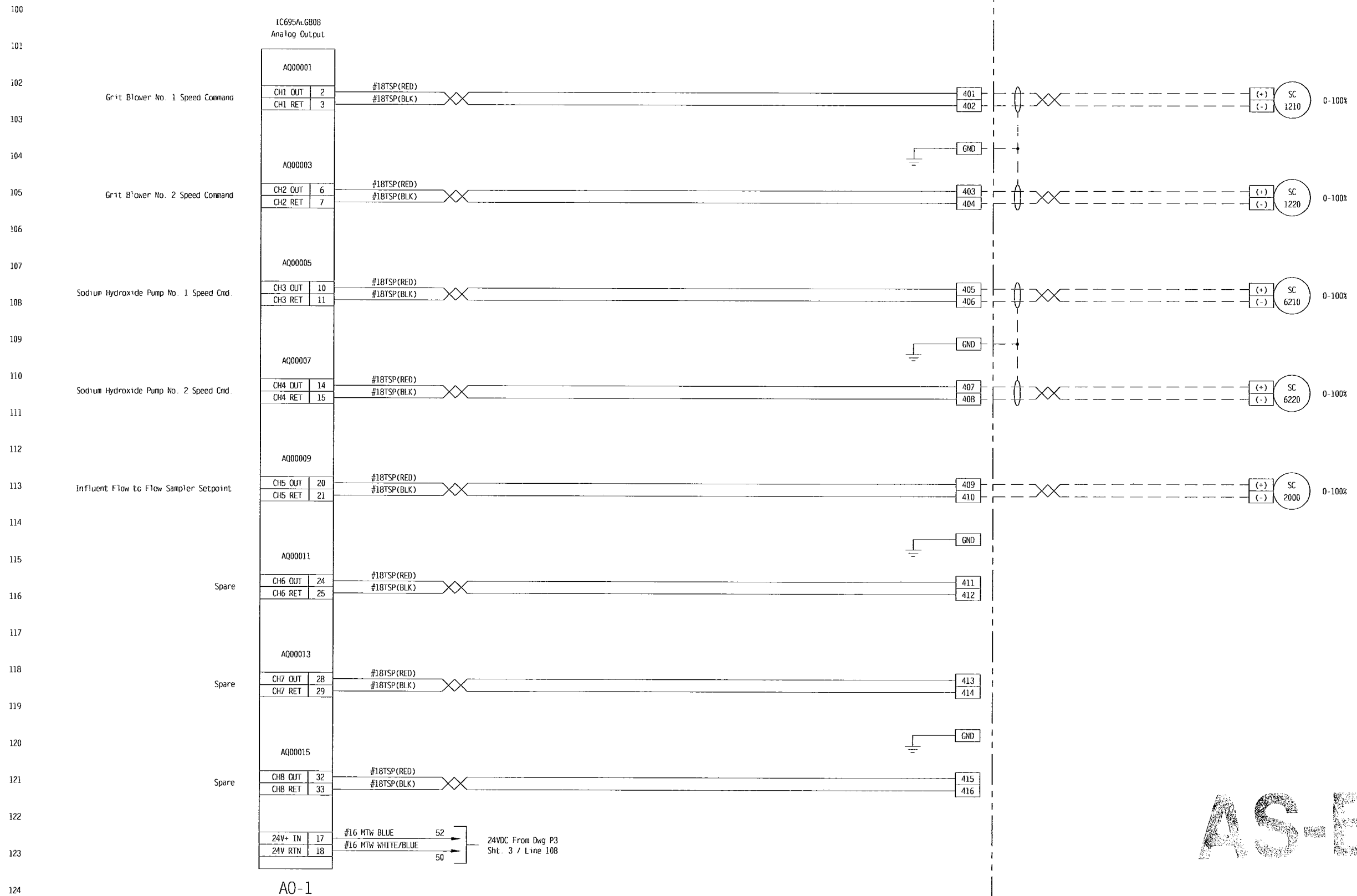
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PANEL WIRING _____

REV	DATE	DESCRIPTION	BY
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4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) Reserved Spare	
		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:
	CGN	JPM	JPM
DATE:	SHEET	OF SHEETS	DRAWING NO.
01/18/10	3	11	0904018-W3

Cabinet Devices

Field Devices



AO-1

AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING _____

REV	DATE	DESCRIPTION	BY
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4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates		TITLE: Pretreatment Control Panel (PTCP) Analog Output #1	
478 West Main Street Waterbury, CT 06702		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE: CGN	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 4	OF SHEETS 11	DRAWING NO. 0904018-W3

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PANEL WIRING _____

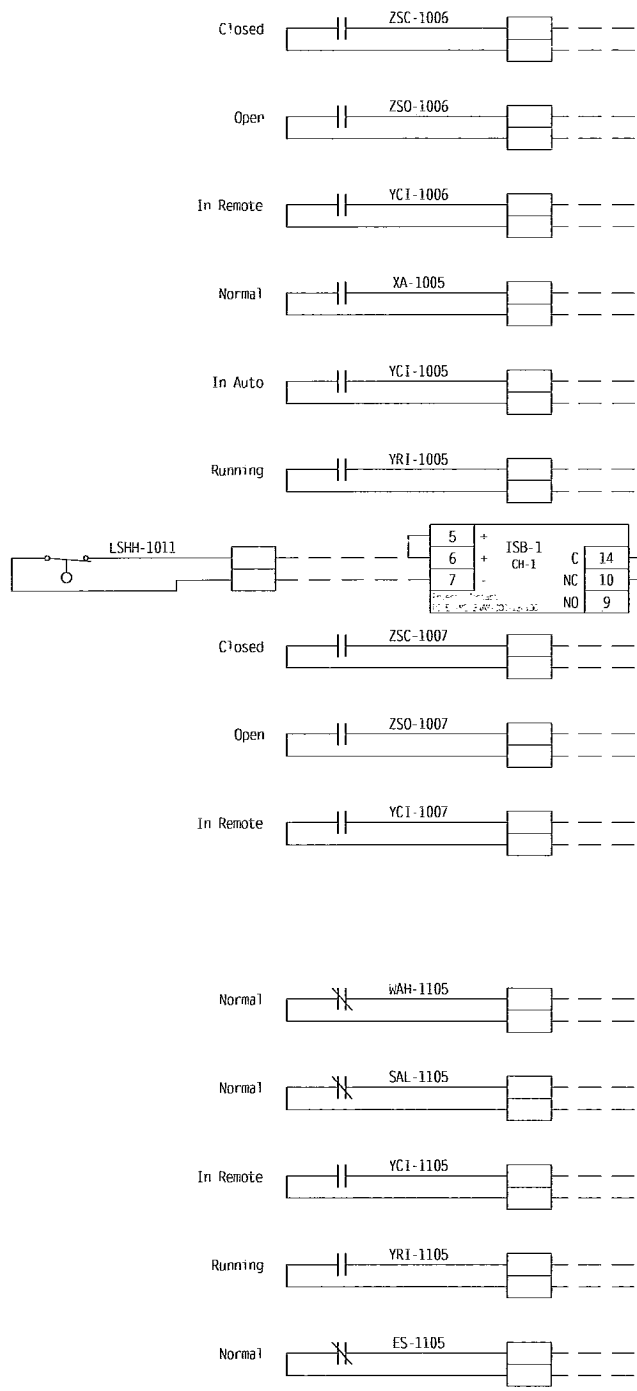
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3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates		TITLE: Pretreatment Control Panel (PTCP) Reserved Spare	
478 West Main Street Waterbury, CT 06702		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPR'D BY: JPM
DATE: 01/18/10	SHEET 5	OF SHEETS 11	DRAWING NO. 0904018-W3

Field Devices

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IC694MDL240
16-Pt. Digital Input Module

1	i1	Septage Feed Valve Closed
2	i2	Septage Feed Valve Open
3	i3	Septage Feed Valve In Remote
4	i4	Septage Feed Pump Common Alarm
5	i5	Septage Feed Pump In Auto
6	i6	Septage Feed Pump Running
7	i7	Upstream Screen Level High High
8	i8	Septage Recirculation Valve Closed
9	i9	Septage Recirculation Valve Open
10	i10	Septage Recirculation Valve In Remote
11	i11	Spare
12	i12	Grit Bucket Elevator High Torque
13	i13	Grit Bucket Elevator Speed Alarm
14	i14	Grit Bucket Elevator In Remote
15	i15	Grit Bucket Elevator Running
16	i16	Grit Bucket Elevator E-Stop
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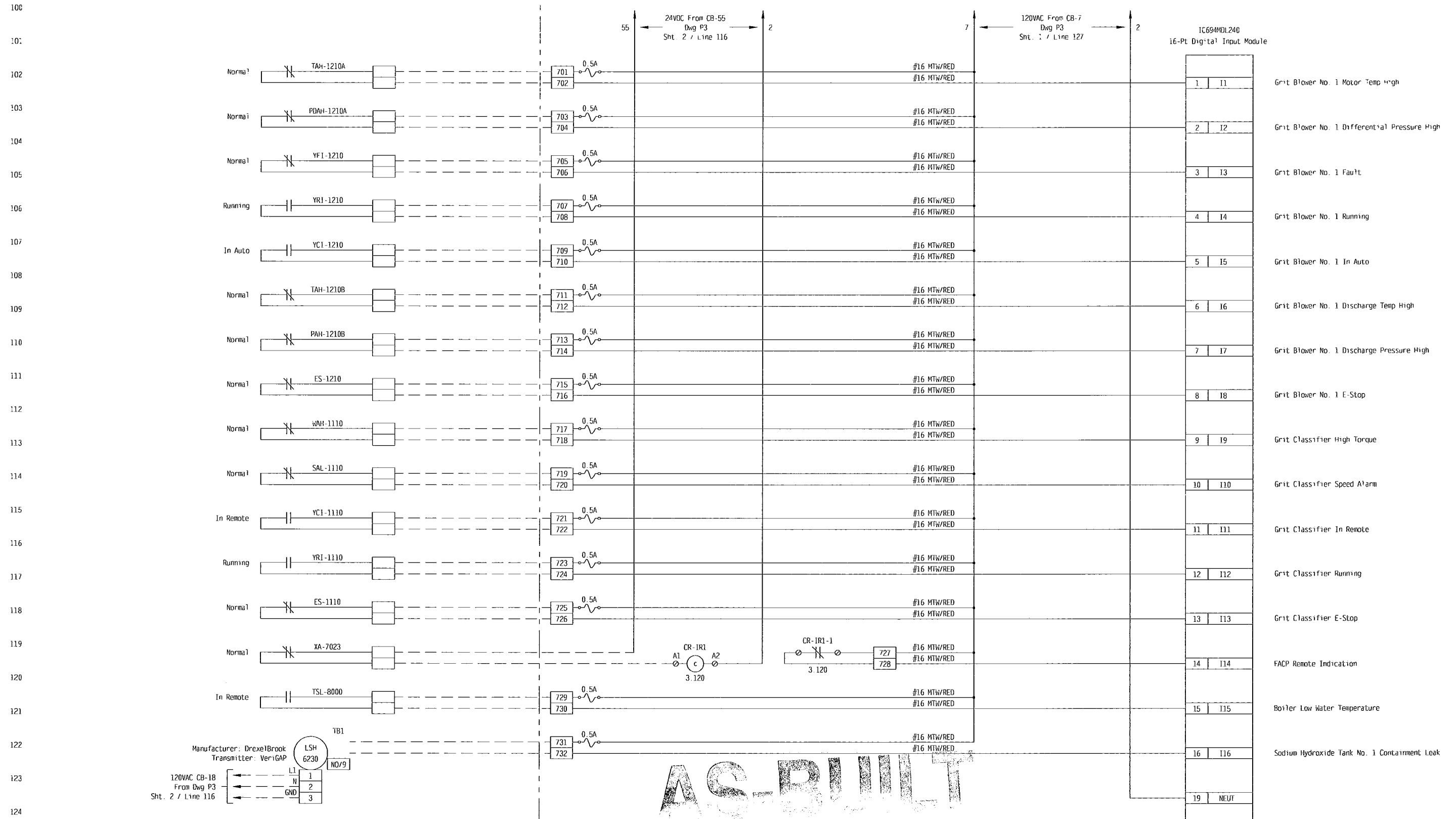
DI-1

KEY:
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Aaron Associates 478 West Main Street Waterbury, CT 06702				TITLE: Pretreatment Control Panel (PTCP) Digital Input #1	
PROJECT: Stafford Springs Water Pollution Control Upgrade				SCALE: CGN DRAWN BY: JPM CHECKED BY: JPM APP'D BY: JPM	
REV	DATE	DESCRIPTION	BY	DATE	SHEET OF SHEETS
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4	03/07/11	Revised per Change Order	CGN		
3	12/09/10	As Built	JPM		
2	07/09/10	Revised per Engineer Comments	JPM		
1	01/18/10	Initial Submittal	CGN		
				DRAWING NO. 0904018-W3	

Field Devices

Cabinet Devices



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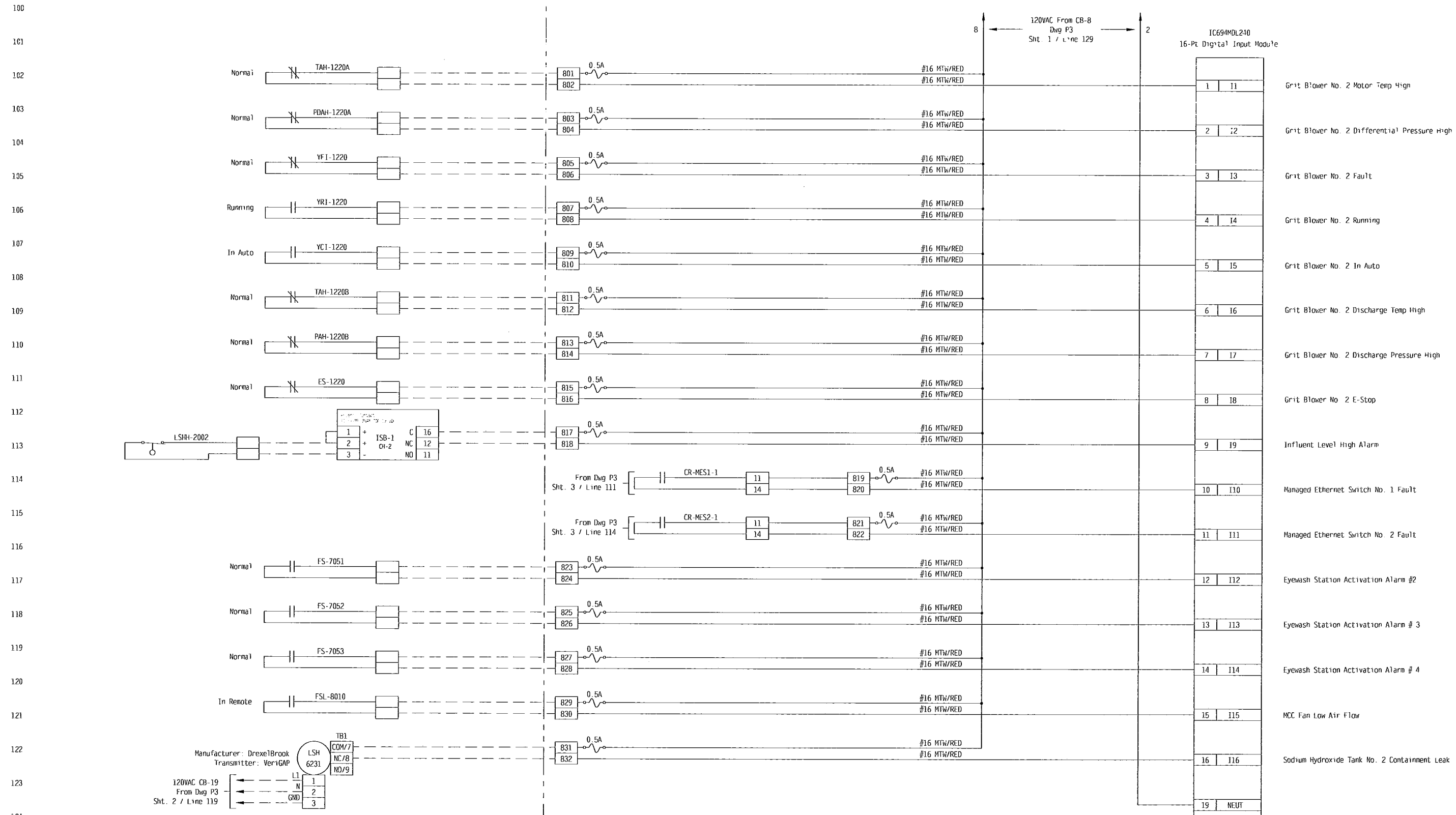
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REV	DATE	DESCRIPTION	BY
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3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates		TITLE: Pretreatment Control Panel (PTCP) Digital Input #2	
478 West Main Street Waterbury, CT 06702		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE: CGN	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 7	OF SHEETS 11	DRAWING NO. 0904018-W3

Field Devices

Cabinet Devices



KEY:
FIELD WIRING - - - - -
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REV	DATE	DESCRIPTION	BY
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4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) Digital Input #3
PROJECT: Stafford Springs Water Pollution Control Upgrade	SCALE: CGN	CHECKED BY: JPM APP'D BY: JPM
DATE: 01/18/10	SHEET: 8 OF SHEETS 11	DRAWING NO.: 0904018-W3

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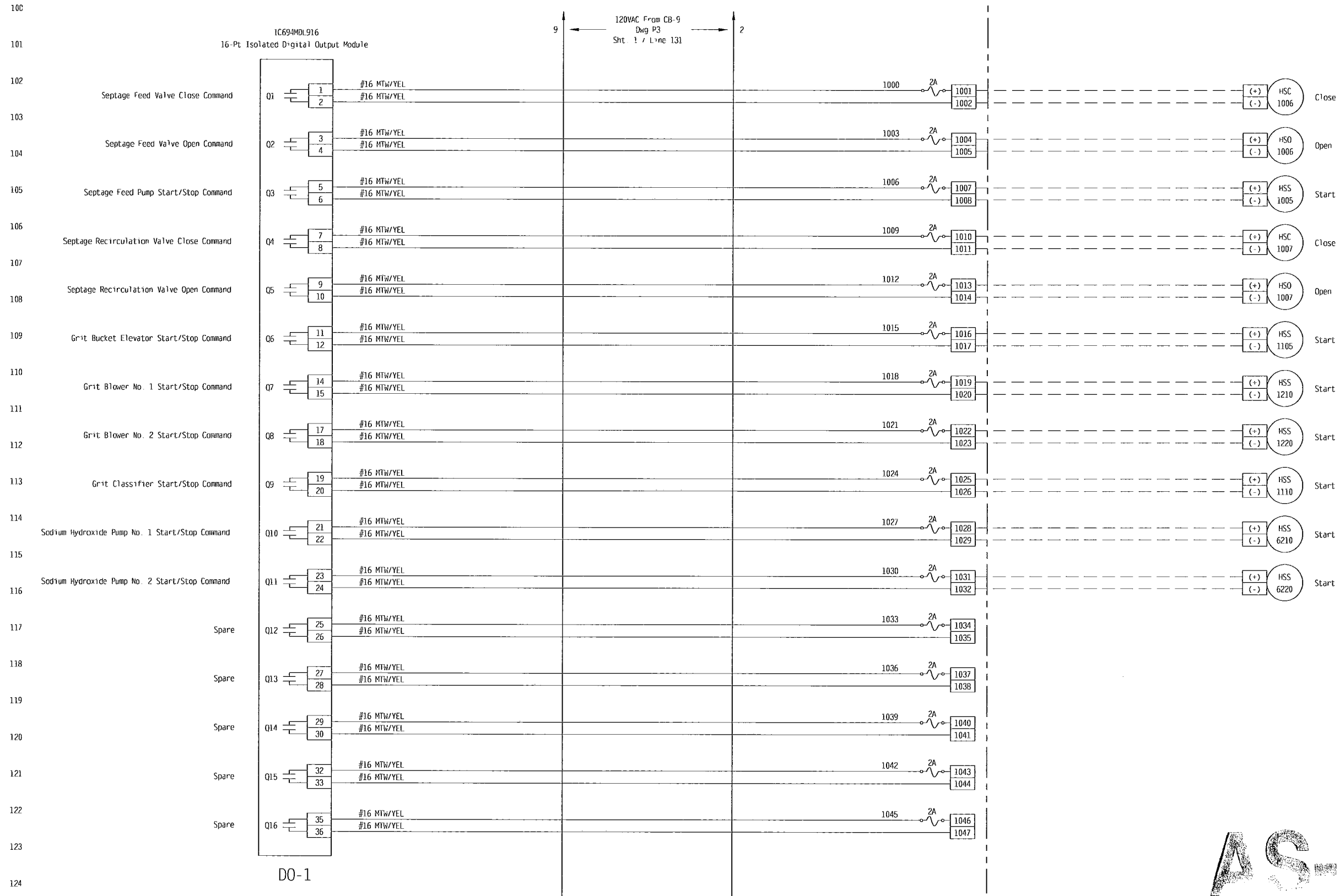
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4	03/07/11	Revised per Change Order	CGN		PROJECT: Stafford Springs Water Pollution Control Upgrade
3	12/09/10	As Built	JPM		SCALE: CGN
2	07/09/10	Revised per Engineer Comments	JPM		CHECKED BY: JPM
1	01/18/10	Initial Submittal	CGN		APPRO BY: JPM
REV	DATE	DESCRIPTION	BY		DATE: 01/18/10 SHEET 9 OF SHEETS 11 DRAWING NO. 0904018-W3

Cabinet Devices

Field Devices



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REV	DATE	DESCRIPTION	BY
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4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineer Comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Pretreatment Control Panel (PTCP) Digital Output #1
PROJECT: Stafford Springs Water Pollution Control Upgrade		
SCALE: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 10 OF SHEETS 11	DRAWING NO. 0904018-W3

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4	03/07/11	Revised per Change Order	CGN																												
3	12/09/10	As Built	JPM																												
2	07/09/10	Revised per Engineer Comments	JPM																												
1	01/18/10	Initial Submittal	CGN																												
REV	DATE	DESCRIPTION	BY																												
				<p>PROJECT: Stafford Springs Water Pollution Control Upgrade</p>																											
				SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPR'D BY: JPM																								
				DATE: 01/18/10	SHEET 11	OF SHEETS 11	DRAWING NO. 0904018-W3																								

LOOP #	TAG	DESCRIPTION	TYPE	RANGE	ALARM LIMIT	RACK	SLOT	CH	DWG	SHT	LINE	P&ID
2011	YFI-2011	Aeration Tank No.1A Mixer Zone 1 Fault	DI	Normal		0	15	1	W-1	11	102	4
2011	YRI-2011	Aeration Tank No.1A Mixer Zone 1 Running	DI	Running		0	15	2	W-1	11	103	4
2011	YCI-2011	Aeration Tank No.1A Mixer Zone 1 In Auto	DI	In Auto		0	15	3	W-1	11	105	4
2011	XA-2011	Aeration Tank No.1A Mixer Zone 1 Common Alarm	DI	Normal		0	15	4	W-1	11	106	4
2011	HSS-2011	Aeration Tank No.1A Mixer Zone 1 Start/Stop Cmd.	DO	Start		1	8	1	W-1	19	102	4
2012	YFI-2012	Aeration Tank No.1A Zone 2 Mixer Fault	DI	Normal		1	1	1	W-1	12	102	4
2012	YRI-2012	Aeration Tank No.1A Zone 2 Mixer Running	DI	Running		1	1	2	W-1	12	103	4
2012	YCI-2012	Aeration Tank No.1A Zone 2 Mixer In Remote	DI	In Remote		1	1	3	W-1	12	105	4
2012	XA-2012	Aeration Tank No.1A Zone 2 Mixer Common Alarm	DI	Normal		1	1	4	W-1	12	106	4
2012	HSS-2012	Aeration Tank No.1A Zone 2 Start/Stop Cmd.	DO	Start		1	9	1	W-1	20	102	4
2013	YFI-2013	Aeration Tank No.1A Zone 3 Mixer Fault	DI	Normal		1	2	1	W-1	13	102	4
2013	YRI-2013	Aeration Tank No.1A Zone 3 Mixer Running	DI	Running		1	2	2	W-1	13	103	4
2013	YCI-2013	Aeration Tank No.1A Zone 3 Mixer In Remote	DI	In Remote		1	2	3	W-1	13	105	4
2013	XA-2013	Aeration Tank No.1A Zone 3 Mixer Common Alarm	DI	Normal		1	2	4	W-1	13	106	4
2013	HSS-2013	Aeration Tank No.1A Zone 3 Start/Stop Cmd.	DO	Start		1	10	1	W-1	21	102	4
2014	AIT-2014	Aeration Tank 1A Nitrate Monitoring	AI	1-20mg/L		0	7	6	W-1	3A	119	4
2015-1	AIT-2015-1	Aeration Tank 1A Anoxic Zone 3 DO Monitoring	AI	0-20ppm		0	8	1	W-1	4A	102	4
2015-2	AIT-2015-2	Aeration Tank 1A Anoxic Zone 1 DO Monitoring	AI	0-20ppm		0	9	1	W-1	5A	102	4
2020	ZC-2020	Aeration Tank 1A Aerobic Zone 1 Flow Ctrl Valve Position FB	AI	0-100%		0	5	1	W-1	1A	102	4
2020	ZI-2020	Aeration Tank 1A Aerobic Zone 1 Flow Ctrl Valve Position Cmd.	AO	0-100%		0	11	1	W-1	7	102	4
2020	YCI-2020	Aeration Tank 1A Aerobic Zone 1 Flow Control Valve In Remote	DI	In Remote		0	15	5	W-1	11	107	4
2021	FIT-2021	Aeration Tank 1A Aerobic Zone 1 Flow	AI	N/A		0	5	3	W-1	1A	109	4
2022	HSS-2022	Aeration Tank No.1A Cleaning Valve No.1 Open/Close Cmd.	DO	Open		1	8	3	W-1	19	105	4
2023	HSS-2023	Aeration Tank No.1A Cleaning Valve No.2 Open/Close Cmd.	DO	Open		1	9	3	W-1	20	105	4
2030	ZC-2030	Aeration Tank 1B Aerobic Zone 2 Flow Ctrl Valve Position FB	AI	0-100%		0	5	2	W-1	1A	106	4
2030	ZI-2030	Aeration Tank 1B Aerobic Zone 2 Flow Ctrl Valve Position Cmd.	AO	0-100%		0	11	2	W-1	7	105	4
2030	YCI-2030	Aeration Tank 1B Aerobic Zone 2 Flow Control Valve In Remote	DI	In Remote		0	15	6	W-1	11	108	4
2031	FIT-2031	Aeration Tank 1B Aerobic Zone 2 Flow	AI	N/A		0	5	4	W-1	1A	112	4
2032	HSS-2032	Aeration Tank No.1B Cleaning Valve No.1 Open/Close Cmd.	DO	Open		1	8	4	W-1	19	106	4
2033	HSS-2033	Aeration Tank No.1B Cleaning Valve No.2 Open/Close Cmd.	DO	Open		1	9	4	W-1	20	106	4
2035-1	AIT-2035-1	Aeration Tank 1B Anoxic Zone 2 DO Monitoring	AI	0-20ppm		0	8	2	W-1	4A	106	4
2035-2	AIT-2035-2	Aeration Tank 1B Anoxic Zone 3 DO Monitoring	AI	0-20ppm		0	9	2	W-1	5A	106	4
2040	ZC-2040	Aeration Tank 1B Aerobic Zone 3 Flow Ctrl Valve Position FB	AI	0-100%		0	6	1	W-1	2A	102	4
2040	ZI-2040	Aeration Tank 1B Aerobic Zone 3 Flow Ctrl Valve Position Cmd.	AO	0-100%		0	12	1	W-1	8	102	4
2040	YCI-2040	Aeration Tank 1B Aerobic Zone 3 Flow Control Valve In Remote	DI	In Remote		1	1	5	W-1	12	107	4
2041	FIT-2041	Aeration Tank 1B Aerobic Zone 3 Flow	AI	N/A		0	6	3	W-1	2A	109	4
2042	HSS-2042	Aeration Tank No.1B Cleaning Valve No.3 Open/Close Cmd.	DO	Open		1	9	5	W-1	20	107	4
2045-1	AIT-2045-1	Aeration Tank 2A Anoxic Zone 3 DO Monitoring	AI	0-20ppm		0	8	3	W-1	4A	109	4
2045-2	AIT-2045-2	Aeration Tank 2A Anoxic Zone 1 DO Monitoring	AI	0-20ppm		0	9	3	W-1	5A	109	4
2051	YFI-2051	Aeration Tank No.2A Zone 1 Mixer Fault	DI	Normal		1	3	1	W-1	14	102	4
2051	YRI-2051	Aeration Tank No.2A Zone 1 Mixer Running	DI	Running		1	3	2	W-1	14	103	4
2051	YCI-2051	Aeration Tank No.2A Zone 1 Mixer In Remote	DI	In Remote		1	3	3	W-1	14	105	4
2051	XA-2051	Aeration Tank No.2A Zone 1 Mixer Common Alarm	DI	Normal		1	3	4	W-1	14	106	4
2051	HSS-2051	Aeration Tank No.2A Zone 1 Start/Stop Cmd.	DO	Start		1	8	2	W-1	19	103	4
2052	YFI-2052	Aeration Tank No.2A Zone 2 Mixer Fault	DI	Normal		1	4	1	W-1	15	102	4
2052	YRI-2052	Aeration Tank No.2A Zone 2 Mixer Running	DI	Running		1	4	2	W-1	15	103	4
2052	YCI-2052	Aeration Tank No.2A Zone 2 Mixer In Remote	DI	In Remote		1	4	3	W-1	15	105	4
2052	XA-2052	Aeration Tank No.2A Zone 2 Mixer Common Alarm	DI	Normal		1	4	4	W-1	15	106	4
2052	HSS-2052	Aeration Tank No.2A Zone 2 Start/Stop Cmd.	DO	Start		1	9	2	W-1	20	103	4
2053	YFI-2053	Aeration Tank No.2A Zone 3 Mixer Fault	DI	Normal		1	5	1	W-1	16	102	4
2053	YRI-2053	Aeration Tank No.2A Zone 3 Mixer Running	DI	Running		1	5	2	W-1	16	103	4
2053	YCI-2053	Aeration Tank No.2A Zone 3 Mixer In Remote	DI	In Remote		1	5	3	W-1	16	105	4
2053	XA-2053	Aeration Tank No.2A Zone 3 Mixer Common Alarm	DI	Normal		1	5	4	W-1	16	106	4
2053	HSS-2053	Aeration Tank No.2A Zone 3 Start/Stop Cmd.	DO	Start		1	10	2	W-1	21	103	4
2055	SI-2055	IR Pump No. 1 VFD Speed FB	AI	0-100%		0	5	8	W-1	1B	106	4
2055	SC-2055	IR Pump No. 1 Speed Cmd.	AO	0-100%		0	11	6	W-1	7	115	4
2055	TAH-2055	Internal Recycle Pump No. 1 Temp High	DI	Normal		0	15	7	W-1	11	110	4
2055	XA-2055-1	Internal Recycle Pump No. 1 Leak	DI	Normal		0	15	8	W-1	11	111	4
2055	YFI-2055	Internal Recycle Pump No. 1 VFD Fault	DI	Normal		0	15	9	W-1	11	112	4
2055	XA-2055-2	Internal Recycle Pump No. 1 Fault	DI	Normal		0	15	10	W-1	11	114	4
2055	YI-2055	Internal Recycle Pump No. 1 VFD Bypass	DI	VFD		0	15	11	W-1	11	115	4
2055	YRI-2055	Internal Recycle Pump No. 1 Running	DI	Running		0	15	12	W-1	11	116	4
2055	YCI-2055	Internal Recycle Pump No. 1 In Auto	DI	In Auto		0	15	13	W-1	11	118	4
2055	HSS-2055	IR Pump No. 1 Start/Stop Cmd.	DO	Start		1	8	13	W-1	19	118	4

LOOP #	TAG	DESCRIPTION	TYPE	RANGE	ALARM LIMIT	RACK	SLOT	CH	DWG	SHT	LINE	P&ID
2060	ZC-2060	Aeration Tank 2A Aerobic Zone 1 Flow Ctrl Valve Position FB	AI	0-100%		0	6	2	W-1	2A	106	4
2060	ZI-2060	Aeration Tank 2A Aerobic Zone 1 Flow Ctrl Valve Position Cmd.	AO	0-100%		0	12	2	W-1	8	106	4
2060	YCI-2060	Aeration Tank 2A Aerobic Zone 1 Flow Control Valve In Remote	DI	In Remote		1	1	6	W-1	12	108	4
2061	FIT-2061	Aeration Tank 2A Aerobic Zone 1 Flow	AI	N/A		0	6	4	W-1	2A	112	4
2062	HSS-2062	Aeration Tank No.2A Cleaning Valve No.1 Open/Close Cmd.	DO	Open		1	8	5	W-1	19	107	4
2063	HSS-2063	Aeration Tank No.2A Cleaning Valve No.2 Open/Close Cmd.	DO	Open		1	9	6	W-1	20	109	4
2070	ZC-2070	Aeration Tank 2B Aerobic Zone 2 Flow Ctrl Valve Position FB	AI	0-100%		0	7	1	W-1	3A	102	4
2070	ZI-2070	Aeration Tank 2B Aerobic Zone 2 Flow Ctrl Valve Position Cmd.	AO	0-100%		0	13	1	W-1	9	102	4
2070	YCI-2070	Aeration Tank 2B Aerobic Zone 2 Flow Control Valve In Remote	DI	In Remote		1	2	5	W-1	13	107	4
2071	FIT-2071	Aeration Tank 2B Aerobic Zone 2 Flow	AI	N/A		0	7	3	W-1	3A	109	4
2072	HSS-2072	Aeration Tank No.2B Cleaning Valve No.1 Open/Close Cmd.	DO	Open		1	8	6	W-1	19	109	4
2073	HSS-2073	Aeration Tank No.2B Cleaning Valve No.2 Open/Close Cmd.	DO	Open		1	8	7	W-1	19	110	4
2080	ZC-2080	Aeration Tank 2B Aerobic Zone 3 Flow Ctrl Valve Position FB	AI	0-100%		0	7	2	W-1	3A	106	4
2080	ZI-2080	Aeration Tank 2B Aerobic Zone 3 Flow Ctrl Valve Position Cmd.	AO	0-100%		0	13	2	W-1	9	105	4
2080	YCI-2080	Aeration Tank 2B Aerobic Zone 3 Flow Control Valve In Remote	DI	In Remote		1	2	6	W-1	13	108	4
2081	FIT-2081	Aeration Tank 2B Aerobic Zone 3 Flow	AI	N/A		0	7	4	W-1	3A	112	4
2082	HSS-2082	Aeration Tank No.2B Cleaning Valve No.3 Open/Close Cmd.	DO	Open		1	9	7	W-1	20	110	4
2085-1	AIT-2085-1	Aeration Tank 2B Anoxic Zone 2 DO Monitoring	AI	0-20ppm		0	8	4	W-1	4A	112	4
2085-2	AIT-2085-2	Aeration Tank 2B Anoxic Zone 3 DO Monitoring	AI	0-20ppm		0	9	4	W-1	5A	112	4
2095	SI-2095	IR Pump No. 1 VFD Speed FB	AI	N/A		0	6	8	W-1	2B	106	4
2095	SC-2095	IR Pump No. 2 Speed Cmd.	AO	0-100%		0	12	6	W-1	8	115	4
2095	TAH-2095	Internal Recycle Pump No. 2 Temp High	DI	Normal		1	1	7	W-1	12	110	4
2095	XA-2095-1	Internal Recycle Pump No. 2 Leak	DI	Normal		1	1	8	W-1	12	111	4
2095	YFI-2095	Internal Recycle Pump No. 2 VFD Fault	DI	Normal		1	1	9	W-1	12	112	4
2095	XA-2095-2	Internal Recycle Pump No. 2 Fault	DI	Normal		1	1	10	W-1	12	114	4
2095	YI-2095	Internal Recycle Pump No. 2 VFD Bypass	DI	VFD		1	1	11	W-1	12	115	4
2095	YRI-2095	Internal Recycle Pump No. 2 Running	DI	Running		1	1	12	W-1	12	116	4
2095	YCI-2095	Internal Recycle Pump No. 2 In Remote	DI	In Remote		1	1	13	W-1	12	118	4
2095	HSS-2095	IR Pump No. 2 Start/Stop Cmd.	DO	Start		1	9	13	W-1	20	118	4
3010	WAH-3010	Secondary Clarifier No. 1 High Torque Warning	DI	Normal		1	3	5	W-1	14	107	6
3010	WAHH-3010	Secondary Clarifier No. 1 High High Torque Shutdown	DI	Normal		1	3	6	W-1	14	108	6
3010	YFI-3010	Secondary Clarifier No. 1 Fault	DI	Normal		1	3	7	W-1	14	110	6
3010	YCI-3010	Secondary Clarifier No. 1 In Auto	DI	In Auto		1	3	8	W-1	14	111	6
3010	YRI-3010	Secondary Clarifier No. 1 Running	DI	Running		1	3	9	W-1	14	112	6
3010	HSS-3010	Secondary Clarifier No. 1 Start/Stop Cmd.	DO	Start		1	8	8	W-1	19	111	6
3020	WAH-3020	Secondary Clarifier No. 2 High Torque Warning	DI	Normal		1	4	5	W-1	15	107	6
3020	WAHH-3020	Secondary Clarifier No. 2 High High Torque Shutdown	DI	Normal		1	4	6	W-1	15	108	6
3020	YFI-3020	Secondary Clarifier No. 2 Fault	DI	Normal		1	4	7	W-1	15	110	6
3020	YCI-3020	Secondary Clarifier No. 2 In Auto	DI	In Auto		1	4	8	W-1	15	111	6
3020	YRI-3020	Secondary Clarifier No. 2 Running	DI	Running		1	4	9	W-1	15	112	6
3020	HSS-3020	Secondary Clarifier No. 2 Start/Stop Cmd.	DO	Start		1	9	8	W-1	20	111	6
3110	WAH-3110	Gravity Thickener No. 1 High Torque Warning	DI	Normal		1	3	10	W-1	14	114	7
3110	WAHH-3110	Gravity Thickener No. 1 High High Torque Shutdown	DI	Normal		1	3	11	W-1	14	115	7
3110	YFI-3110	Gravity Thickener No. 1 Fault	DI	Normal		1	3	12	W-1	14	116	7
3110	YCI-3110	Gravity Thickener No. 1 In Auto	DI	In Auto		1	3	13	W-1	14	118	7
3110	YRI-3110	Gravity Thickener No. 1 Running	DI	Running		1	3	14	W-1	14	119	7
3110	HSS-3110	Gravity Thickener No. 1 Start/Stop Cmd.	DO	Start		1	8	9	W-1	19	113	7
3110	HSS-3120	Gravity Thickener No. 2 Start/Stop Cmd.	DO	Start		1	9	9	W-1	20	113	7
3120	WAH-3120	Gravity Thickener No. 2 High Torque Warning	DI	Normal		1	4	10				

LOOP #	TAG	DESCRIPTION	TYPE	RANGE	ALARM LIMIT	RACK	SLOT	CH	DWG	SHT	LINE	P&ID
3210	SI-3210	RAS Pump No. 1 Speed FB	AI	0-100%		0	5	5	W-1	1A	116	11
3210	SC-3210	RAS Pump No. 1 Speed Cmd	AO	0-100%		0	11	3	W-1	7	108	11
3210	YFI-3210	RAS Pump No. 1 Fault	DI	Normal		1	5	5	W-1	16	107	11
3210	XA-3210	RAS Pump No. 1 Common Alarm	DI	Normal		1	5	6	W-1	16	108	11
3210	YRI-3210	RAS Pump No. 1 Running	DI	Running		1	5	7	W-1	16	110	11
3210	YCI-3210	RAS Pump No. 1 In Auto	DI	In Auto		1	5	8	W-1	16	111	11
3210	HSS-3210	RAS Pump No. 1 Start/Stop Cmd	DO	Start		1	8	10	W-1	19	114	11
3220	SI-3220	RAS Pump No. 2 Speed FB	AI	0-100%		0	6	5	W-1	2A	116	11
3220	SC-3220	RAS Pump No. 2 Speed Cmd	AO	0-100%		0	12	3	W-1	8	108	11
3220	YFI-3220	RAS Pump No. 2 Fault	DI	Normal		1	6	6	W-1	17	108	11
3220	XA-3220	RAS Pump No. 2 Common Alarm	DI	Normal		1	6	7	W-1	17	110	11
3220	YRI-3220	RAS Pump No. 2 Running	DI	Running		1	6	8	W-1	17	111	11
3220	YCI-3220	RAS Pump No. 2 In Auto	DI	In Auto		1	6	9	W-1	17	112	11
3220	HSS-3220	RAS Pump No. 2 Start/Stop Cmd	DO	Start		1	9	10	W-1	20	114	11
3230	SI-3230	RAS Pump No. 3 Speed FB	AI	0-100%		0	7	5	W-1	3A	116	11
3230	SC-3230	RAS Pump No. 3 Speed Cmd	AO	0-100%		0	13	3	W-1	9	108	11
3230	YFI-3230	RAS Pump No. 3 Fault	DI	Normal		1	7	5	W-1	18	107	11
3230	XA-3230	RAS Pump No. 3 Common Alarm	DI	Normal		1	7	6	W-1	18	108	11
3230	YRI-3230	RAS Pump No. 3 Running	DI	Running		1	7	7	W-1	18	110	11
3230	YCI-3230	RAS Pump No. 3 In Auto	DI	In Auto		1	7	8	W-1	18	111	11
3230	HSS-3230	RAS Pump No. 3 Start/Stop Cmd	DO	Start		1	10	3	W-1	21	105	11
3233	FIT-3233	RAS to Aeration Tank 2A Flow	AI	100-1000gpm		0	5	7	W-1	1B	102	11
3235	FIT-3235	RAS to Aeration Tank 1A Flow	AI	100-1000gpm		0	6	7	W-1	2B	102	11
3240	SI-3240	WAS Pump No. 1 Speed FB	AI	0-100%		0	5	6	W-1	1A	119	11
3240	SC-3240	WAS Pump No. 1 Speed Cmd	AO	0-100%		0	11	4	W-1	7	110	11
3240	YFI-3240	WAS Pump No. 1 Fault	DI	Normal		1	5	9	W-1	16	112	11
3240	XA-3240	WAS Pump No. 1 Common Alarm	DI	Normal		1	5	10	W-1	16	114	11
3240	YRI-3240	WAS Pump No. 1 Running	DI	Running		1	5	11	W-1	16	115	11
3240	YCI-3240	WAS Pump No. 1 In Auto	DI	In Auto		1	5	12	W-1	16	116	11
3240	HSS-3240	WAS Pump No. 1 Start/Stop Cmd	DO	Start		1	8	11	W-1	19	115	11
3250	SI-3250	WAS Pump No. 2 Speed FB	AI	0-100%		0	6	6	W-1	2A	119	11
3250	SC-3250	WAS Pump No. 2 Speed Cmd	AO	0-100%		0	12	4	W-1	8	110	11
3250	YFI-3250	WAS Pump No. 2 Fault	DI	Normal		1	6	10	W-1	17	114	11
3250	XA-3250	WAS Pump No. 2 Common Alarm	DI	Normal		1	6	11	W-1	17	115	11
3250	YRI-3250	WAS Pump No. 2 Running	DI	Running		1	6	12	W-1	17	116	11
3250	YCI-3250	WAS Pump No. 2 In Auto	DI	In Auto		1	6	13	W-1	17	118	11
3250	HSS-3250	WAS Pump No. 2 Start/Stop Cmd	DO	Start		1	9	11	W-1	20	115	11
3255	FIT-3255	WAS Flow	AI	40-400gpm		0	7	7	W-1	3B	102	11
3256	LSHH-3256	RAS and WAS Flood Alarm	DI	Normal		1	2	7	W-1	13	110	11
4250	YFI-4250	Backwash Air Blower No. 1 Fault	DI	Normal		1	2	10	W-1	13	114	10
4250	PSH-4250	Backwash Air Blower No. 1 Pressure High	DI	Normal		1	2	11	W-1	13	115	10
4250	PSL-4250	Backwash Air Blower No. 1 Pressure Low	DI	Normal		1	2	12	W-1	13	117	10
4250	YCI-4250	Backwash Air Blower No. 1 In Remote	DI	In Remote		1	2	13	W-1	13	118	10
4250	YRI-4250	Backwash Air Blower No. 1 Running	DI	Running		1	2	14	W-1	13	120	10
4250	HSS-4250	Backwash Air Blower No. 1 Start/Stop Command	DO	Start		1	8	15	W-1	20	121	10
6010	YCI-6010	Polymer Pump No. 1 In Remote	DI	In Remote		1	5	13	W-1	16	118	13
6010	SC-6010	Polymer Pump No. 1 Speed Command	AO	0-100%		0	11	5	W-1	7	113	13
6010	HSS-6010	Polymer Pump No. 1 Start/Stop Command	DO	Start		1	8	12	W-1	20	117	13
6020	YCI-6020	Polymer Pump No. 2 In Remote	DI	In Remote		1	6	14	W-1	17	119	13
6020	SC-6020	Polymer Pump No. 2 Speed Command	AO	0-100%		0	12	5	W-1	8	113	13
6020	HSS-6020	Polymer Pump No. 2 Start/Stop Command	DO	Start		1	9	12	W-1	21	117	13
7000	XA-A-7000	Generator Trouble Alarm	DI	Normal		1	7	9	W-1	18	113	17
7000	XA-B-7000	Generator Shutdown Alarm	DI	Normal		1	7	10	W-1	18	114	17
7000	YRI-7000	Generator Running	DI	Normal		1	7	11	W-1	18	115	17
7005	HS-7005	Generator Emergency Stop Status	DI	Normal		1	7	12	W-1	18	117	17
7010	YI-A-7010	ATS Utility Power	DI	Utility Power		1	7	13	W-1	18	119	17
7010	YI-B-7010	ATS Generator Power	DI	Normal		1	7	14	W-1	18	120	17
7031	YFI-7031	STCP-01 Managed Ethernet Switch Fault	DI	Normal		1	2	9	W-1	13	112	17
7050	FS-7050	Eyewash Station Activation Alarm	DI	Normal		1	2	8	W-1	13	111	17

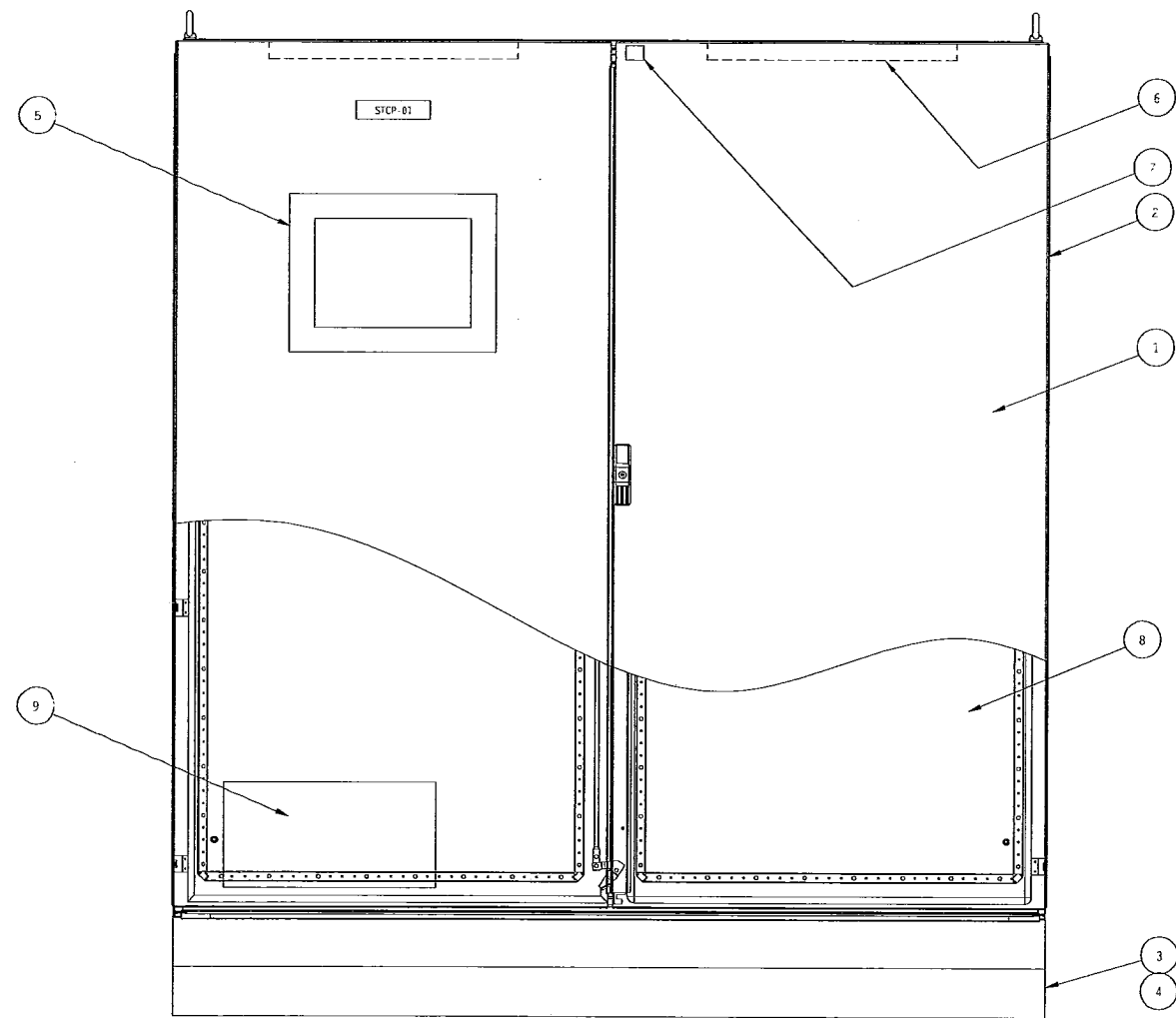
AS-BUILT

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

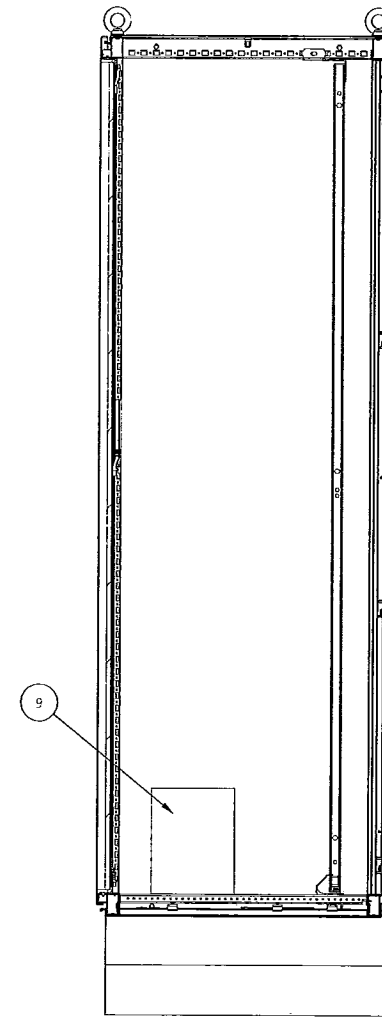
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Loop Index			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:
	CGN	JPM	JPM
DATE:	SHEET	OF SHEETS	DRAWING NO.
01/18/10	2	2	0904018-L1

ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
1	Rittal	1	TS 8901.270	Enclosure, NEMA 12, 71"H x 70.5" W x 24" D TS Type
2	Rittal	1	8186.235	Cabinet Side Wall
3	Rittal	1	8901.930	Cabinet F/R Base 8"
4	Rittal	1	8602.060	Cabinet Side Base 8"
5	Industrial Computing	1	PM-P-15	Industrial PC
6	Lightolier	2	TSL 0028 W BPR	Interior Cabinet Lighting
7	Rittal	1	PS 4127.000	Door Light Switch
8	Cortec	1	VpCI-110	Corrosion inhibitor
9	APC	1	SMT1500	Smart UPS 1500VA, 120VAC



Front View



Right Side View

LINE #	LINE #1	ENGRAVING TEXT	SIZE	TEXT SIZE
1	STCP-01		1 1/2" X 6"	5/8"

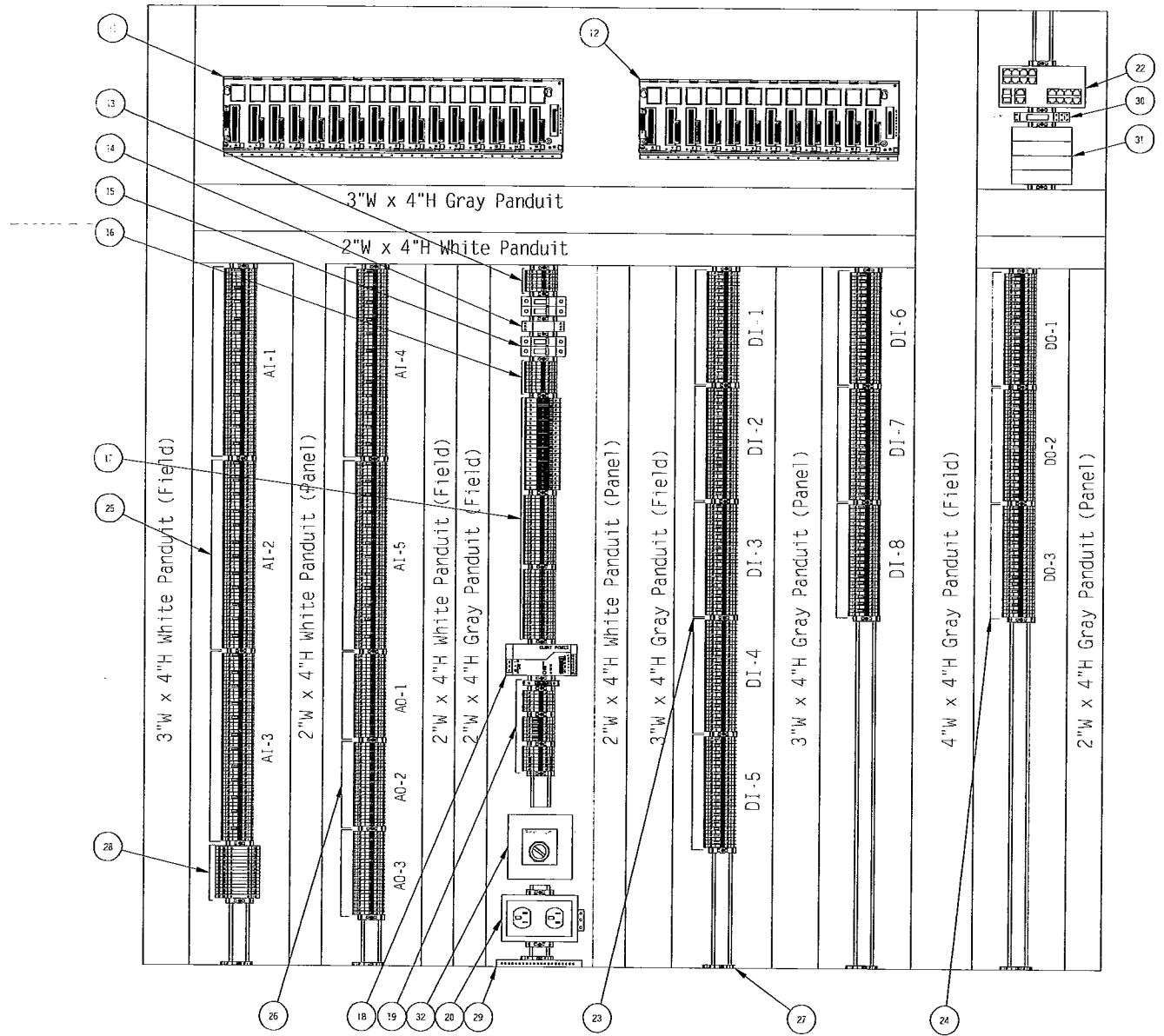
Notes:

- Lamacoards engraved using white letters on black background.
- Standard size lamacoards have beveled front edges.
- Lamacoards have adhesive back side.
- Standard letter heights are 3/16" and 5/16"
- Letter height adjustable from 3/16" to 9/16" as needed.

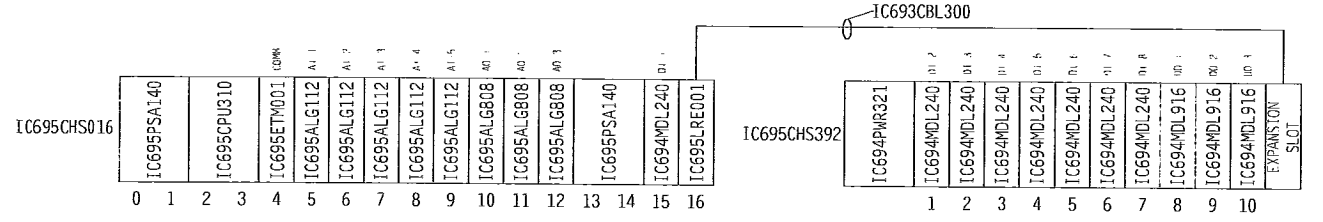
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Exterior Panel Layout			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 1	OF SHEETS 2	DRAWING NO. 0904018-A1



Front View



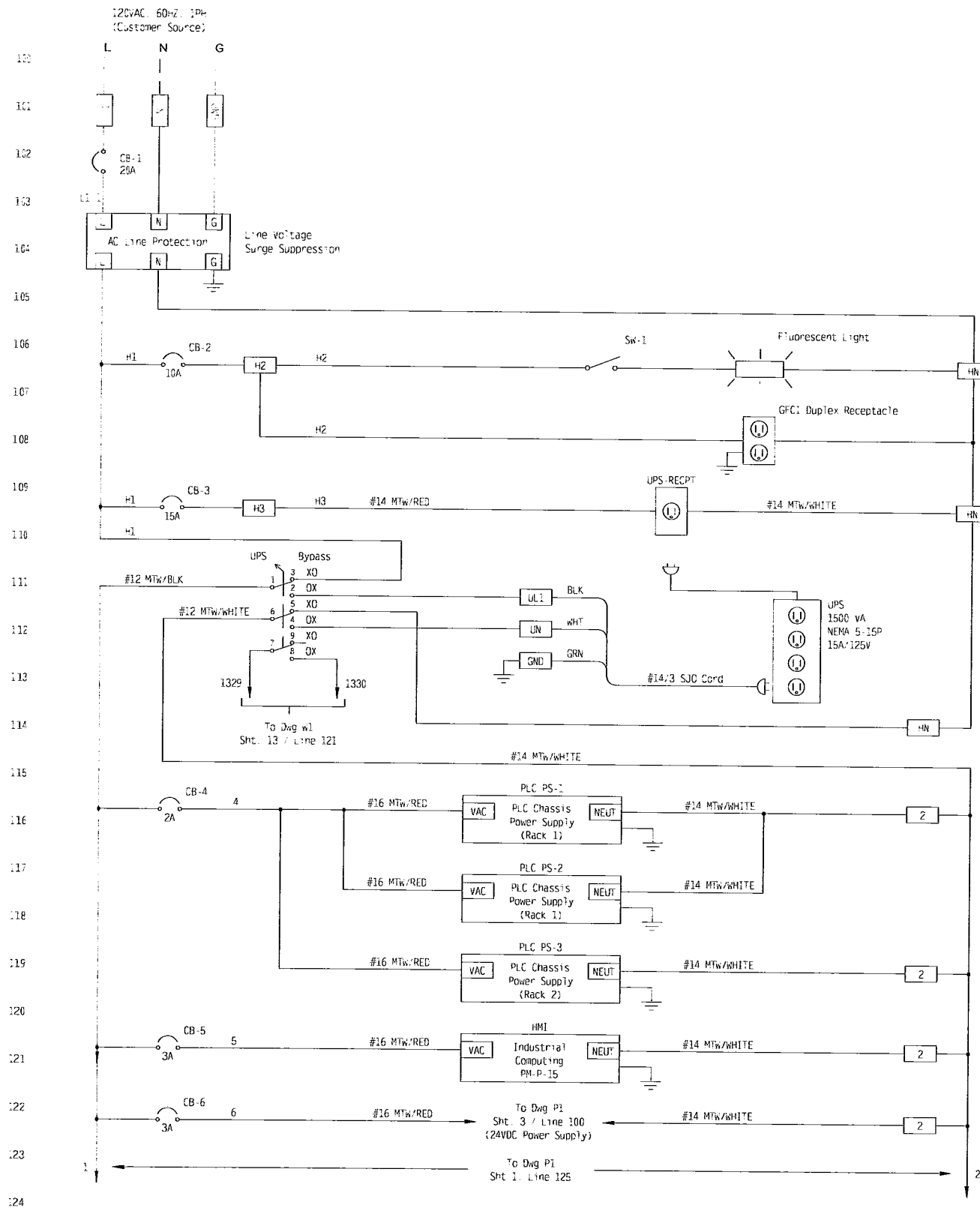
AS-BUILT

ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
11	General Electric	1	IC 695CHS016	RX3i Main CPU Rack
		1	IC 695PSA040	16 Slot Chassis
		1	IC 695CPU310	Power Supplies
		1	IC695ETM001	RX3i CPU
		1	IC695ALG112	Ethernet/IP Module
		5	IC695ALG112	12pt Analog Input Module
		3	IC695ALG808	8pt Analog Output Module
		1	IC694MDL240	16pt 120VAC Digital Input Module
		1	IC695LRE001	Local Expansion Module
		1	IC693CBL300	Expansion Rack Communication Cable
12	General Electric	1	IC 694CHS392	RX3i Expansion Rack
		1	IC 694PWR321	10 Slot Expansion Chassis
		7	IC694MDL240	Power Supply
		3	IC694MDL916	16pt 120VAC Digital Input Module
		3	IC694MDL916	16pt Digital Output Relay Module
13	Phoenix Contact	4	30 46 18 4	Incoming Power Distribution (UPS+Non-UPS)
		2	30 46 20 7	UT 4-MTD Feed Through Terminal Block
14	Phoenix Contact	1	28 56 81 2	UT 4-MTD-PE/S Grounding Terminal Block
15	Allen-Bradley	2	1489-A1C-200	120VAC Surge Suppressor (26 Amp)
		1	1489-A1C-100	Circuit Breakers for 120VAC Power Distribution
		1	1489-A1C-150	20A Circuit Breakers (CB-1, CB-UPS)
				10A Circuit Breakers (CB-2)
				15A Circuit Breakers (CB-3)
16	Phoenix Contact	8	30 46 18 4	Terminal Blocks for 120VAC for Primary Distribution
		1	30 46 20 7	UT 4-MTD Feed Through Terminal Block
				UT 4-MTD-PE/S Grounding Terminal Block
17	Phoenix Contact	30	07 12 21 7	Circuit Breakers for 120VAC Power Distribution
		2	07 12 23 3	TCP 2A Miniature Circuit Breaker, 2 Amp, CB's 4, 5, 7-35
		2	31 18 20 3	TCP 3A Miniature Circuit Breaker, 3 Amp, CB 5,6
		20	30 46 18 4	UK 6-FSI/C Circuit Breaker Base
		20	30 46 20 7	UT 4-MTD Feed Through Terminal Block (Neutral)
				UT 4-MTD-PE/S Grounding Terminal Block
18	Phoenix Contact	2	29 38 57 8	24VDC Power Supply, 2.5A, Quint-PS-100-240AC-24DC-2.5
19	Phoenix Contact	1	07 12 23 3	Terminal Blocks for 24VDC Distribution
		1	31 18 20 3	TCP 3A Miniature Circuit Breaker, 3 Amp (CB-51)
		6	30 46 09 0	UK 6-FSI/C Circuit Breaker Base
		11	30 46 18 4	UT 4-HESILA Indicating Fused Terminal Block 24VDC
				UT 4-MTD Feed Through Terminal Block
20	Phoenix Contact	1	56 00 46 2	Convenience Receptacle w/GFCI EM-DUO
21	Phoenix Contact	Lot	08 00 88 5	End Retainers E/NE 35 N
22	Sixnet	1	SLX-18MG-1	Industrial Ethernet Managed Switch
		2	GM-FIBER-SFP-500	Industrial Ethernet Gigabit Fiber Transceivers
23	Phoenix Contact	128	30 46 10 0	Terminal Blocks for Digital Inputs
		128	30 46 18 4	UT 4-HESILA 250 Indicating Fused Terminal Block 120VAC
				UT 4-MTD Feed Through Terminal Block
24	Phoenix Contact	48	30 46 10 0	Terminals for Digital Outputs
		48	30 46 18 4	UT 4-HESILA 250 Indicating Fused Terminal Block 120VAC
				UT 4-MTD Feed Through Terminal Block
25	Phoenix Contact	60	30 46 14 2	Terminal Blocks for Analog Inputs
		Lot	30 36 81 9	UT4-TG Fused Terminal
		180	30 46 18 4	P-FU 5x20 LED 24 Fuse Plug (qty as shown on drawings)
		30	30 46 20 7	UT4-MTD Terminal Block
				UT4-MTD-PE/S
26	Phoenix Contact	48	30 46 18 4	Terminal Blocks for Analog Outputs
		12	30 46 20 7	UT4-MTD Terminal Block
				UT4-MTD-PE/S
27	Phoenix Contact	Lot	30 46 20 7	Din Rail Bonding Terminals
				UT4-MTD PE/S Grounding Terminals
28	Phoenix Contact	19	28 38 18 6	Surge Suppression 24VDC/Analog
				TT-2PE-24DC
29	General Electric	1	N/A	24 Position Ground Bar
30	Phoenix Contact	1	28 34 48 1	24VDC UPS Relay PR1-RSC3-LDP-24DC/2x21, MES1
31	Sixnet	4	SL-2ES-25C	Fiber to Copper Converter, SC to RJ45
32	Electroswitch	1	101603A-2A	Snap action switch, 20A continuous, 3 pole, including "UPS\Bypass" faceplate, in 4 x 4 Carlin Box

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

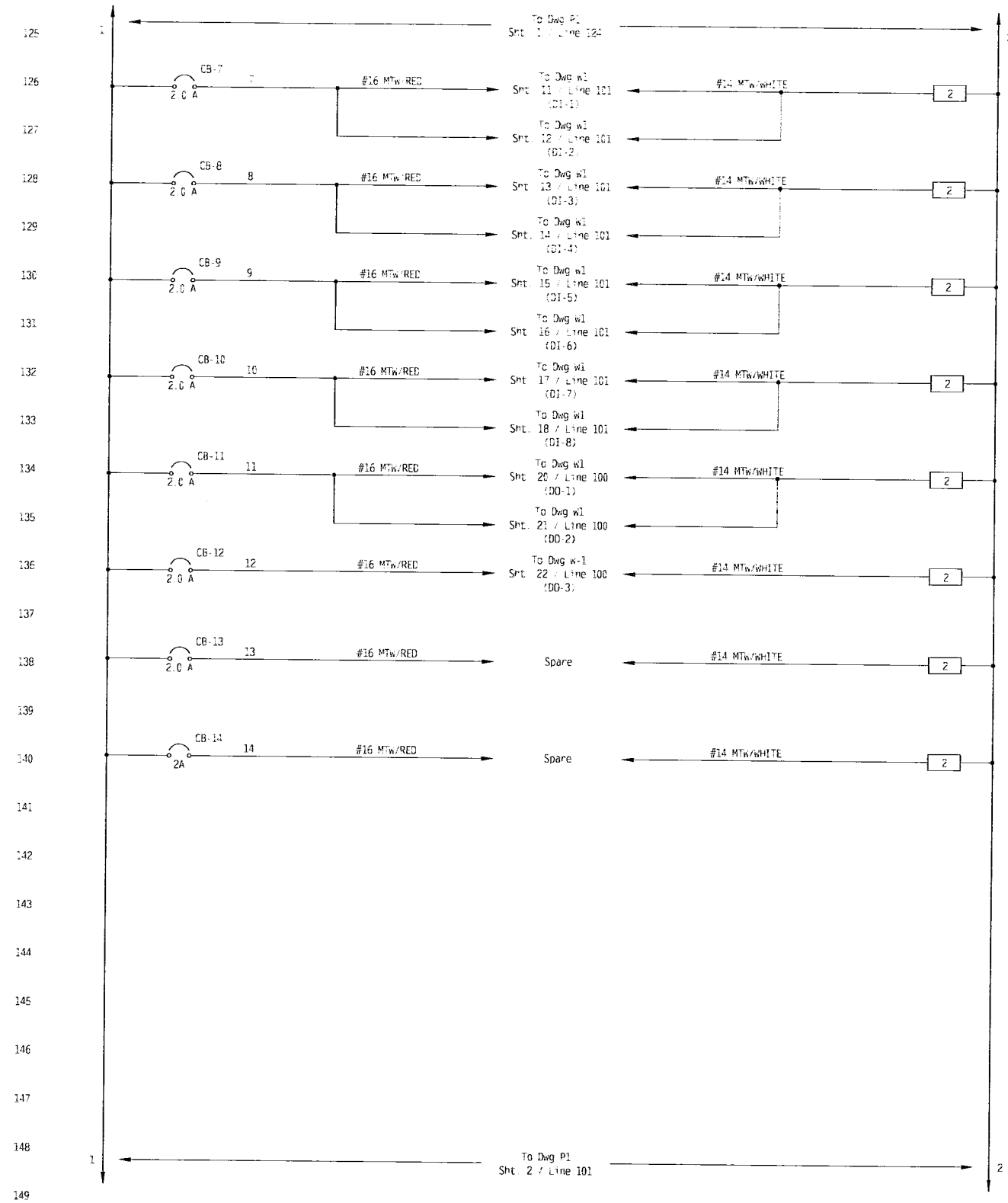
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Interior Layout			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY:	CHECKED BY:	APPROVED BY:
	CGN	JPM	JPM
DATE:	SHEET	OF SHEETS	DRAWING NO.
01/18/10	2	2	0904018-A1



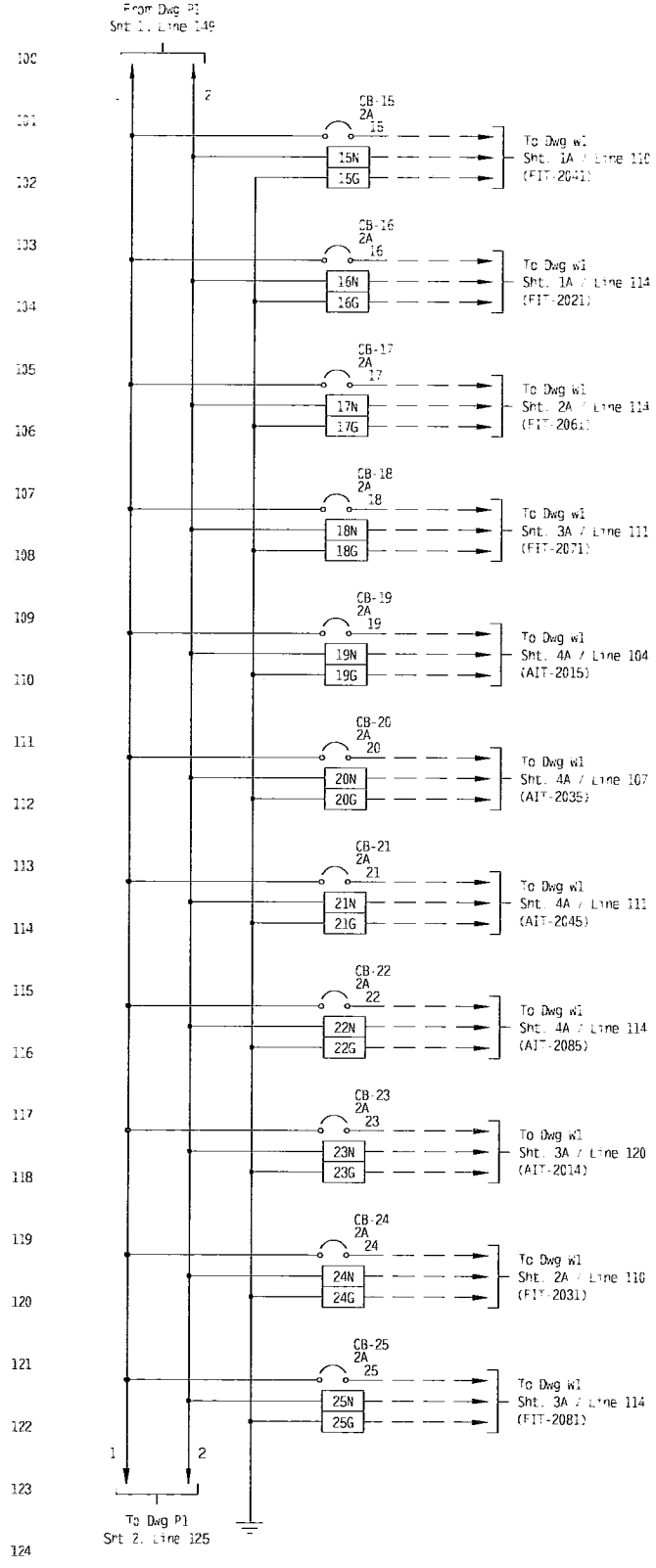
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 PANEL WIRING ————

AS BUILT

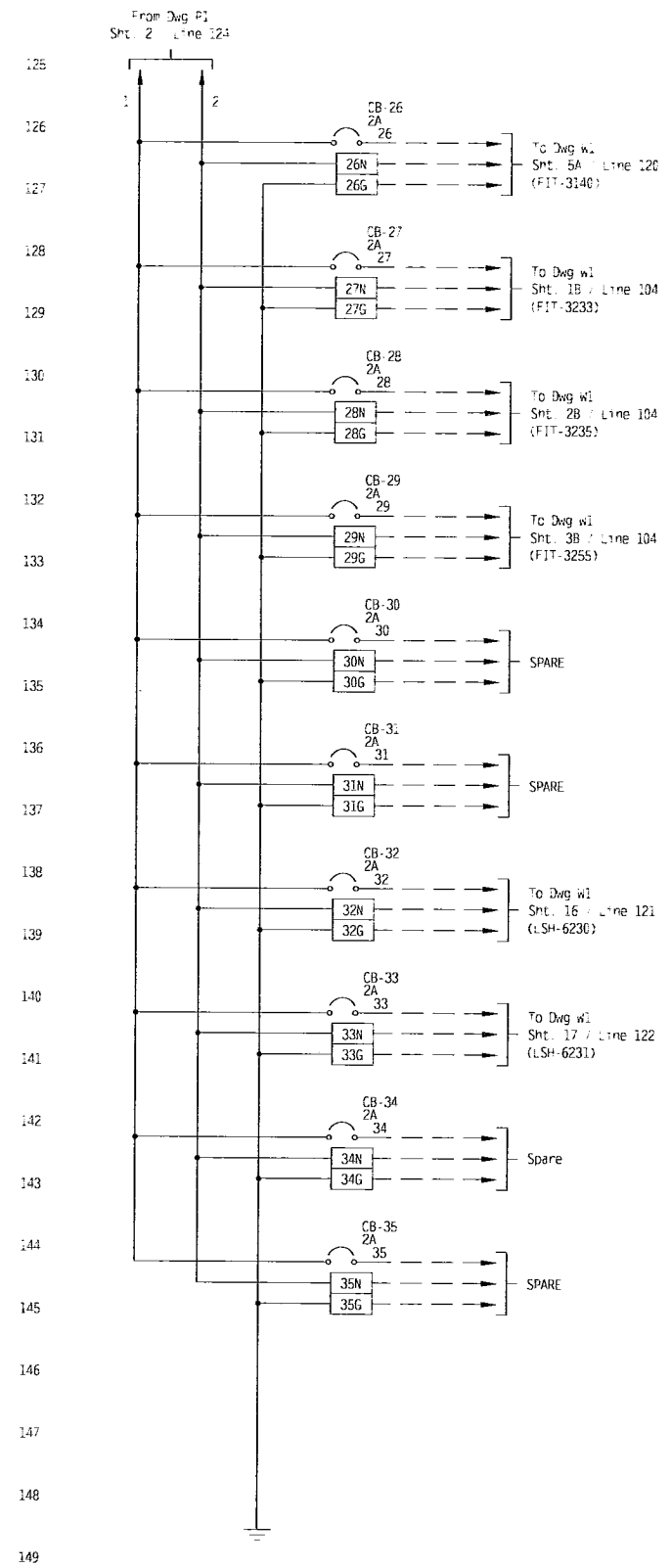


REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702			
TITLE: Secondary Treatment Control Panel #1 (STCP-01) Power Distribution		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 1	OF SHEETS 3	DRAWING NO. 0904018-P1

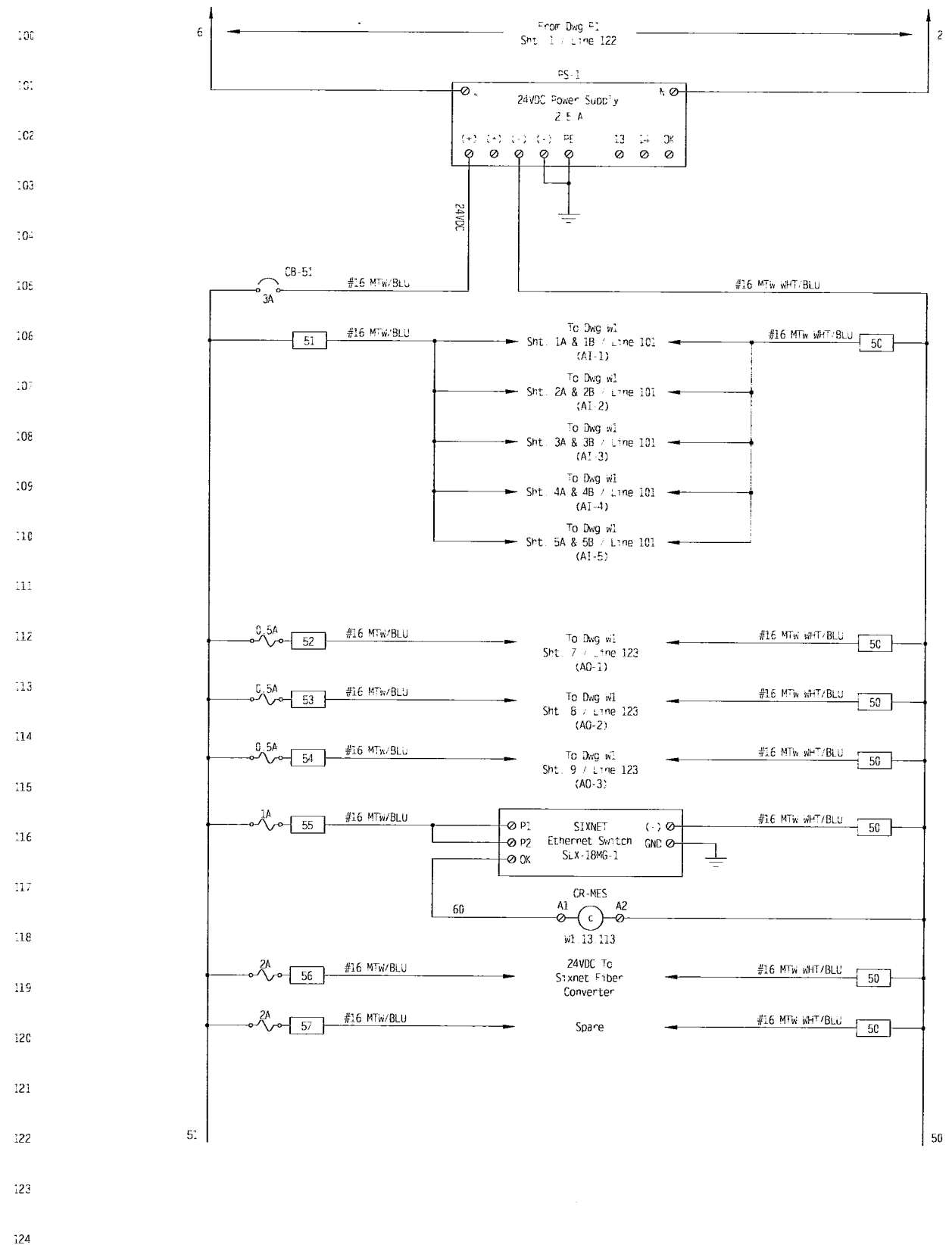


KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -



REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates			
478 West Main Street Waterbury, CT 06702			
TITLE: Secondary Treatment Control Panel #1 (STCP-01) Power Distribution			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 2	OF SHEETS 3	DRAWING NO. 0904018-P1



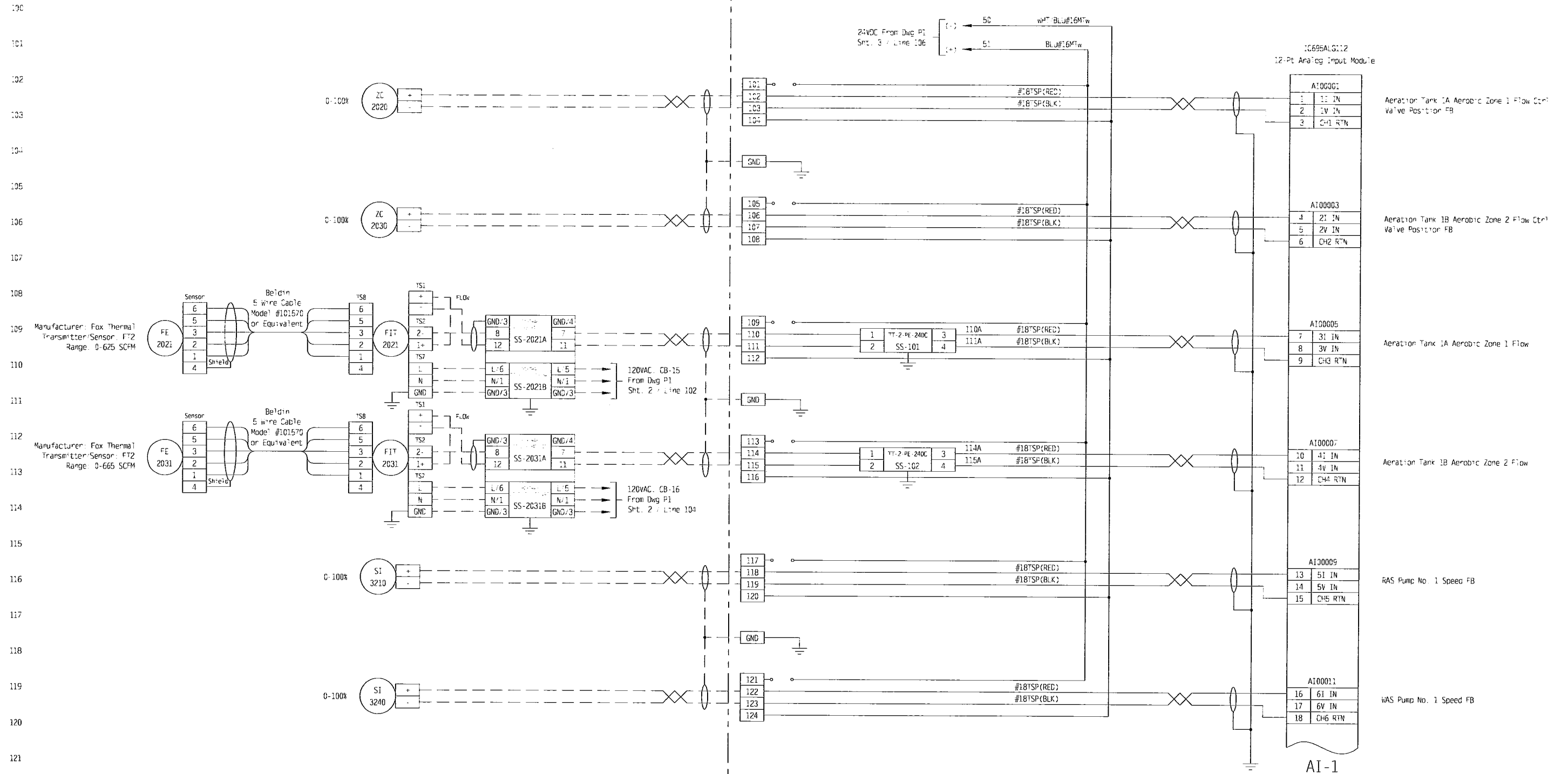
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7	8/10/11	As Built Revised	CGN
6	04/16/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
 478 West Main Street
 Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Power Distribution			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPRO BY: JPM
DATE: 01/18/10	SHEET 3	OF SHEETS 3	DRAWING NO. 0904018-P1

Field Devices

Cabinet Devices



AS-BUILT

KEY:
 FIELD WIRING - - - - -
 PANEL WIRING - - - - -

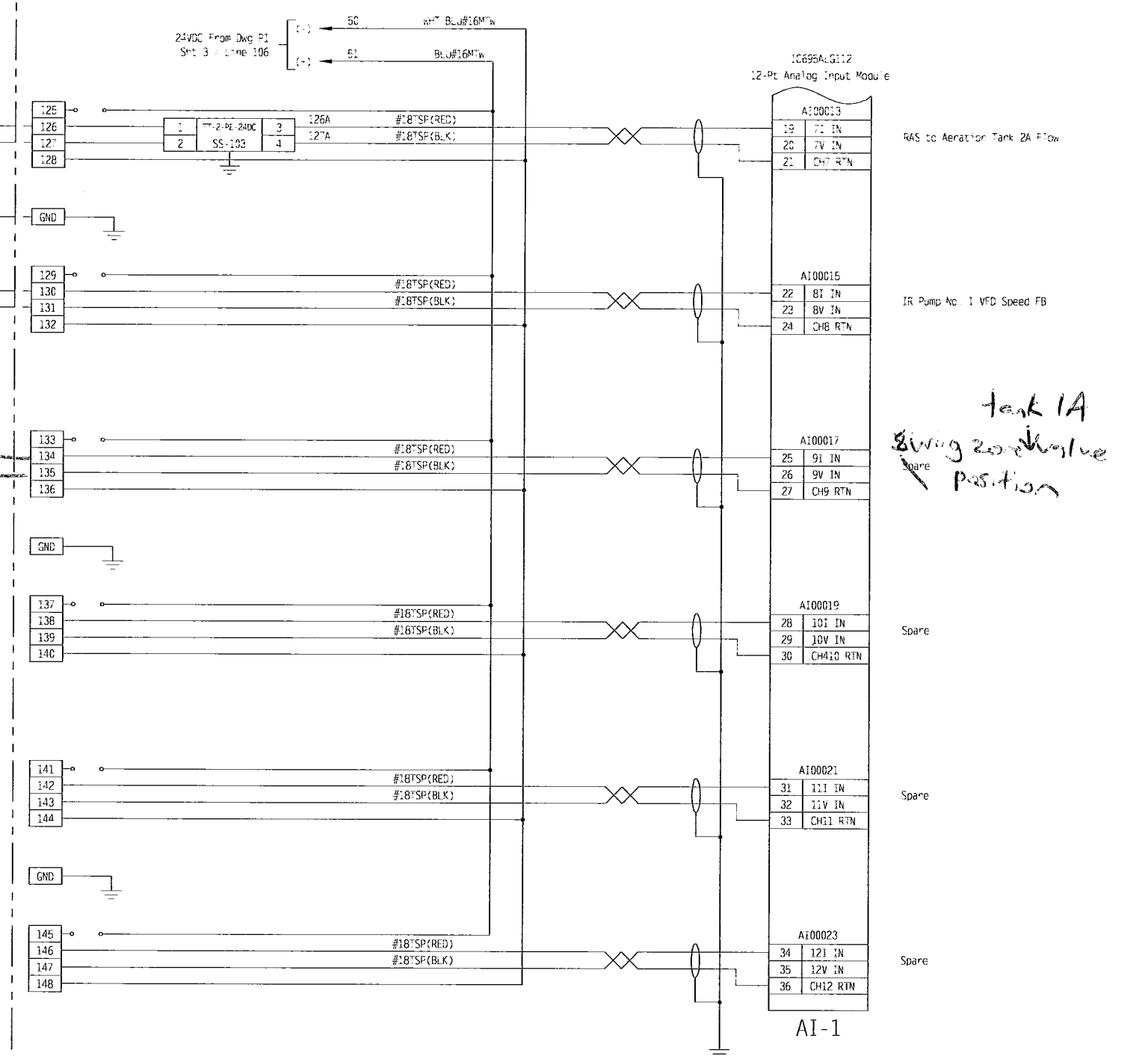
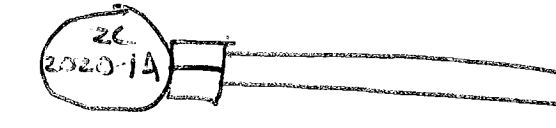
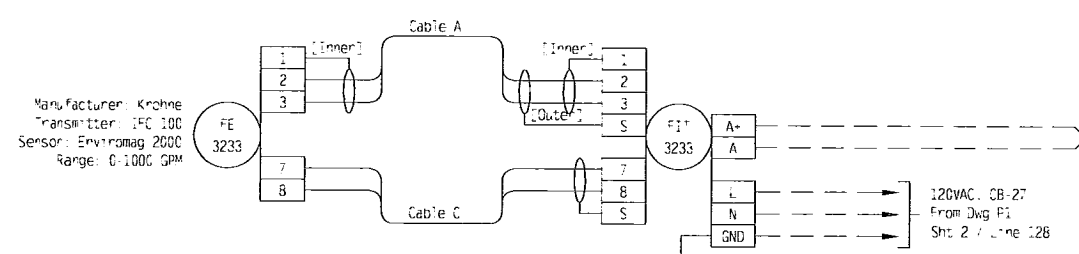
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Input #1	
PROJECT: Stafford Springs Water Pollution Control Upgrade		SCALE: CGN	DRAWN BY: JPM CHECKED BY: JPM APP'D BY: JPM
DATE: 01/18/10	SHEET: 1A	OF SHEETS: 22	DRAWING NO: 0904018-W1

Field Devices

Cabinet Devices

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Handwritten: Tank 1A
Sizing 2000 valve
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AS-BUILT

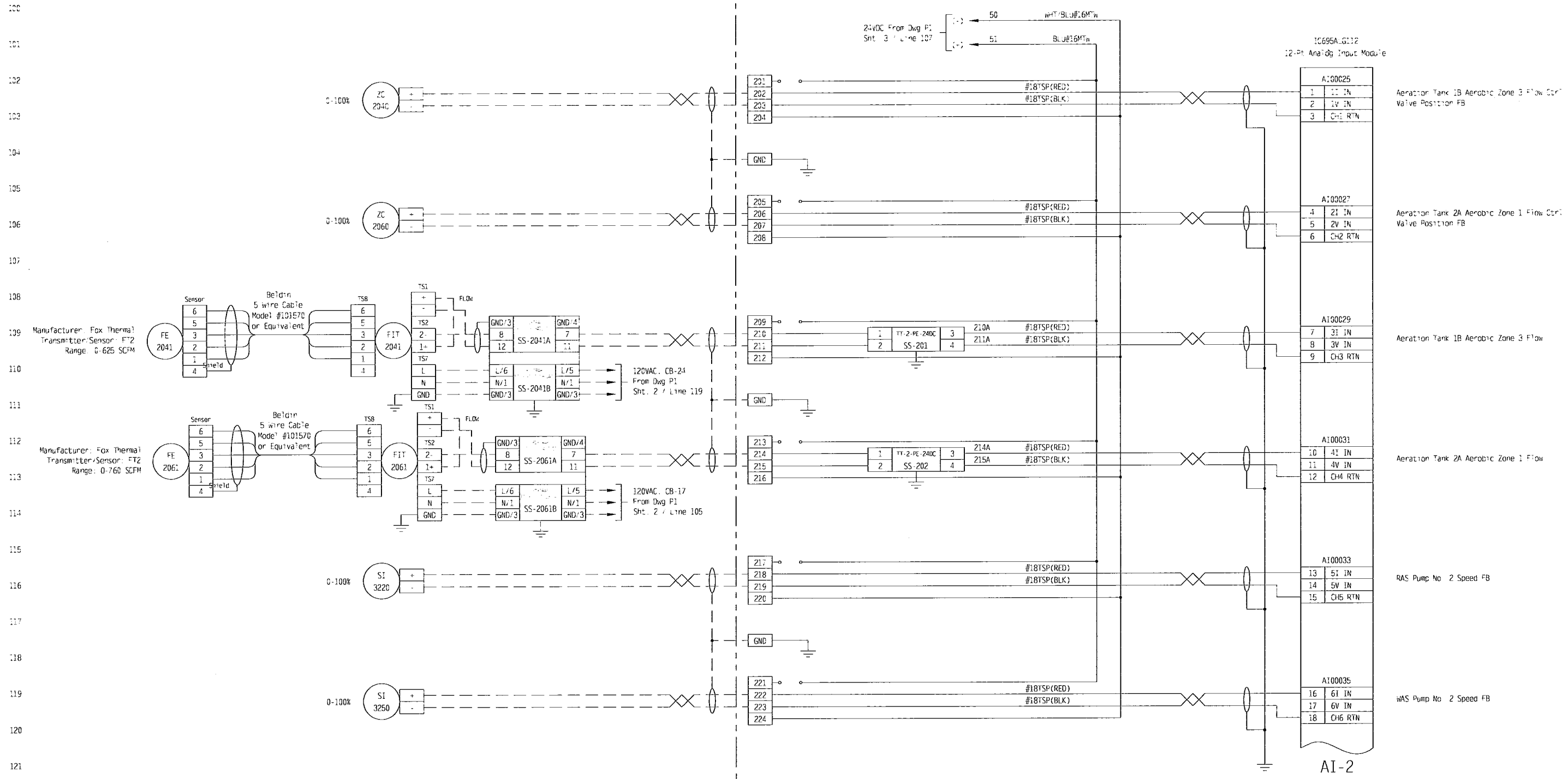
KEY:
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PANEL WIRING

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Input #1 PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROV BY: JPM
DATE: 01/18/10	SHEET 1B	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

Cabinet Devices



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KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/16/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

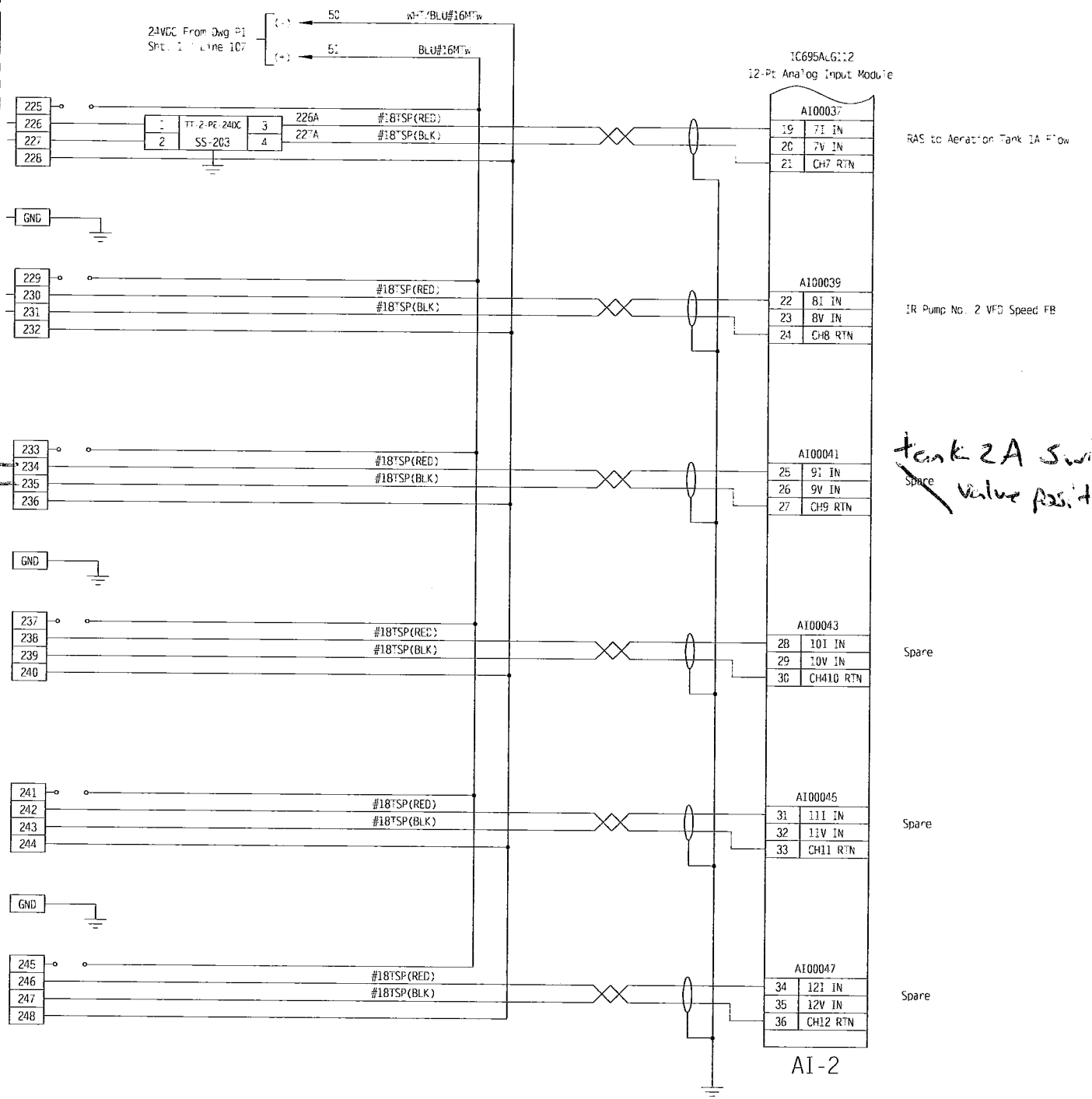
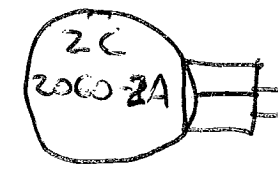
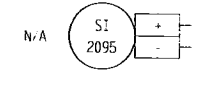
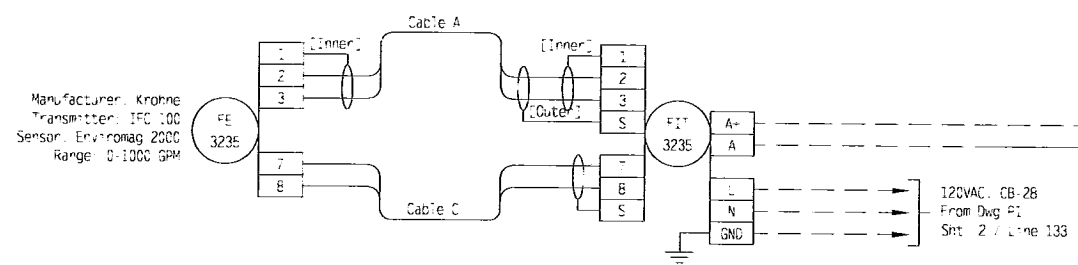
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PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 2A	OF SHEETS 22	DRAWING NO. 0904018-W1

NOT TO SCALE

Field Devices

Cabinet Devices

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Handwritten note: Tank 2A Swing Valve Position

AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING _____

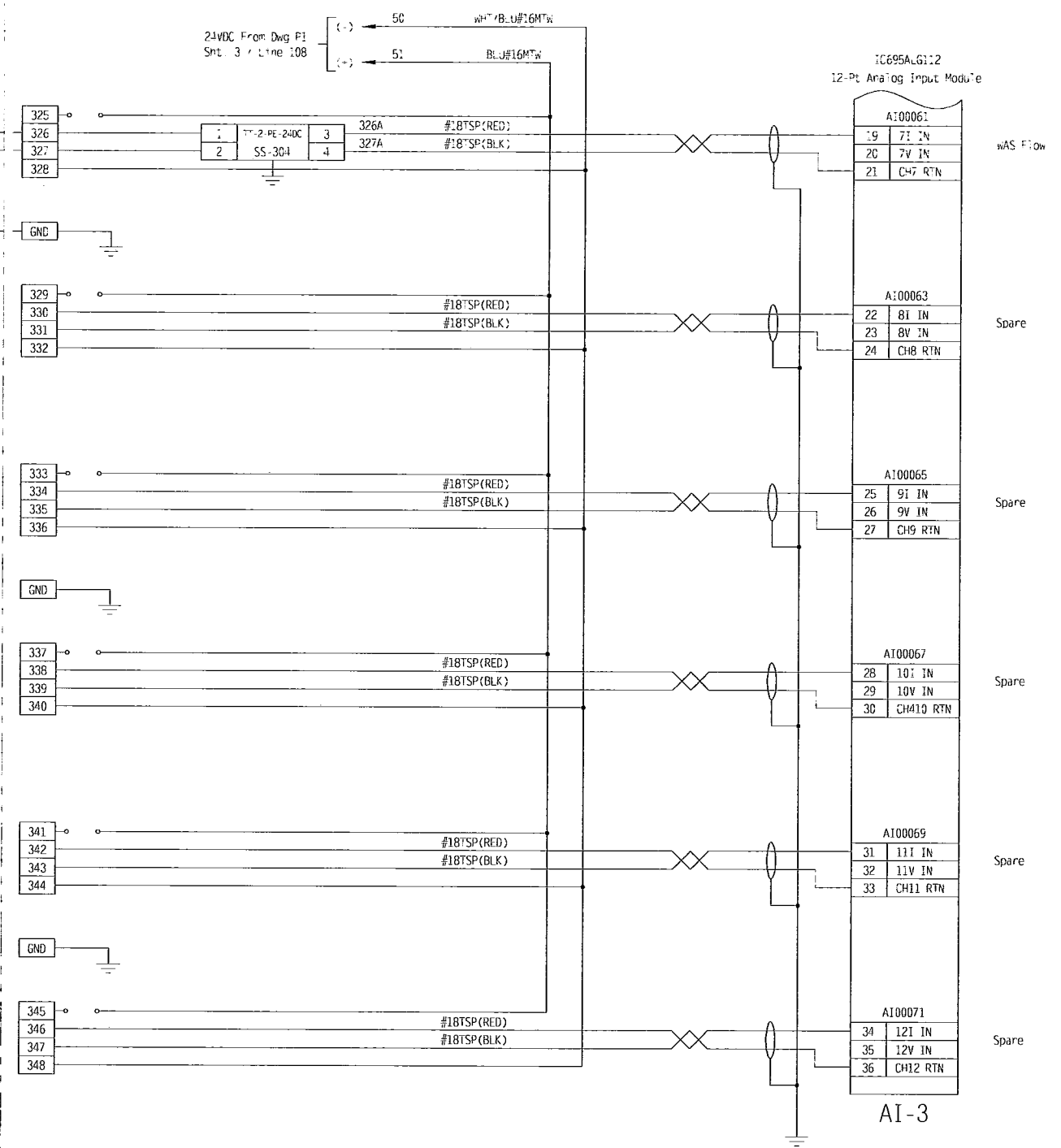
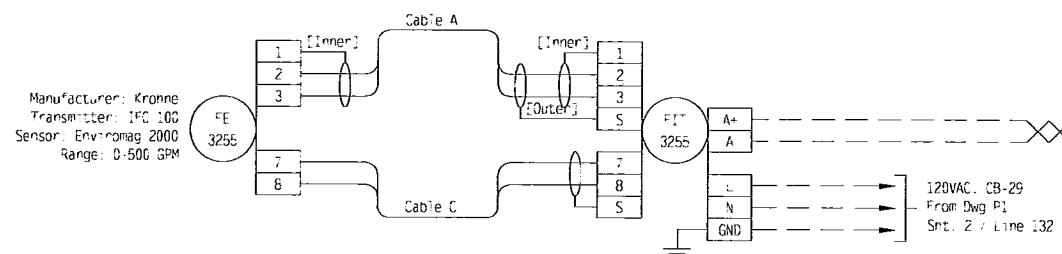
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Input #2 PROJECT: Stafford Springs Water Pollution Control Upgrade
SCALE: CGN	DRAWN BY: JPM	CHECKED BY: JPM
DATE: 01/18/10	SHEET 2B	OF SHEETS 22
DRAWING NO: 0904018-W1		APP'D BY: JPM

Field Devices

Cabinet Devices

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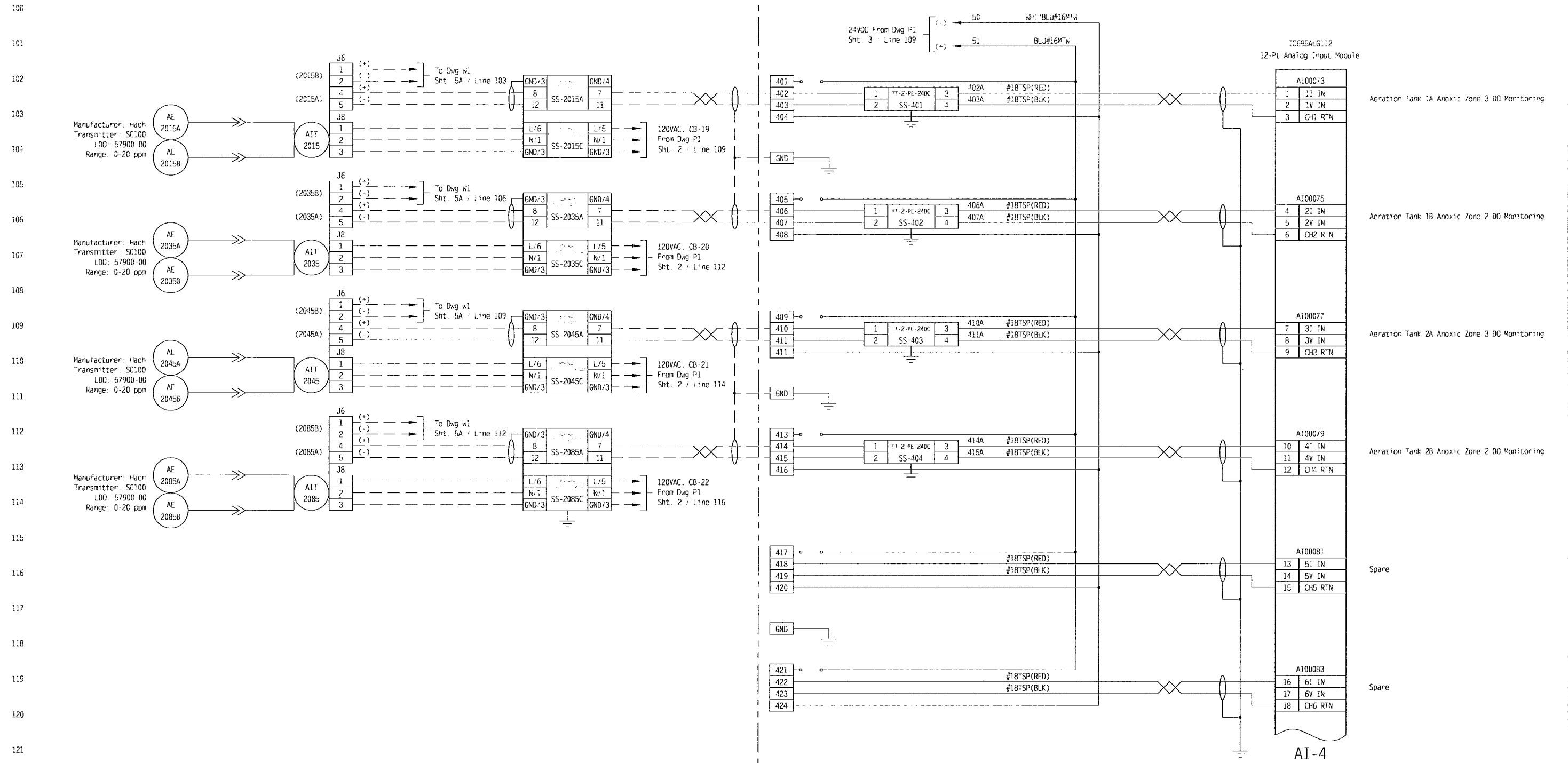
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FIELD WIRING - - - - -
PANEL WIRING - - - - -

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresion for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Input #3 PROJECT: Stafford Springs Water Pollution Control Upgrade
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM
DATE: 01/18/10	SHEET 3B	OF SHEETS 22
DRAWING NO: 0904018-W1		APP'D BY: JPM

Field Devices

Cabinet Devices



AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

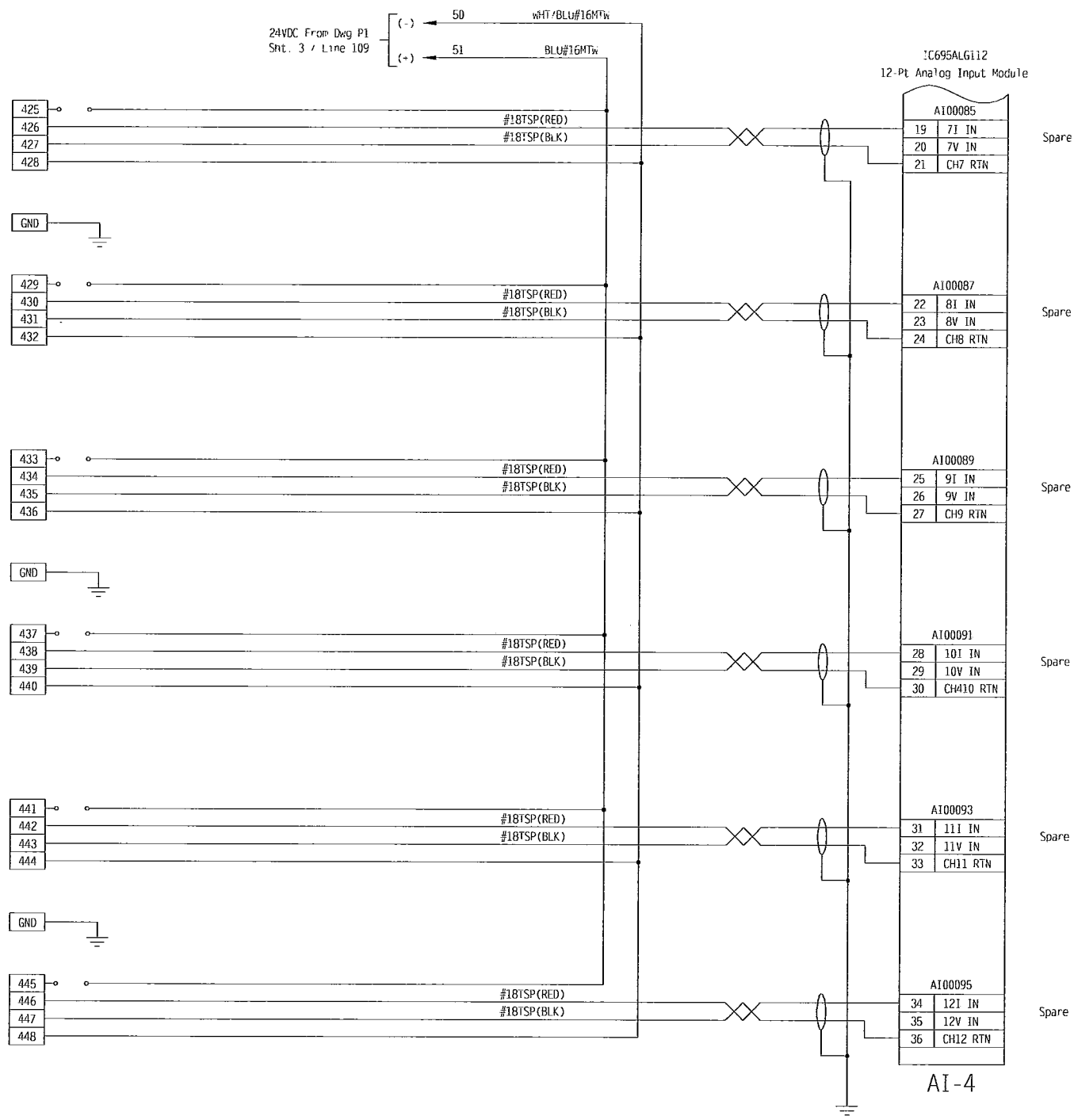
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Input #4	
478 West Main Street Waterbury, CT 06702		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE: CGN	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 4A	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

Cabinet Devices

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AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING _____

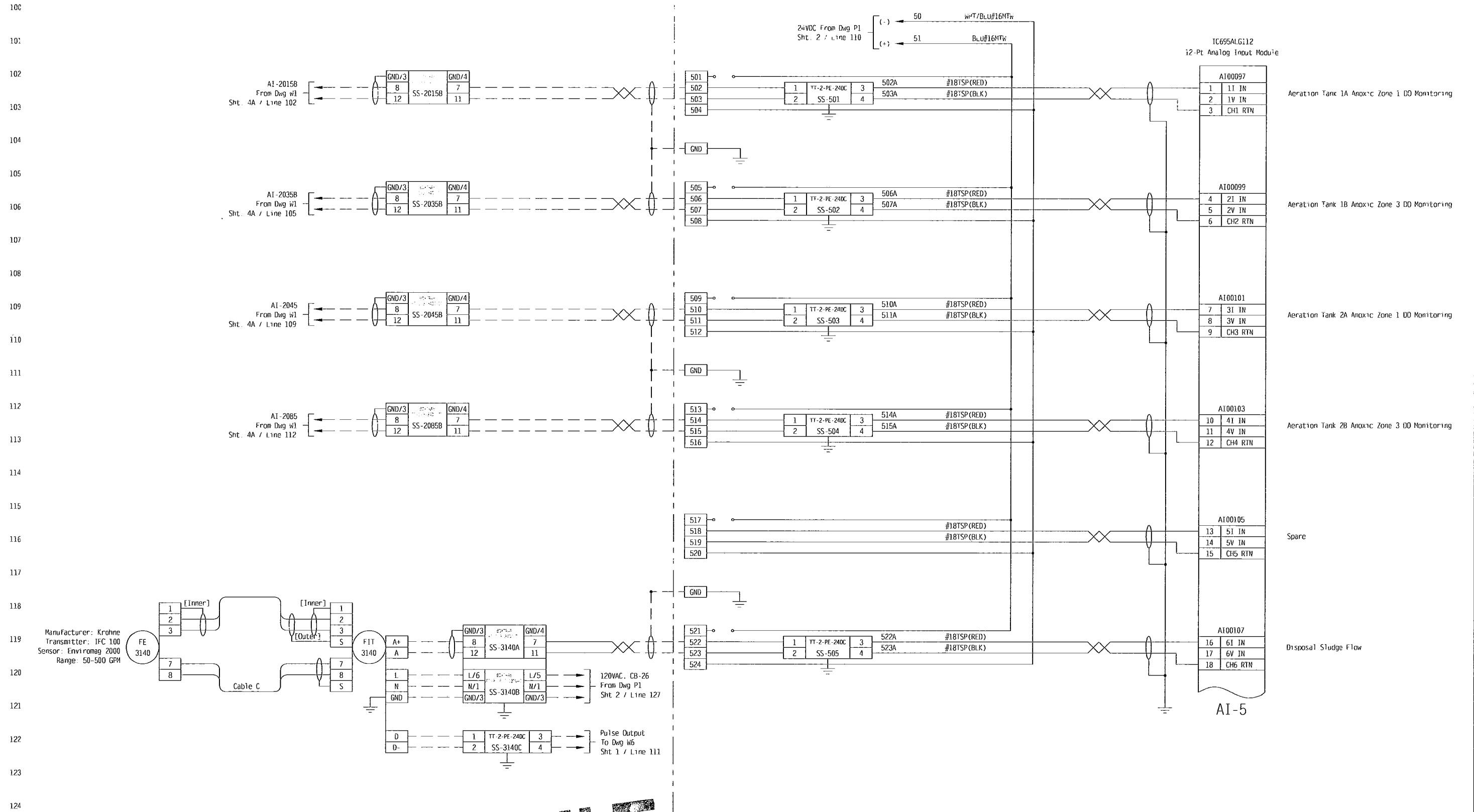
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7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresion for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Input #4			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPD BY: JPM
DATE: 01/18/10	SHEET 4B	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

Cabinet Devices



AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

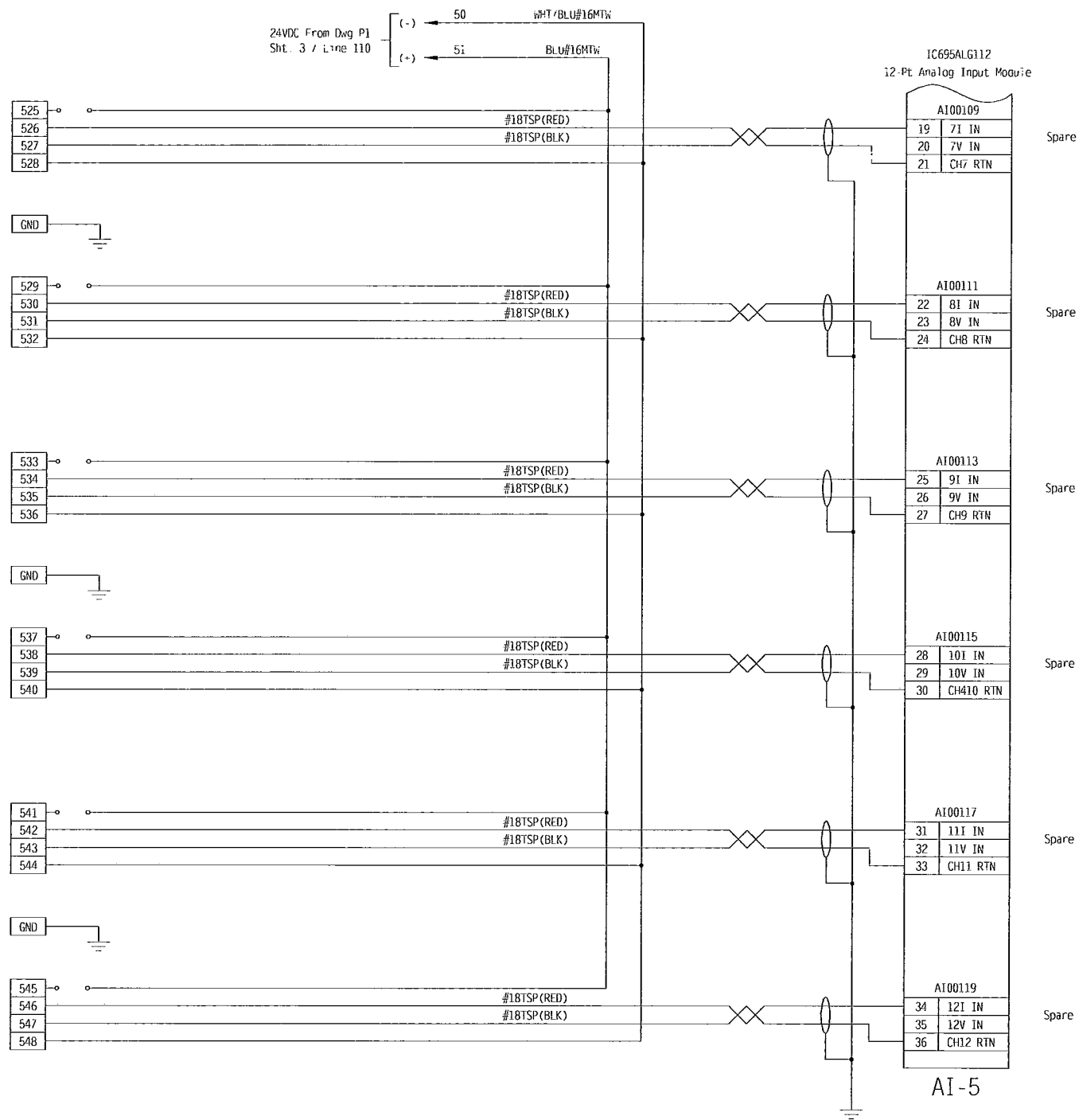
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7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Input #5	
PROJECT: Stafford Springs Water Pollution Control Upgrade		SCALE: CGN	DRAWN BY: JPM
DATE: 01/18/10	SHEET: 5A	OF SHEETS: 22	DRAWING NO.: 0904018-W1

Field Devices

Cabinet Devices

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AS-BUILT

KEY:
FIELD WIRING - - - - -
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REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresison for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Input #5			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROV BY: JPM
DATE: 01/18/10	SHEET 5B	OF SHEETS 22	DRAWING NO. 0904018-W1

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As Built

KEY
FIELD WIRING - - - - -
PANEL WIRING _____

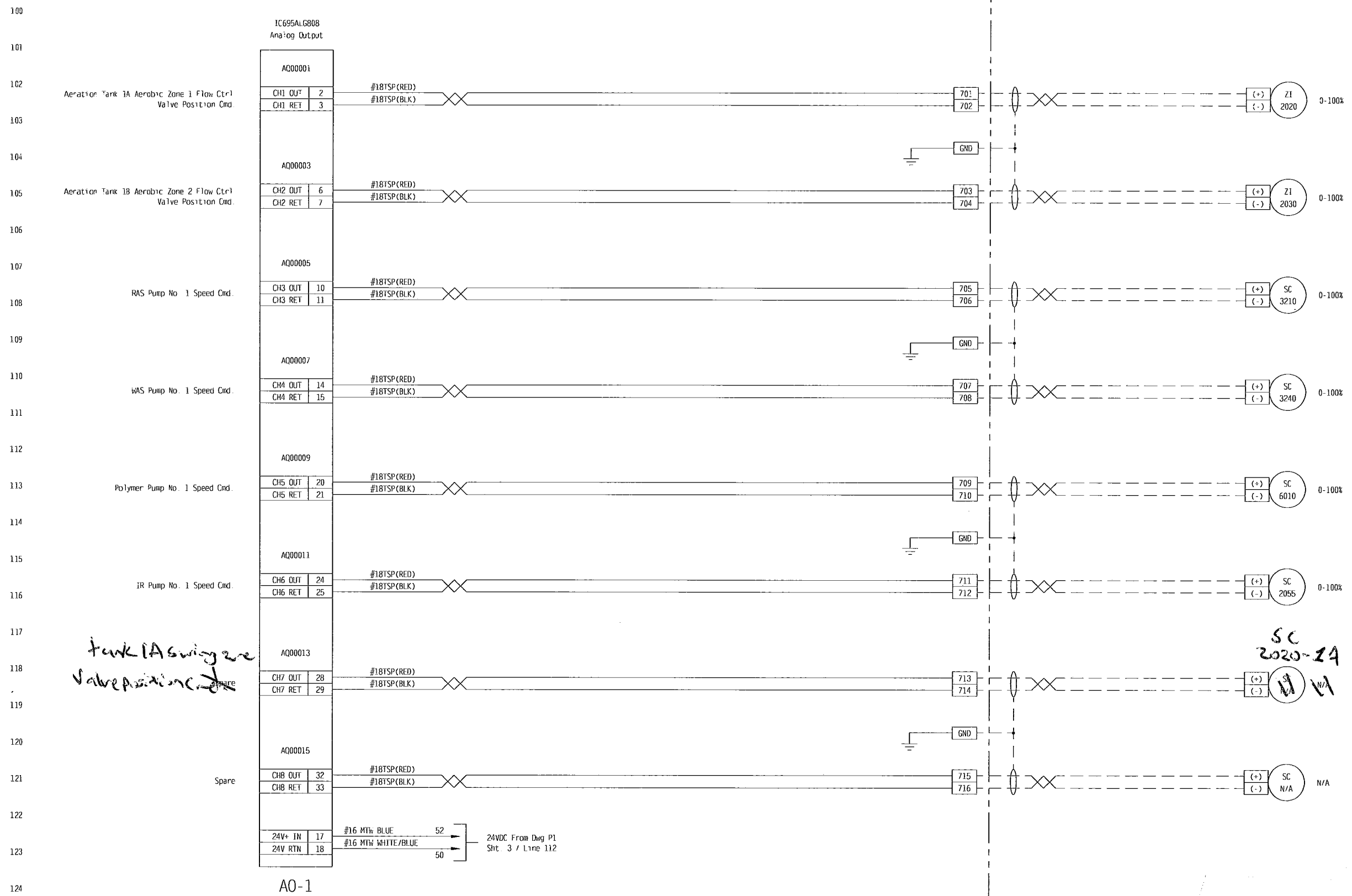
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresison for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Reserved Spare			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 6	OF SHEETS 22	DRAWING NO. 0904018-W1

Cabinet Devices

Field Devices



Handwritten note: Tank 1A swing valve position cmd

Handwritten note: SC 2020-24 N/A 0-100%

KEY:
FIELD WIRING: - - - - -
PANEL WIRING: _____

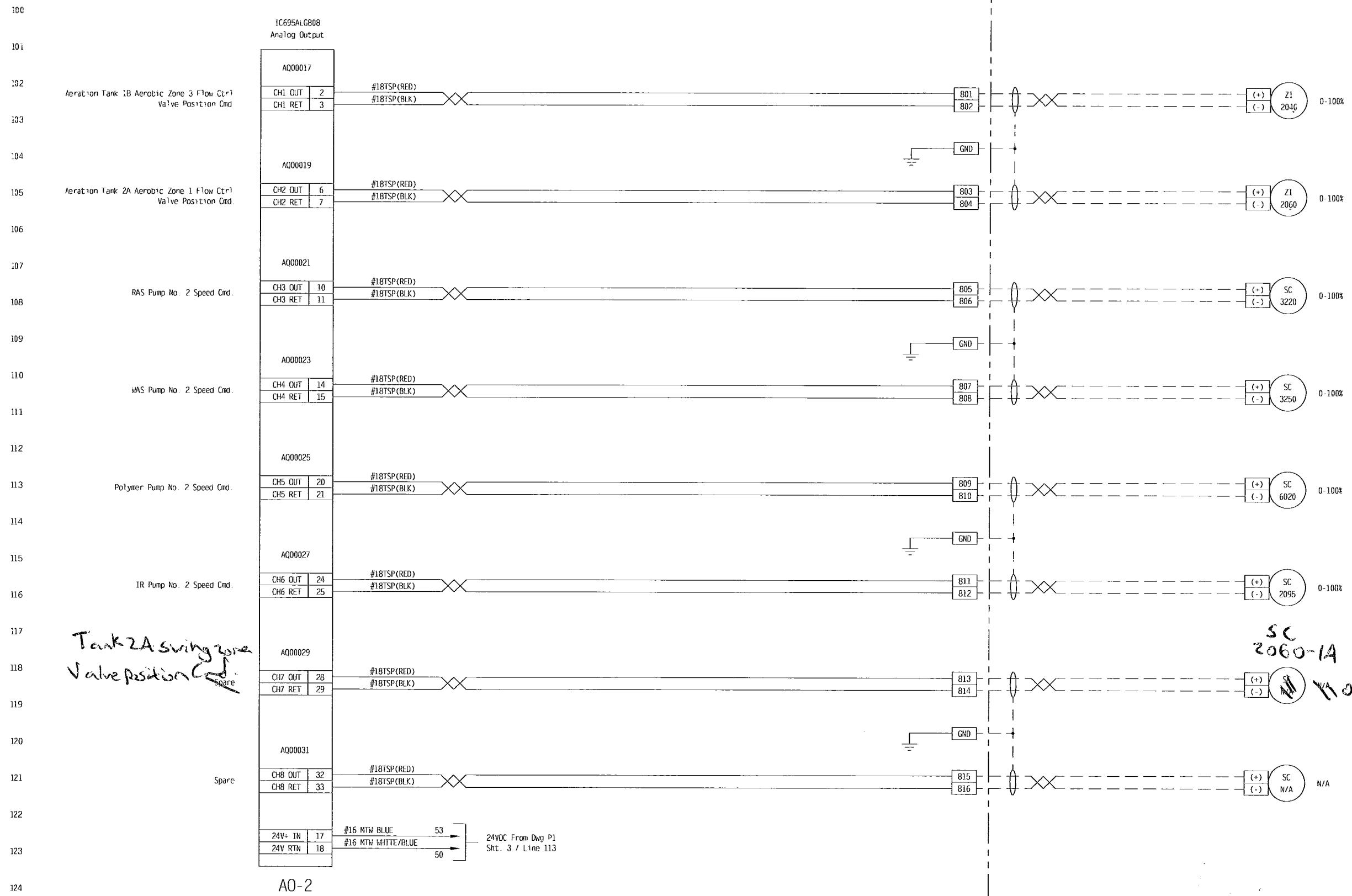
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7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Output #1			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 7	OF SHEETS 22	DRAWING NO. 0904018-W1

Cabinet Devices

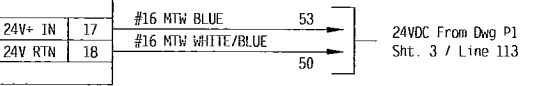
Field Devices



Tank 2A swing zone Valve position Cmd. Spare

SC 2060-1A
N/A 0-100%

AO-2



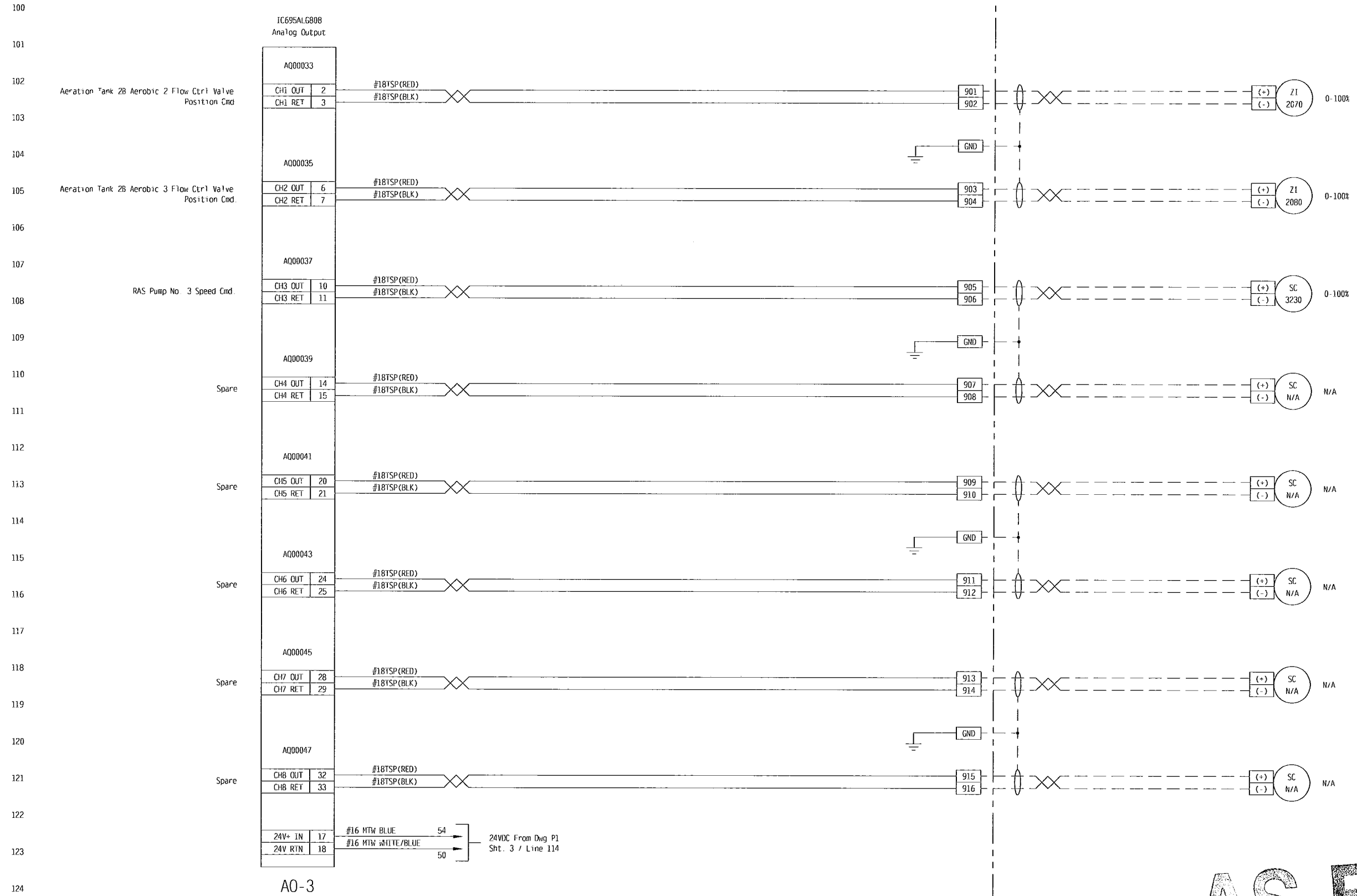
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PANEL WIRING

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresison for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Output #2	
PROJECT: Stafford Springs Water Pollution Control Upgrade		SCALE: CGN	APPD BY: JPM
DATE: 01/18/10	SHEET: 8	OF SHEETS: 22	DRAWING NO.: 0904018-W1

Cabinet Devices

Field Devices



AO-3

AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresison for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Analog Output #3			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 9	OF SHEETS 22	DRAWING NO. 0904018-W1

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AS-BUILT

KEY
FIELD WIRING - - - - -
PANEL WIRING _____

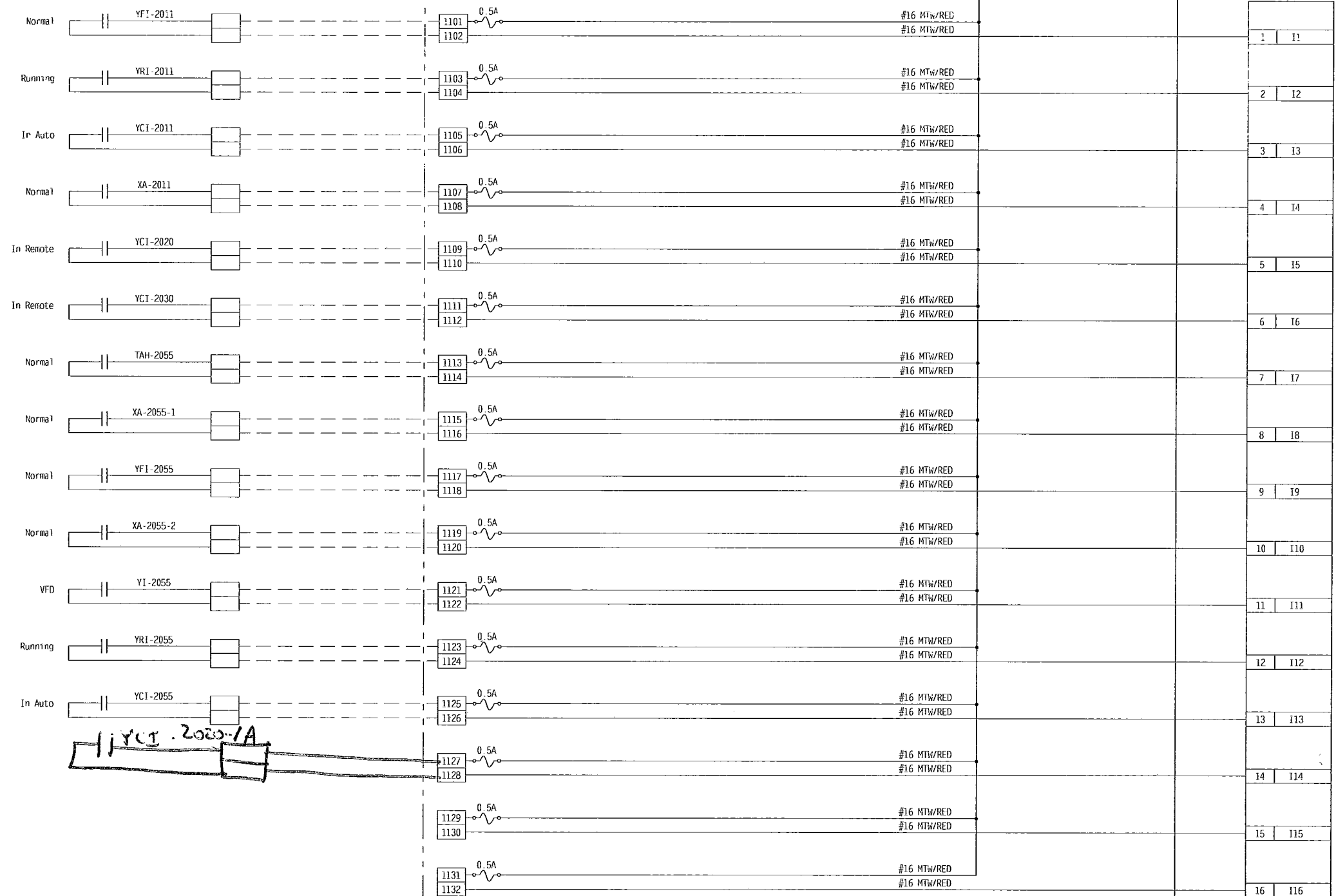
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresison for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Reserved Spare	
		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 10	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

Cabinet Devices

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YCI-2020-1A

*tank 1A swing zone
valve in remote*

KEY:
FIELD WIRING ---
PANEL WIRING ———

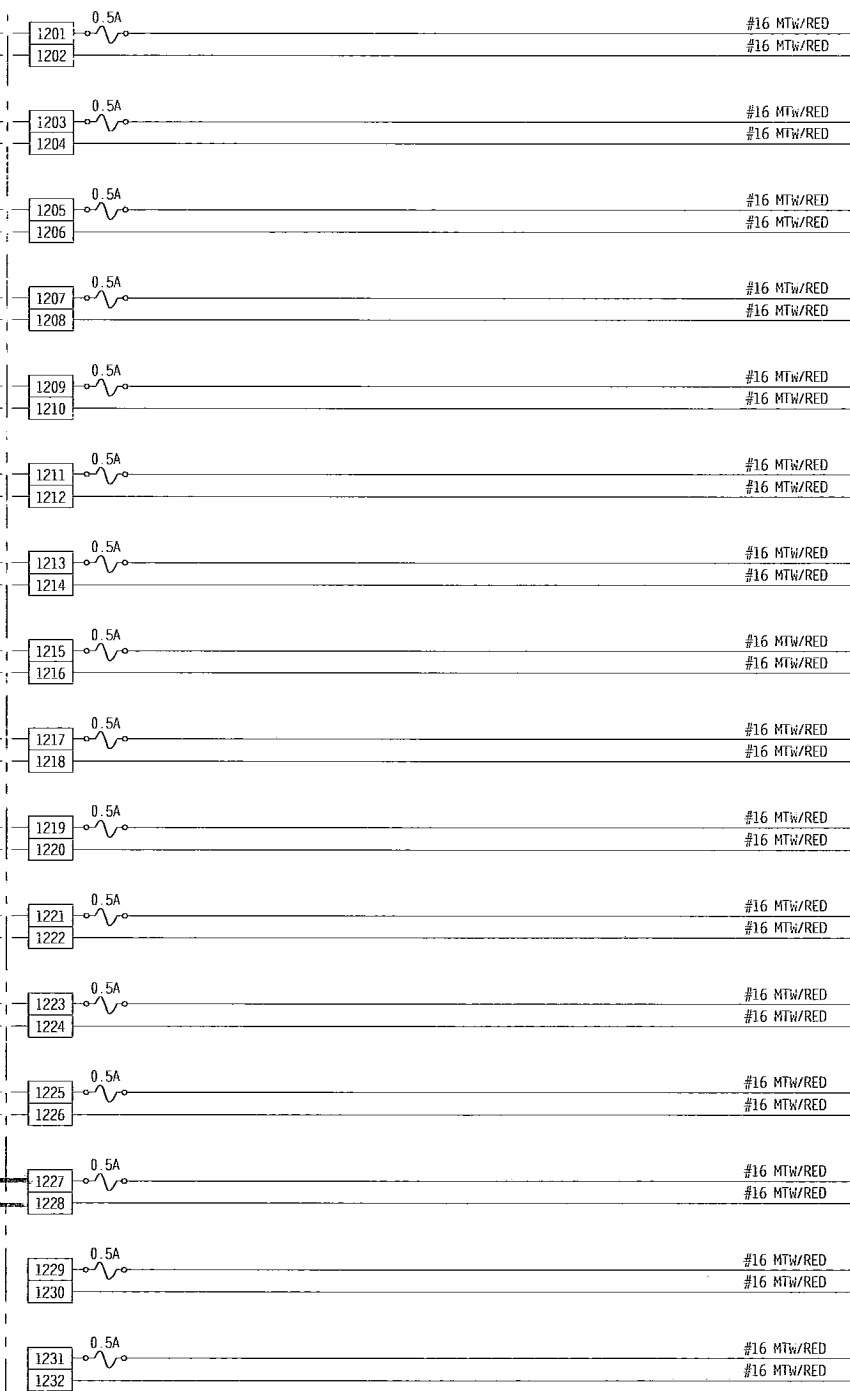
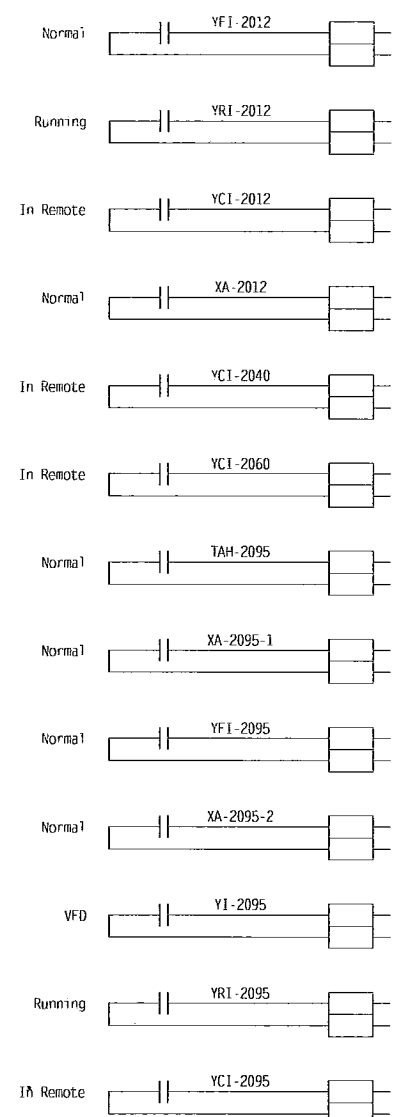
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresion for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Input #1	
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPD BY: JPM
DATE: 01/18/10	SHEET 11	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

Cabinet Devices

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120VAC From CB-7
Dwg P1
Sht. 1 of Line 127

IC694MDL240
16-Pt Digital Input Module

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19	NEUT

Aeration Tank No. 1A Zone 2 Mixer Fault

Aeration Tank No. 1A Zone 2 Mixer Running

Aeration Tank No. 1A Zone 2 Mixer In Remote

Aeration Tank No. 1A Zone 2 Mixer Common Alarm

Aeration Tank 1B Aerobic Zone 3 Flow Control Valve In Remote

Aeration Tank 2A Aerobic Zone 1 Flow Control Valve In Remote

Internal Recycle Pump No. 2 Temp High

Internal Recycle Pump No. 2 Leak

Internal Recycle Pump No. 2 VFD Fault

Internal Recycle Pump No. 2 Fault

Internal Recycle Pump No. 2 VFD Bypass

Internal Recycle Pump No. 2 Running

Internal Recycle Pump No. 2 In Remote

Spare

Spare

Handwritten: Tank 2A Swing zone Valve in remote

DI-2

KEY:
FIELD WIRING ---
PANEL WIRING ———

AS-BUILT

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Input #2			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 12	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

Cabinet Devices

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1	11	Aeration Tank No 1A Zone 3 Mixer Fault
2	12	Aeration Tank No 1A Zone 3 Mixer Running
3	13	Aeration Tank No 1A Zone 3 Mixer In Remote
4	14	Aeration Tank No 1A Zone 3 Mixer Common Alarm
5	15	Aeration Tank 2B Aerobic 2 Flow Control Valve In Remote
6	16	Aeration Tank 2B Aerobic 3 Flow Control Valve In Remote
7	17	RAS and WAS Flood Alarm
8	18	Eyewash Station Activation Alarm
9	19	STCP-01 Managed Ethernet Switch Fault
10	110	Backwash Air Blower No. 1 Fault
11	111	Backwash Air Blower No. 1 Pressure High
12	112	Backwash Air Blower No. 1 Pressure Low
13	113	Backwash Air Blower No. 1 In Remote
14	114	Backwash Air Blower No. 1 Running
15	115	UPS Maintenance Bypass Status
16	116	Spare
19	NEUT	

DI-3

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

AS-BUILT

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

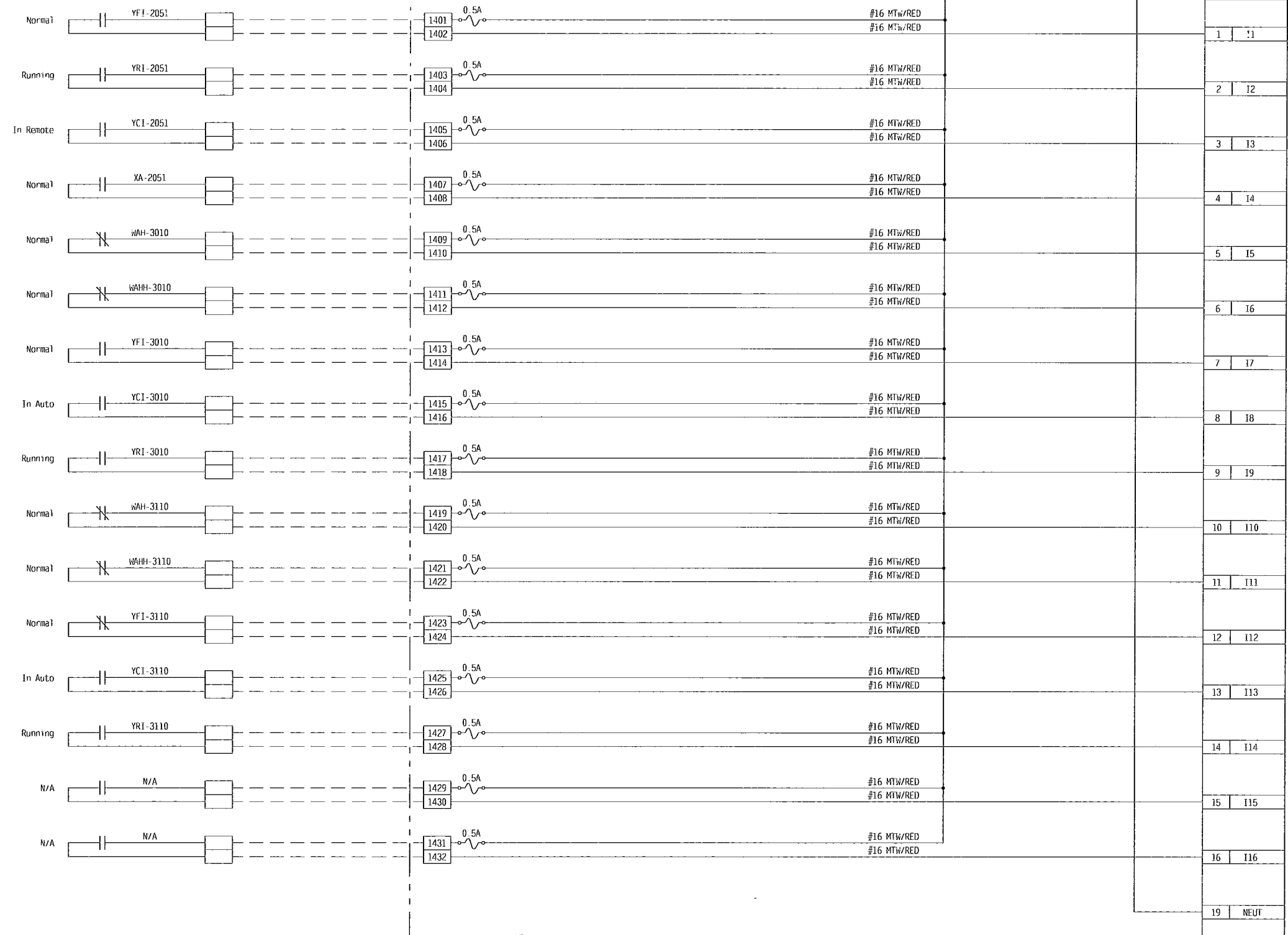
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Input #3			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 13 OF SHEETS	DRAWING NO. 0904018-W1	

Field Devices

Cabinet Devices

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DI-4

KEY:
FIELD WIRING ---
PANEL WIRING - - -

AS-BUILT

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

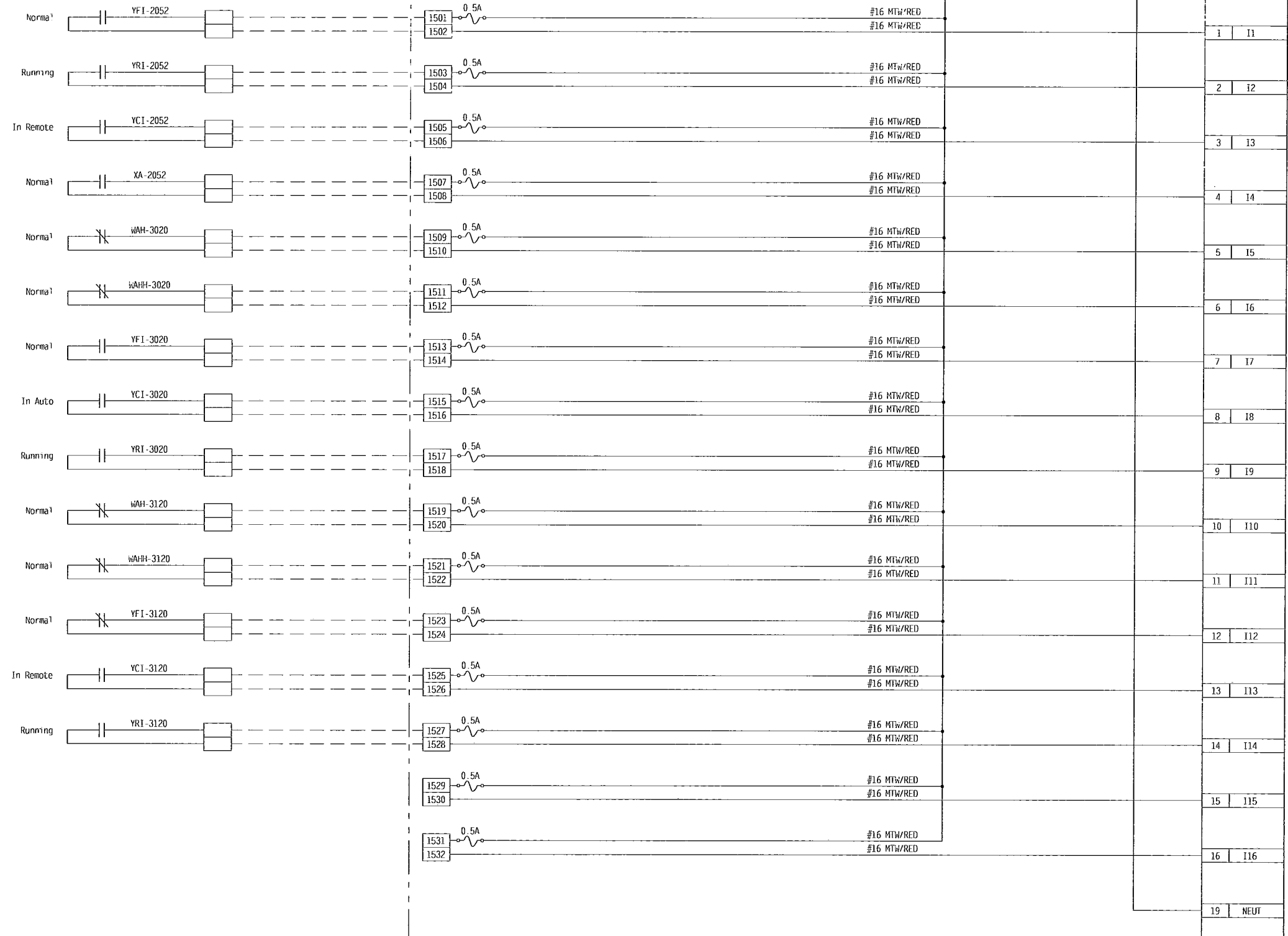
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Input #4			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 14	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

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Aeration Tank No 2A Zone 2 Mixer Fault

Aeration Tank No 2A Zone 2 Mixer Running

Aeration Tank No 2A Zone 2 Mixer In Remote

Aeration Tank No 2A Zone 2 Mixer Common Alarm

Secondary Clarifier No. 2 High Torque Warning

Secondary Clarifier No. 2 High High Torque Shutdown

Secondary Clarifier No. 2 Fault

Secondary Clarifier No. 2 In Auto

Secondary Clarifier No. 2 Running

Gravity Thickener No. 2 High Torque Warning

Gravity Thickener No. 2 High High Torque Shutdown

Gravity Thickener No. 2 Fault

Gravity Thickener No. 2 In Remote

Gravity Thickener No. 2 Running

Spare

Spare

KEY:
FIELD WIRING - - - - -
PANEL WIRING _____

As BUILT

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresion for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

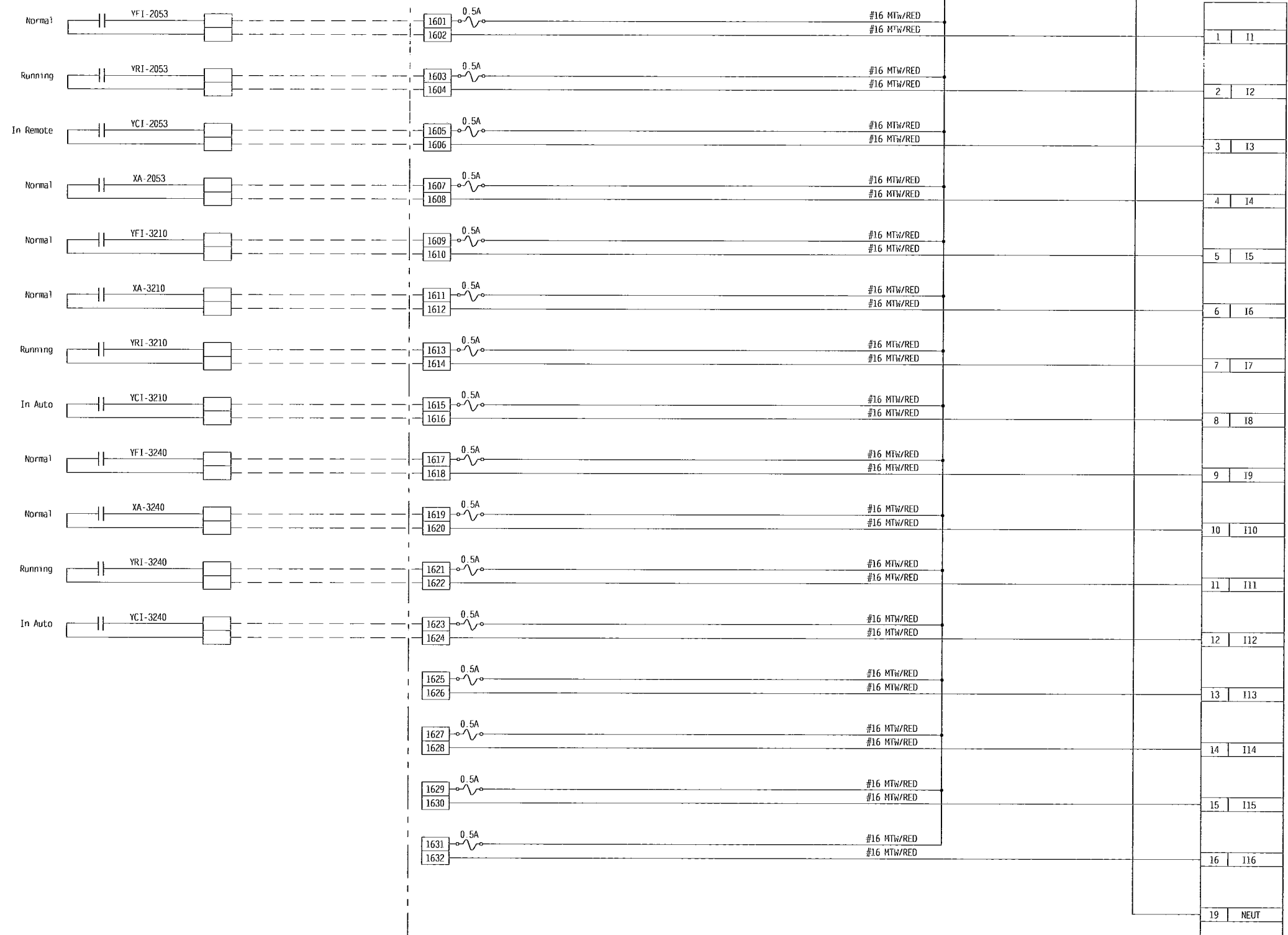
TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Input #5			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 15	OF SHEETS 22	DRAWING NO. 0904018-W1

DI-5

Field Devices

Cabinet Devices

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1	I1	Aeration Tank No. 2A Zone 3 Mixer Fault
2	I2	Aeration Tank No. 2A Zone 3 Mixer Running
3	I3	Aeration Tank No. 2A Zone 3 Mixer In Remote
4	I4	Aeration Tank No. 2A Zone 3 Mixer Common Alarm
5	I5	RAS Pump No. 1 Fault
6	I6	RAS Pump No. 1 Common Alarm
7	I7	RAS Pump No. 1 Running
8	I8	RAS Pump No. 1 In Auto
9	I9	WAS Pump No. 1 Fault
10	I10	WAS Pump No. 1 Common Alarm
11	I11	WAS Pump No. 1 Running
12	I12	WAS Pump No. 1 In Auto
13	I13	Spare
14	I14	Spare
15	I15	Spare
16	I16	Spare
19	NEUT	

KEY:
FIELD WIRING - - - -
PANEL WIRING - - - -

AS-BUILT

DI-6

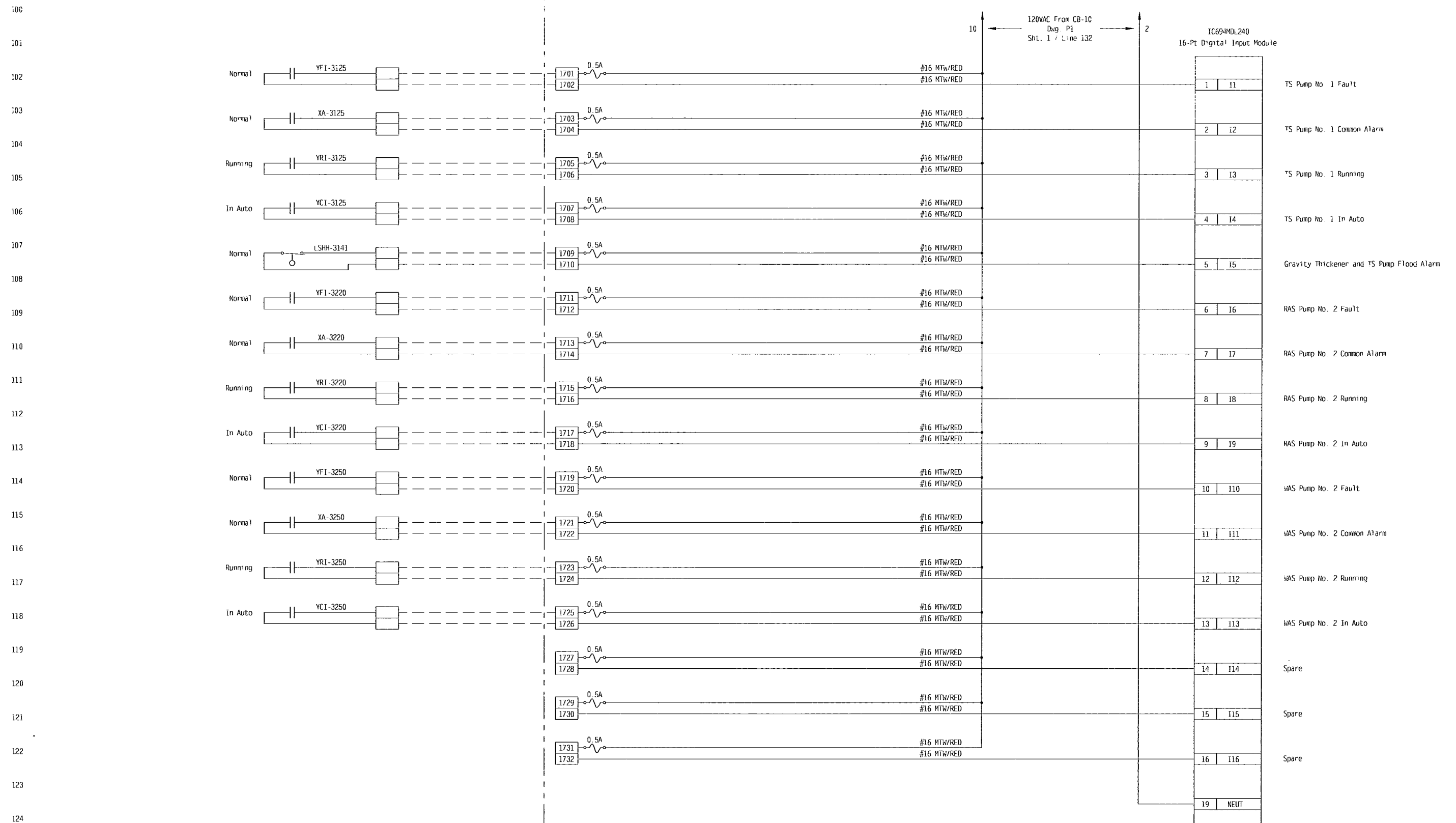
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Input #6			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 16	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

Cabinet Devices



DI-7

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

AS BUILT

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresison for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

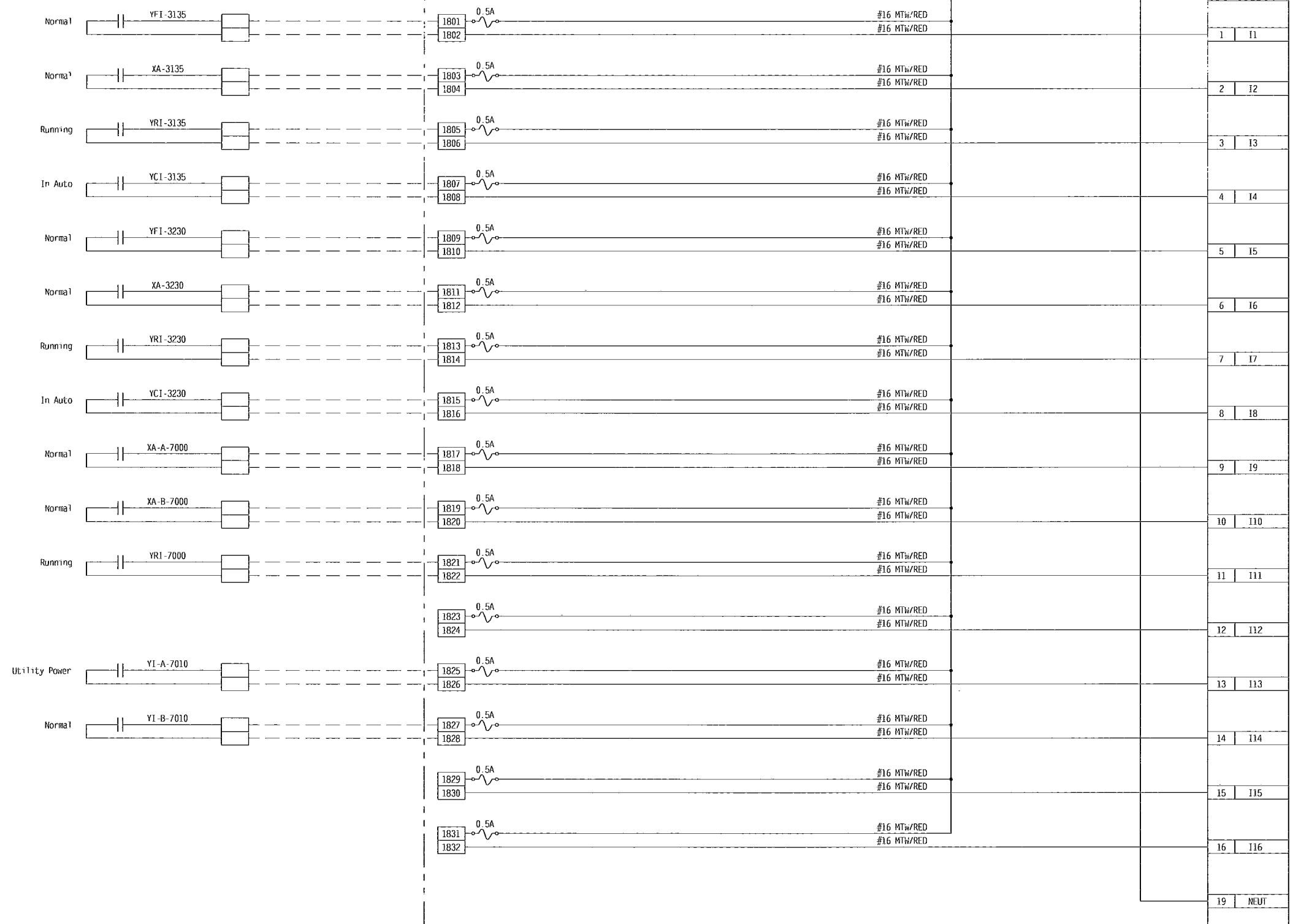
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Input #7			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 17	OF SHEETS 22	DRAWING NO. 0904018-W1

Field Devices

Cabinet Devices

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KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

DI-8

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates		478 West Main Street Waterbury, CT 06702	
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TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Input #8			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 18	OF SHEETS 22	DRAWING NO. 0904018-W1

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KEY
FIELD WIRING - - - - -
PANEL WIRING _____

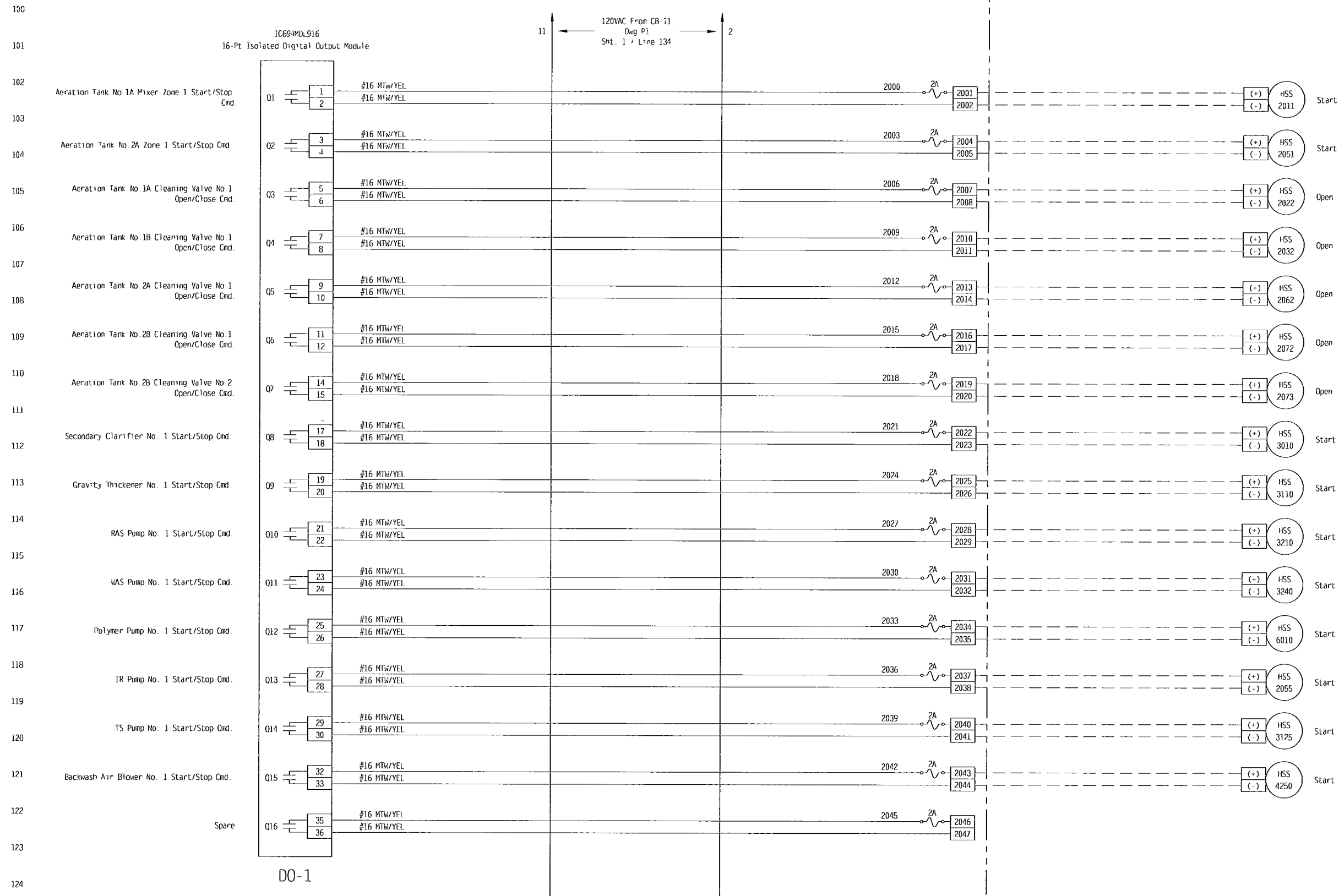
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppresison for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Reserved Spare			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CREATED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 19	OF SHEETS 22	DRAWING NO. 0904018-W1

Cabinet Devices

Field Devices



DO-1

KEY:
FIELD WIRING - - - -
PANEL WIRING - - - -

AS-BUILT

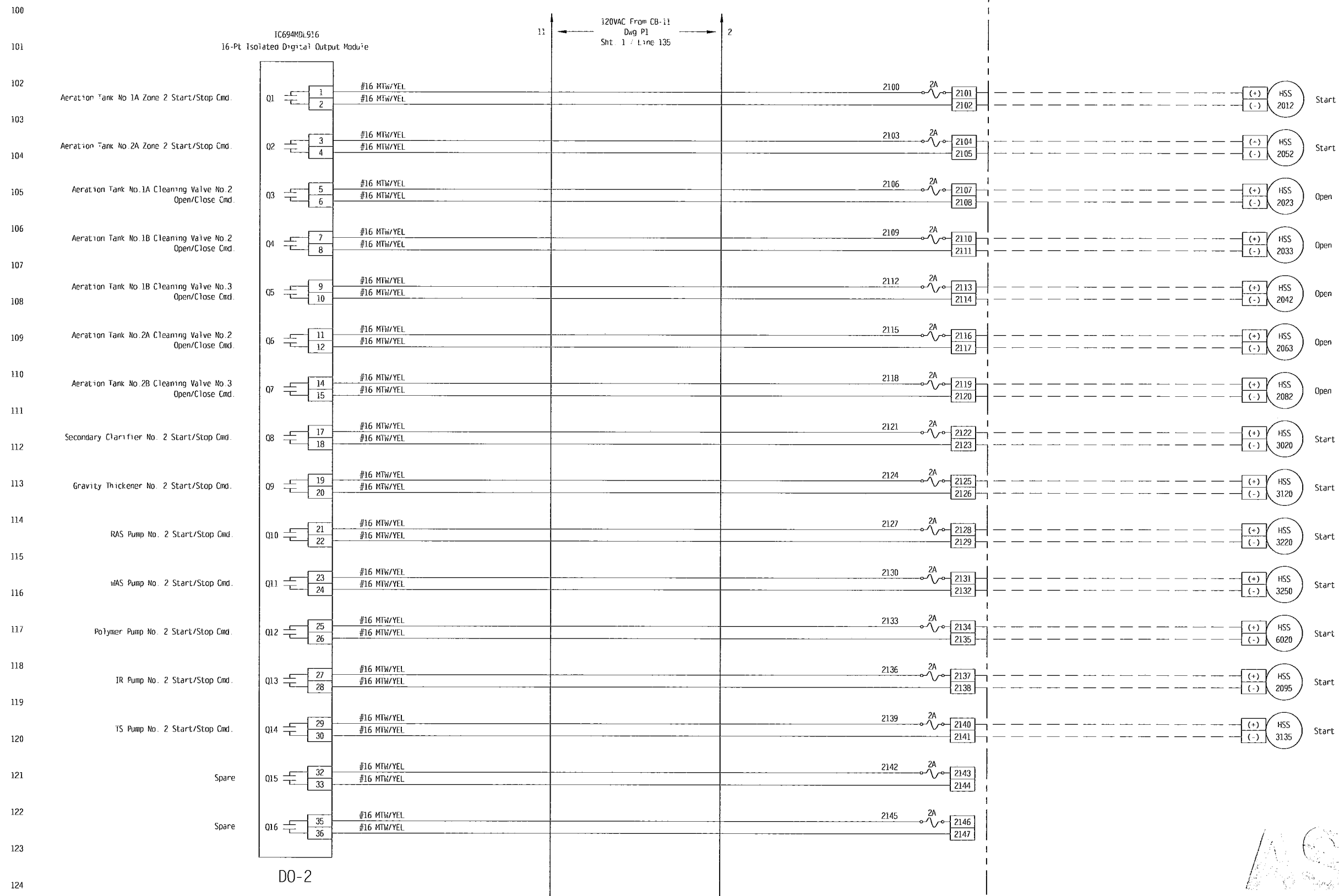
REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Output #1			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 20	OF SHEETS 22	DRAWING NO. 0904018-W1

Cabinet Devices

Field Devices



AS-BUILT

KEY:
FIELD WIRING - - - -
PANEL WIRING - - - -

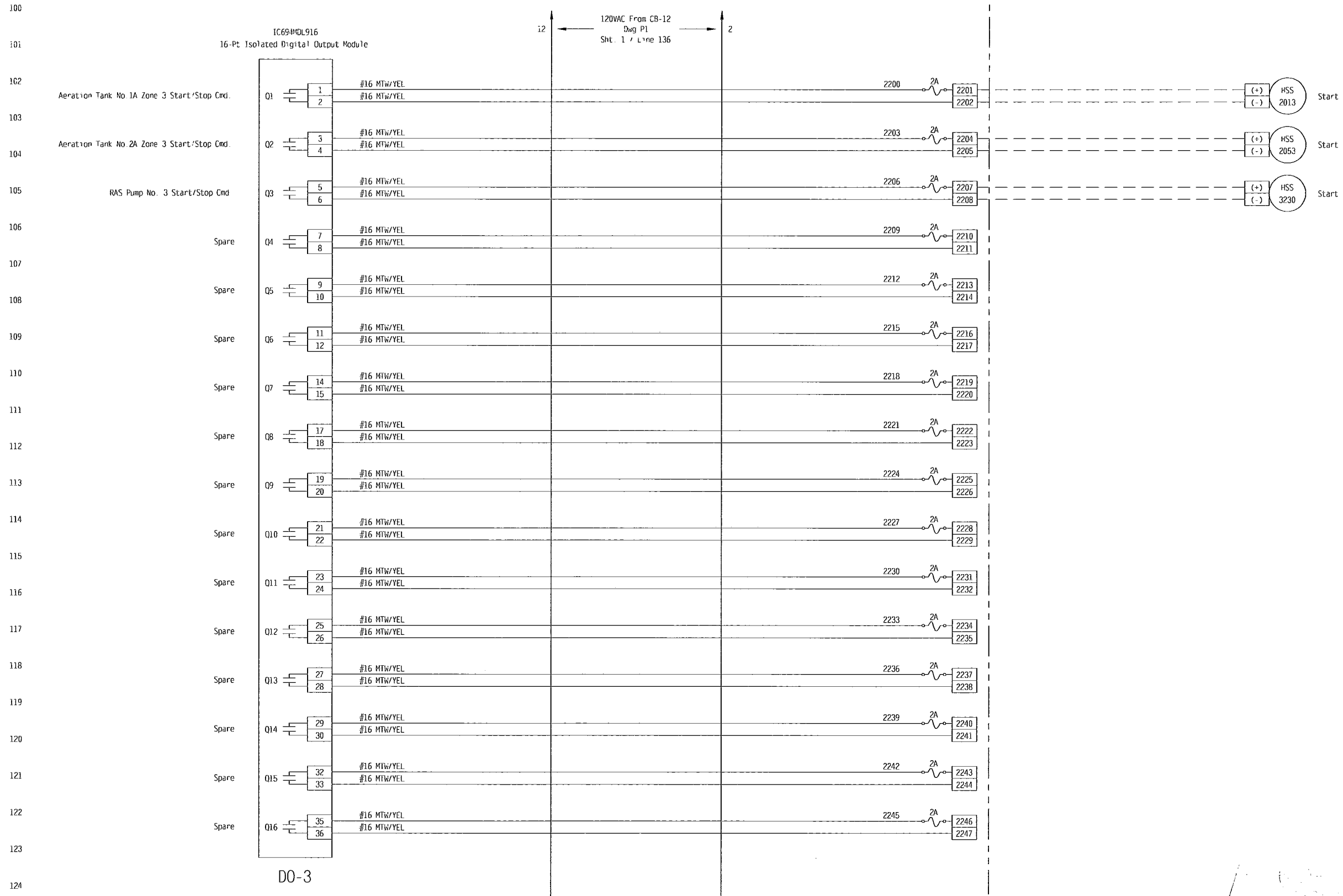
DO-2

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates		478 West Main Street Waterbury, CT 06702	
TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Output #2		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 21	OF SHEETS 22	DRAWING NO. 0904018-W1

Cabinet Devices

Field Devices



DO-3

AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

REV	DATE	DESCRIPTION	BY
7	6/10/11	As Built Revised	CGN
6	04/15/11	Change Order for UPS Wiring	JLR
5	03/28/11	Addition of Surge Suppression for Pulsed Flow Signal	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #1 (STCP-01) Digital Output #3			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 22	OF SHEETS 22	DRAWING NO. 0904018-W1

LOOP #	TAG	DESCRIPTION	TYPE	RANGE	ALARM LIMIT	RACK	SLOT	CH	DWG	SHT	LINE	P&ID
4000	LFI-4000	Secondary Effluent Wet Well Level	AI	N/A		0	5	3	W-2	1A	109	8
4000	LSL-4000	Secondary Effluent Wet Well Low Level	DI	Normal		0	13	1	W-2	9	102	8
4000	LSH-4000	Secondary Effluent Wet Well High Level	DI	Normal		0	13	2	W-2	9	103	8
4010	YFI-4010	Secondary Effluent Pump No. 1 Fault	DI	Normal		0	8	1	W-2	4	102	8
4010	XA-4010	Secondary Effluent Pump No. 1 Common Alarm	DI	Normal		0	8	2	W-2	4	103	8
4010	YCI-4010	Secondary Effluent Pump No. 1 In Auto	DI	In Auto		0	8	3	W-2	4	105	8
4010	YRI-4010	Secondary Effluent Pump No. 1 Running	DI	Running		0	8	4	W-2	4	106	8
4010	HSS-4010	Secondary Effluent Pump No. 1 Start/Stop Command	DC	Start		0	15	1	W-2	11	102	8
4110	ZSO-4110-1	Filter Air Scour Valve Open	DI	Open		0	8	5	W-2	4	107	9
4020	YFI-4020	Secondary Effluent Pump No. 2 Fault	DI	Normal		0	9	1	W-2	5	102	8
4020	XA-4020	Secondary Effluent Pump No. 2 Common Alarm	DI	Normal		0	9	2	W-2	5	103	8
4020	YCI-4020	Secondary Effluent Pump No. 2 In Remote	DI	In Remote		0	9	3	W-2	5	105	8
4020	YRI-4020	Secondary Effluent Pump No. 2 Running	DI	Running		0	9	4	W-2	5	106	8
4020	HSS-4020	Secondary Effluent Pump No. 2 Start/Stop Command	DC	Start		0	15	2	W-2	11	103	8
4030	YFI-4030	Secondary Effluent Pump No. 3 Fault	DI	Normal		0	10	1	W-2	6	102	8
4030	XA-4030	Secondary Effluent Pump No. 3 Common Alarm	DI	Normal		0	10	2	W-2	6	103	8
4030	YCI-4030	Secondary Effluent Pump No. 3 In Remote	DI	In Remote		0	10	3	W-2	6	105	8
4030	YRI-4030	Secondary Effluent Pump No. 3 Running	DI	Running		0	10	4	W-2	6	106	8
4030	HSS-4030	Secondary Effluent Pump No. 3 Start/Stop Command	DC	Start		0	15	3	W-2	11	105	8
4040	YFI-4040	Secondary Effluent Pump No. 4 Fault	DI	Normal		0	11	1	W-2	7	102	8
4040	XA-4040	Secondary Effluent Pump No. 4 Common Alarm	DI	Normal		0	11	2	W-2	7	103	8
4040	YCI-4040	Secondary Effluent Pump No. 4 In Remote	DI	In Remote		0	11	3	W-2	7	105	8
4040	YRI-4040	Secondary Effluent Pump No. 4 Running	DI	Running		0	11	4	W-2	7	106	8
4040	HSS-4040	Secondary Effluent Pump No. 4 Start/Stop Command	DC	Start		0	15	4	W-2	11	106	8
4050	YFI-4050	Secondary Effluent Pump No. 5 Fault	DI	Normal		0	12	1	W-2	8	102	8
4050	XA-4050	Secondary Effluent Pump No. 5 Common Alarm	DI	Normal		0	12	2	W-2	8	103	8
4050	YCI-4050	Secondary Effluent Pump No. 5 In Remote	DI	In Remote		0	12	3	W-2	8	105	8
4050	YRI-4050	Secondary Effluent Pump No. 5 Running	DI	Running		0	12	4	W-2	8	106	8
4050	HSS-4050	Secondary Effluent Pump No. 5 Start/Stop Command	DC	Start		0	15	5	W-2	11	107	8
4051	LS-HI-4051	Secondary Effluent Pump Flood Alarm	DI	Normal		0	12	5	W-2	8	107	8
4151	YFI-4151	Backwash Tank Pump No. 1 Fault	DI	Normal		0	8	6	W-2	4	108	9
4151	XA-4151	Backwash Tank Pump No. 1 Common Alarm	DI	Normal		0	8	7	W-2	4	110	9
4151	YRI-4151	Backwash Tank Pump No. 1 Running	DI	Running		0	8	8	W-2	4	111	9
4151	YCI-4151	Backwash Tank Pump No. 1 In Remote	DI	In Remote		0	8	9	W-2	4	112	9
4151	HSS-4151	Backwash Tank Pump No. 1 Start/Stop Command	DC	Start		0	15	11	W-2	11	115	9
4152	YFI-4152	Backwash Tank Pump No. 2 Fault	DI	Normal		0	9	6	W-2	5	108	9
4152	XA-4152	Backwash Tank Pump No. 2 Common Alarm	DI	Normal		0	9	7	W-2	5	110	9
4152	YRI-4152	Backwash Tank Pump No. 2 Running	DI	Running		0	9	8	W-2	5	111	9
4152	YCI-4152	Backwash Tank Pump No. 2 In Remote	DI	In Remote		0	9	9	W-2	5	112	9
4152	HSS-4152	Backwash Tank Pump No. 2 Start/Stop Command	DC	Start		0	15	12	W-2	11	117	9
4155	LS-HI-4155	Backwash Tank Level High High Alarm	DI	Normal		0	10	6	W-2	6	108	9
4155	LSH-4155	Backwash Tank Level High Alarm	DI	Normal		0	10	7	W-2	6	110	9
4155	LSL-4155	Backwash Tank Level Low Alarm	DI	Normal		0	10	8	W-2	6	111	9
4155	LSLL-4155	Backwash Tank Level Low Low Alarm	DI	Normal		0	10	9	W-2	6	112	9
4210	SI-4210	Backwash Water Pump No. 1 Speed Feedback	AI	0-100%		0	5	1	W-2	1A	102	10
4210	SC-4210	Backwash Water Pump No. 1 Speed Command	AC	0-100%		0	7	1	W-2	3	102	10
4210	YFI-4210	Backwash Water Pump No. 1 VFD Fault	DI	Normal		0	8	10	W-2	4	114	10
4210	XA-4210	Backwash Water Pump No. 1 Common Alarm	DI	Normal		0	8	11	W-2	4	115	10
4210	YCI-4210	Backwash Water Pump No. 1 In Remote	DI	In Remote		0	8	12	W-2	4	116	10
4210	YRI-4210	Backwash Water Pump No. 1 Running	DI	Running		0	8	13	W-2	4	118	10
4210	HSS-4210	Backwash Water Pump No. 1 Start/Stop Command	DC	Start		0	15	6	W-2	11	109	10
4220	SI-4220	Backwash Water Pump No. 2 Speed Feedback	AI	0-100%		0	6	1	W-2	2A	102	10
4220	SC-4220	Backwash Water Pump No. 2 Speed Command	AC	0-100%		0	7	2	W-2	3	105	10
4220	YFI-4220	Backwash Water Pump No. 2 VFD Fault	DI	Normal		0	9	10	W-2	5	114	10
4220	XA-4220	Backwash Water Pump No. 2 Common Alarm	DI	Normal		0	9	11	W-2	5	115	10
4220	YCI-4220	Backwash Water Pump No. 2 In Remote	DI	In Remote		0	9	12	W-2	5	116	10
4220	YRI-4220	Backwash Water Pump No. 2 Running	DI	Running		0	9	13	W-2	5	118	10
4220	HSS-4220	Backwash Water Pump No. 2 Start/Stop Command	DC	Start		0	15	7	W-2	11	110	10

LOOP #	TAG	DESCRIPTION	TYPE	RANGE	ALARM LIMIT	RACK	SLOT	CH	DWG	SHT	LINE	P&ID
4260	XA-4260	Plant Water Pump Common Alarm	DI	Normal		0	13	3	W-2	9	105	10
4260	YRI-A-4260	Plant Water Pump No. 1 Running	DI	Running		0	13	4	W-2	9	106	10
4260	YRI-B-4260	Plant Water Pump No. 2 Running	DI	Running		0	14	8	W-2	10	111	10
4263	P-T-4263	Plant Water Pump Pressure	AI	N/A		0	5	2	W-2	1A	106	10
4264	F-T-4264	Plant Water Pump Flow	AI	N/A		0	6	2	W-2	2A	106	10
5000	LFI-5000	Effluent Clear Well Level	AI	N/A		0	5	5	W-2	1A	116	12
5005	A-T-5005	Effluent Clear Well pH	AI	0-14		0	5	4	W-2	1A	112	12
5010	FT-5010	Effluent Clear Well Flow	AI	0-8 MGD		0	6	3	W-2	2A	109	12
5010	SC-5010-1	Effluent Flow to UV System	AO	0-5MGD		0	7	3	W-2	3	108	12
	SC-5010-1	Effluent Flow to Effluent Sampler	AO			0	7	4	W-2	3	110	N/A
5022	XA-5021	UV Channel No.1 Bank Comm Failure	DI	Normal		0	12	6	W-2	8	108	12
5022	LSL-5021	UV Channel No.1 Bank LO-LO UV Intensity	DI	Normal		0	12	7	W-2	8	110	12
5022	YFI-5021	UV Channel No.1 Bank Lamp Failure	DI	Normal		0	12	8	W-2	8	111	12
5022	YF-5021	UV Channel No.1 Bank Flow Meter Fail	DI	Normal		0	12	9	W-2	8	112	12
5022	TSH-5021	UV Channel No.1 LCA/LDA Temp Alarm	DI	Normal		0	12	10	W-2	8	113	12
5022	X-5021	UV Channel No. 1 Common Alarm	DI	Normal		0	12	11	W-2	8	114	12
5030	LFI-5030	UV Channel No. 1 Level	AI	0-4.5 FT		0	6	4	W-2	2A	112	12
7041	XA-7040	STCP-02 Managed Ethernet Switch Fault	DI	Normal		0	14	7	W-2	10	110	17

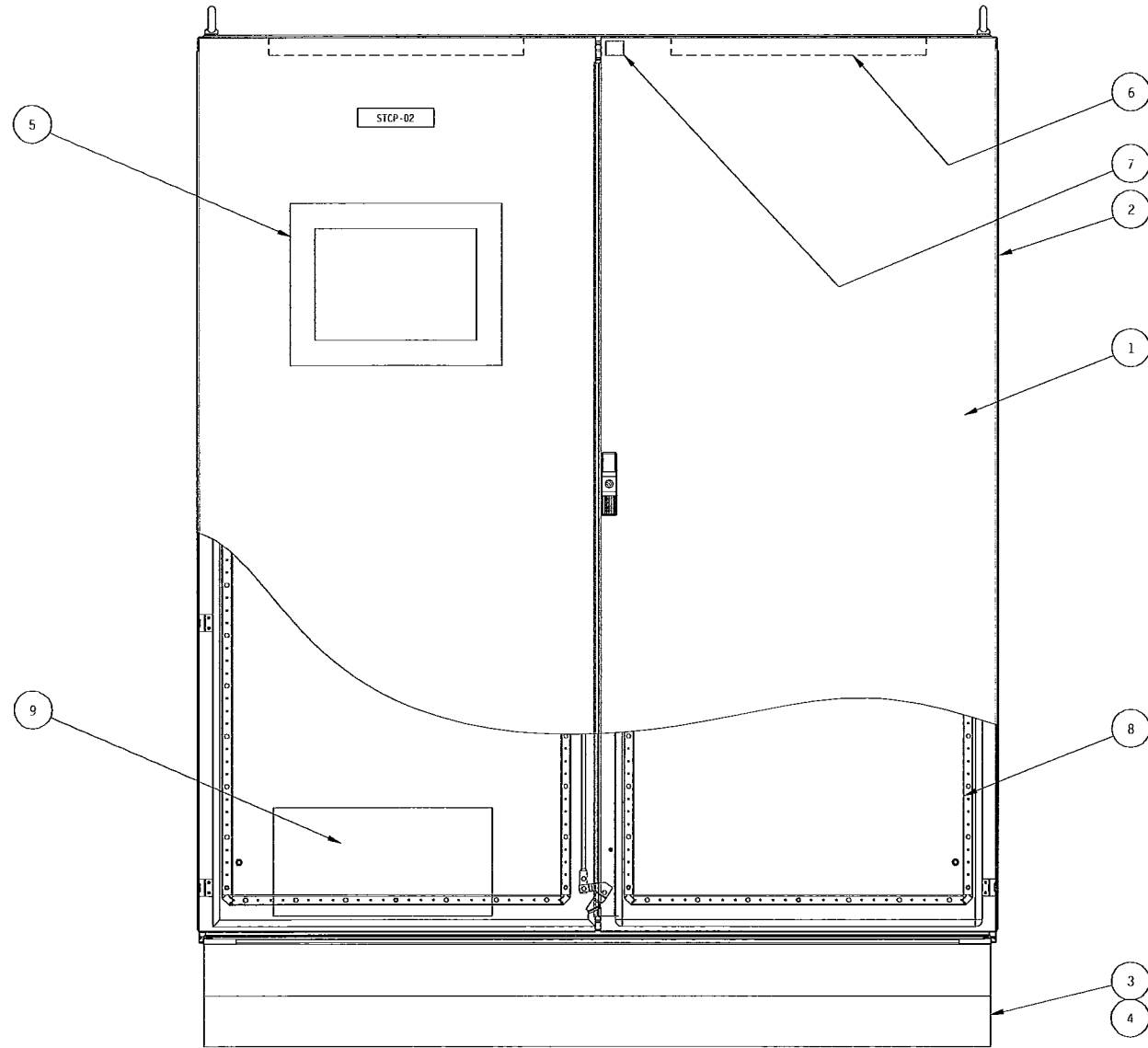
AS-BUILT

REV	DATE	DESCRIPTION	BY
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4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

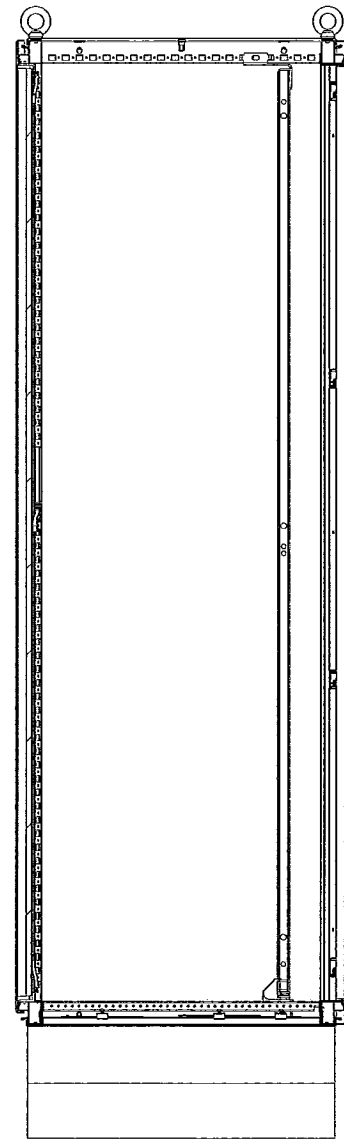
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Loop Index			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 1	OF SHEETS 1	DRAWING NO. 0904018-L2

ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
1	Rittal	1	TS 8901.230	Enclosure, NEMA 12, 71"H x 63" W x 24" D TS Type
2	Rittal	1	8186.235	Cabinet Side Wall
3	Rittal	1	8602.920	Cabinet F/R Base 8"
4	Rittal	1	8602.060	Cabinet Side Base 8"
5	Industrial Computing	1	PM-P-15	Industrial PC
6	Lightolier	2	TSL 0028 W BPR	Interior Cabinet Lighting
7	Rittal	1	PS 4127.000	Door Light Switch
8	Cortec	1	VpCl-110	Corrosion inhibitor
9	APC	1	SMT1500	Smart UPS 1500VA, 120VAC



Front View



Right Side View

NP #	LINE #1	ENGRAVING TEXT	SIZE	TEXT SIZE
1	STCP-02		1 1/2" X 6"	5/8"

Notes:

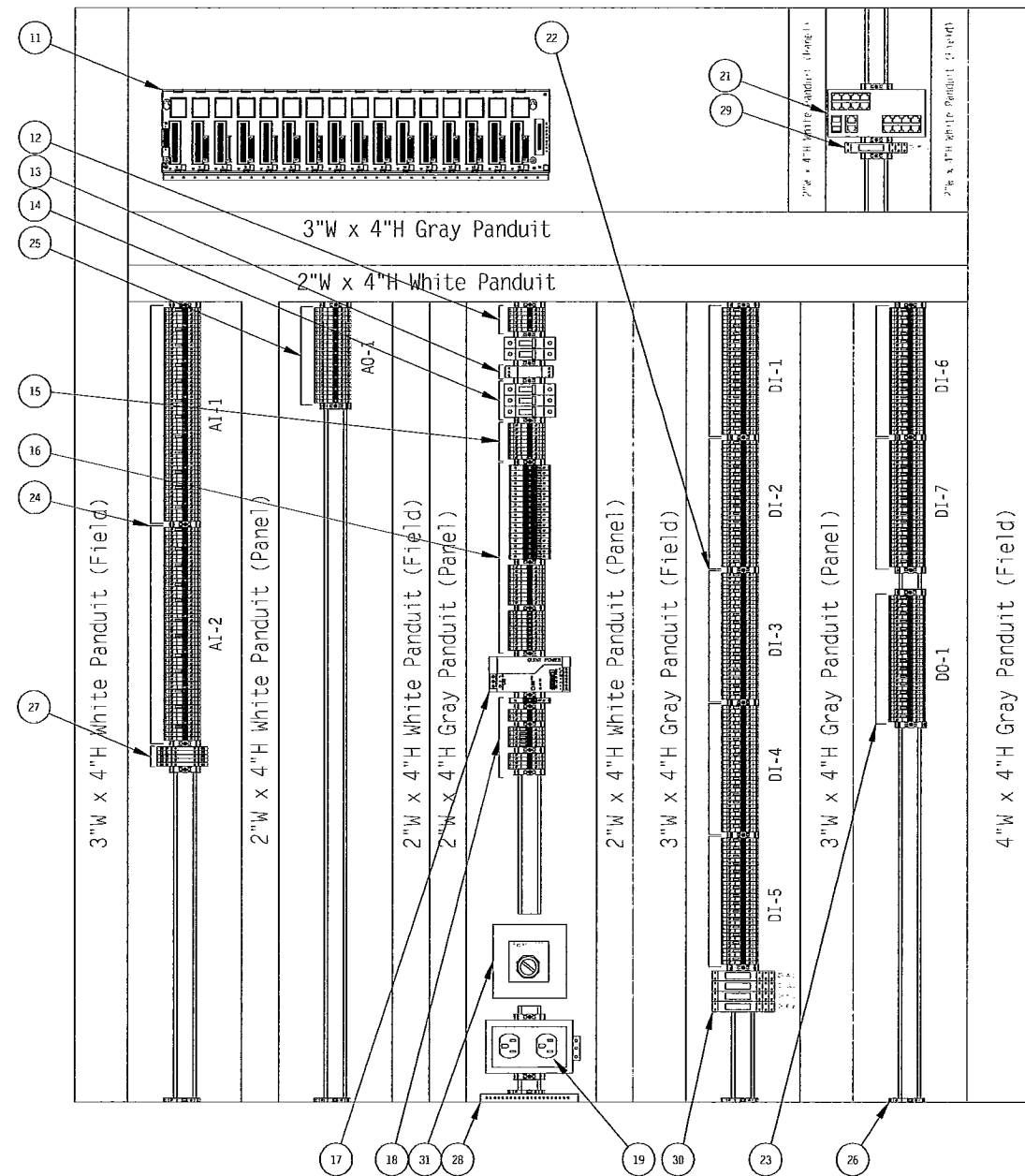
- Lamacoids engraved using white letters on black background.
- Standard size lamacoids have beveled front edges.
- Lamacoids have adhesive back side.
- Standard letter heights are 3/16" and 5/16".
- Letter height adjustable from 3/16" to 9/16" as needed.

AS-BUILT

REV	DATE	DESCRIPTION	BY
6	6/10/11	As Built Revised	CGN
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2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Exterior Layout			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 1/18/10	SHEET 1	OF SHEETS 2	DRAWING NO. 0904018-A2



Front View

IC695CHS016	IC695PSA040	IC695CPU310	IC695ETM001	IC695ALG112	IC695ALG112	IC695ALG808	IC694MDL240	IC694MDL240	IC694MDL240	IC694MDL240	IC694MDL240	IC694MDL240	IC694MDL240	IC694MDL240	IC694MDL916	EXPANSION SLOT	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

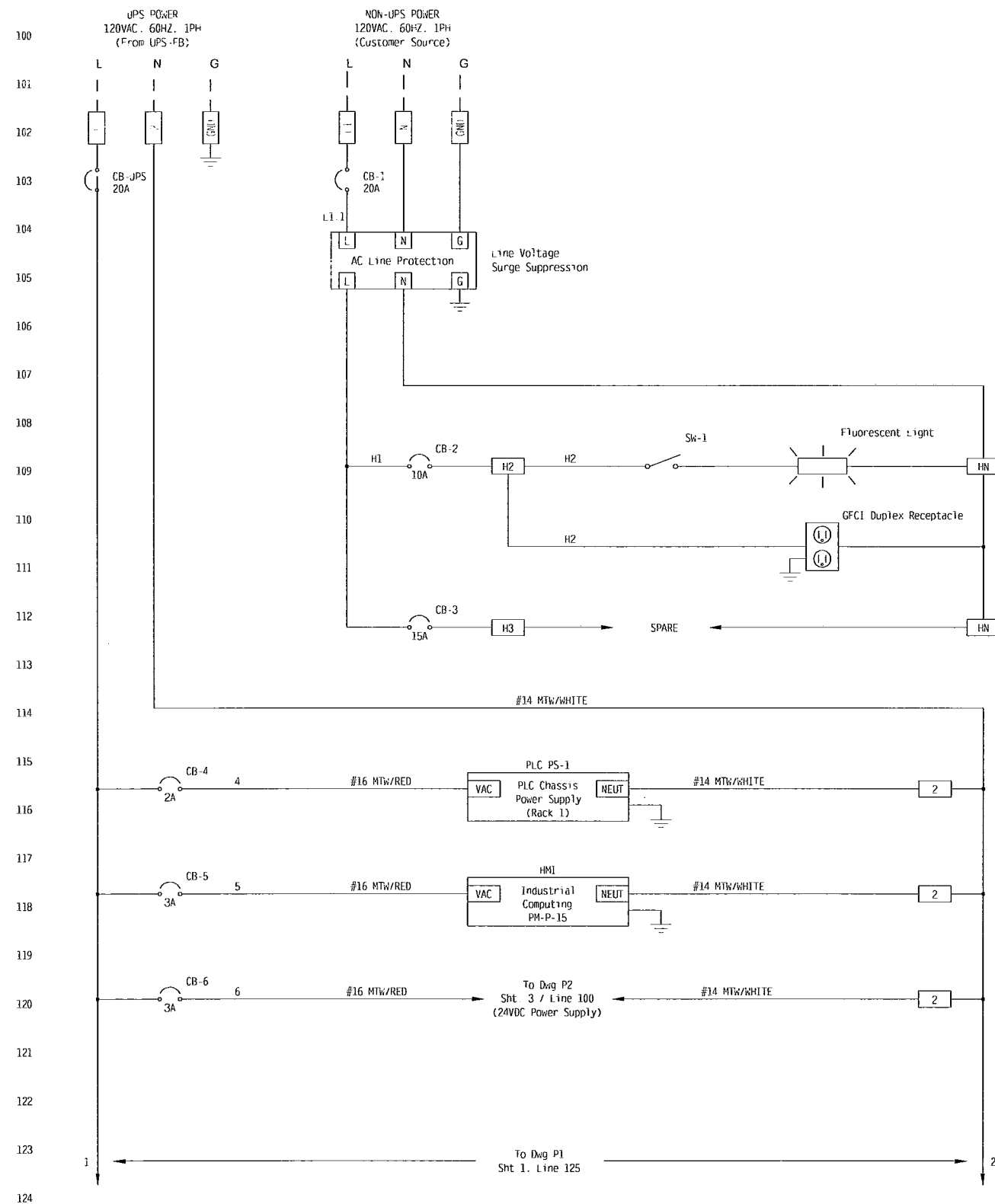
- Lamacoids engraved using white letters on black background.
- Standard size lamacoids have beveled front edges.
- Lamacoids have adhesive back side.
- Standard letter heights are 3/16" and 5/16".
- Letter height adjustable from 3/16" to 9/16" as needed.

ITEM	MANUFACTURER	QTY	MODEL	DESCRIPTION
11	General Electric	1	IC695CHS016	RX3i Main CPU Rack
		1	IC 695PSA040	16 Slot Chassis
		1	IC 695CPU310	Power Supply
		1	IC695ETM001	RX3i CPU
		2	IC695ALG112	Ethernet/IP Module
		1	IC695ALG808	12pt Analog Input Module
		7	IC694MDL240	8pt Analog Output Module
		1	IC694MDL916	16pt 120VAC Digital Input Module 16pt Digital Output Relay Module
12	Phoenix Contact	4	30 46 18 4	Incoming Power Distribution UT 4-MTD Feed Through Terminal Block
		2	30 46 20 7	UT 4-MTD-PE/S Grounding Terminal Block
13	Phoenix Contact	1	28 56 81 2	120VAC Surge Suppressor (26 Amp)
14	Allen-Bradley	2	1489-A1C-200	Circuit Breakers for 120VAC Power Distribution
		1	1489-A1C-100	20A Circuit Breakers (CB-1, CB-UPS)
		1	1489-A1C-150	10A Circuit Breakers (CB-2) 15A Circuit Breakers (CB-3)
15	Phoenix Contact	8	30 46 18 4	Terminal Blocks for 120VAC for Primary Distribution
		1	30 46 20 7	UT 4-MTD Feed Through Terminal Block UT 4-MTD-PE/S Grounding Terminal Block
16	Phoenix Contact	16	07 12 21 7	Circuit Breakers for 120VAC Power Distribution
		2	07 12 23 3	TCP 2A Miniature Circuit Breaker, 2 Amp, CB's 4, 7-20
		18	31 18 20 3	TCP 3A Miniature Circuit Breaker, 3 Amp, CB 5, 6
		10	30 46 18 4	UK 6- FSI/C Circuit Breaker Base
		10	30 46 20 7	UT 4-MTD Feed Through Terminal Block (Neutral) UT 4-MTD-PE/S Grounding Terminal Block
17	Phoenix Contact	2	29 38 57 8	24VDC Power Supply, 2.5A, Quint-PS-100-240AC-24DC-2.5
18	Phoenix Contact	1	07 12 23 3	Terminal Blocks for 24VDC Distribution
		1	31 18 20 3	TCP 3A Miniature Circuit Breaker, 3 Amp (CB-51)
		4	30 46 09 0	UK 6- FSI/C Circuit Breaker Base
		6	30 46 18 4	UT 4-HESILED Indicating Fused Terminal Block 24VDC UT 4-MTD Feed Through Terminal Block
19	Phoenix Contact	1	56 00 46 2	Convenience Receptacle w/GFCI EM-DUO
20	Phoenix Contact	Lot	08 00 88 6	End Retainers E/NE 35 N
21	Sixnet	1	SLX-18MG-1	Industrial Ethernet Managed Switch
		2	GM-FIBER-SFP-500	Industrial Ethernet Gigabit Fiber Transceivers
22	Phoenix Contact	112	30 46 10 0	Terminal Blocks for Digital Inputs
		112	30 46 18 4	UT 4-HESILA 250 Indicating Fused Terminal Block 120VAC UT 4-MTD Feed Through Terminal Block
23	Phoenix Contact	16	30 46 10 0	Terminals for Digital Outputs
		16	30 46 18 4	UT 4-HESILA 250 Indicating Fused Terminal Block 120VAC UT 4-MTD Feed Through Terminal Block
24	Phoenix Contact	24	30 46 14 2	Terminal Blocks for Analog Inputs
		Lot	30 36 81 9	UT4-TG Fused Terminal
		72	30 46 18 4	P-FU 5x20 LED 24 Fuse Plug (qty as shown on drawings)
		12	30 46 20 7	UT4-MTD Terminal Block UT4-MTD-PE/S
25	Phoenix Contact	16	30 46 18 4	Terminal Blocks for Analog Outputs
		4	30 46 20 7	UT4-MTD Terminal Block UT4-MTD-PE/S
26	Phoenix Contact	Lot	30 46 20 7	Din Rail Bonding Terminals
				UT4-MTD PE/S Grounding Terminals
27	Phoenix Contact	5	28 38 18 6	Surge Suppression 24VDC/Analog TT-2PE-24DC
28	General Electric	1	N/A	24 Position Ground Bar
29	Phoenix Contact	1	28 34 48 1	24VDC Relay PR1-RSC3-LDP-24DC/2x21, MES1
30	Phoenix Contact	4	28 34 50 1	120VAC Relay PR1-RSC3-LV-120AC/2x21, 401,501,601,602
31	Electroswitch	1	101603A-2A	Snap action switch, 20A continuous, 3 pole, including "UPS\Bypass" faceplate, in 4 x 4 Carlin Box

REV	DATE	DESCRIPTION	BY
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1	01/18/10	Initial Submittal	CGN

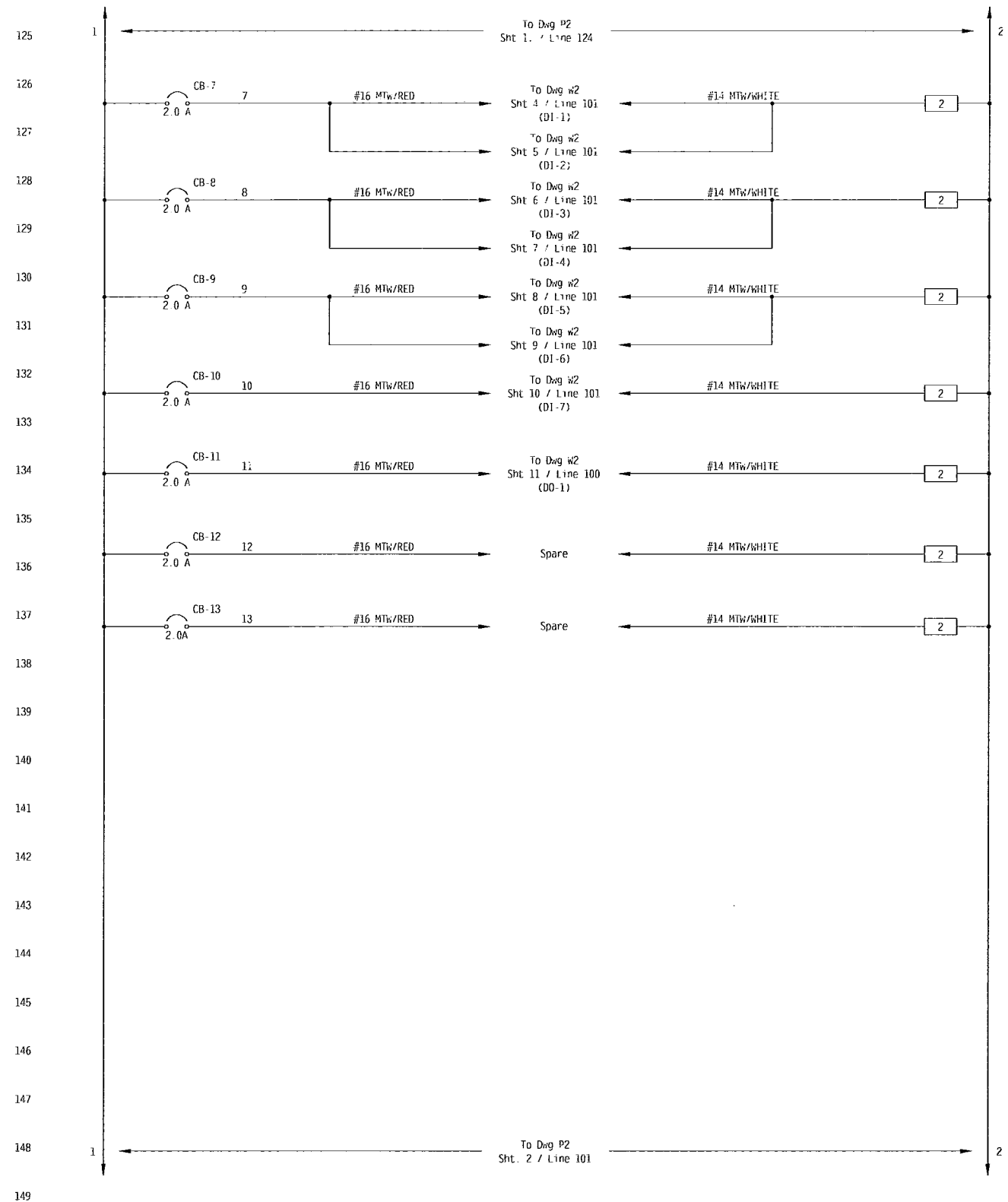
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02)
Interior Layout
PROJECT: Stafford Springs Water Pollution Control Upgrade
SCALE: CGN
DRAWN BY: CGN
CHECKED BY: JPM
APPROVED BY: JPM
DATE: 1/18/10
SHEET 2 OF SHEETS 2
DRAWING NO. 0904018-A2



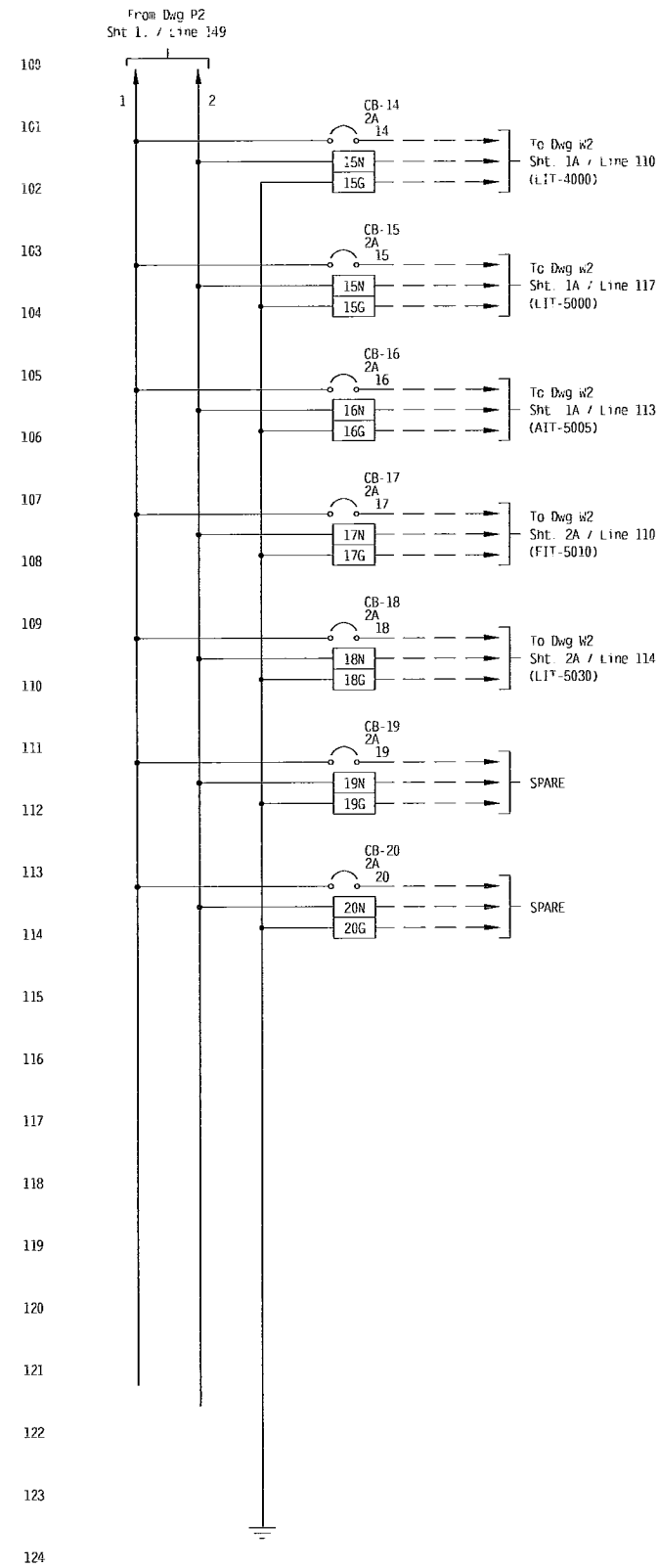
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 PANEL WIRING = = = = =

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1	01/18/10	Initial Submittal	CGN

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #2 (STCP-02) Power Distribution PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE: CGN	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 1	OF SHEETS 3	DRAWING NO. 0904018-P2

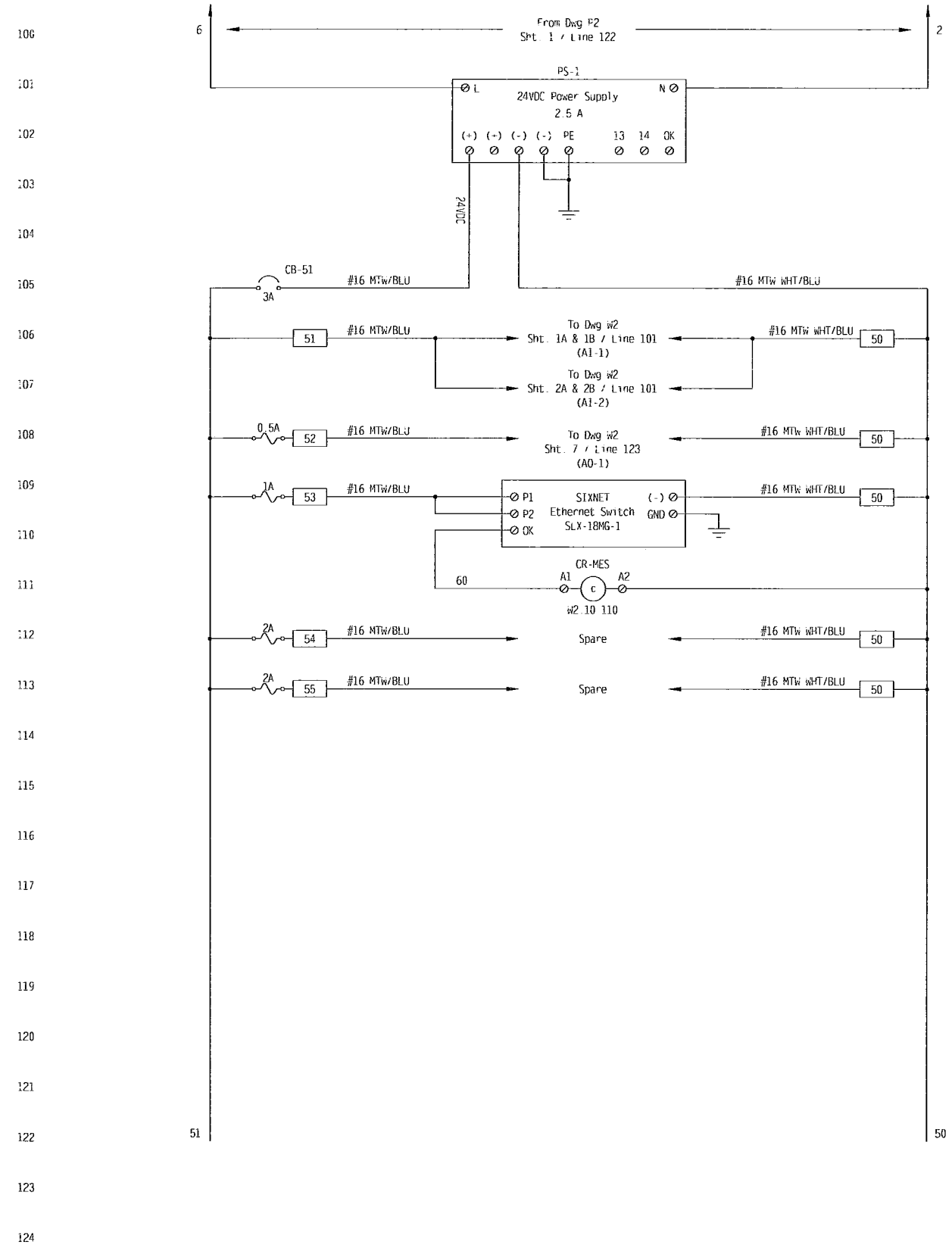


KEY:
 FIELD WIRING - - - - -
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AS-BUILT

		Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #2 (STCP-02) Power Distribution	
		PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM		
DATE: 01/18/10	SHEET 2	OF SHEETS 3	DRAWING NO. 0904018-P2		
REV	DATE	DESCRIPTION	BY		



KEY:
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 PANEL WIRING ————

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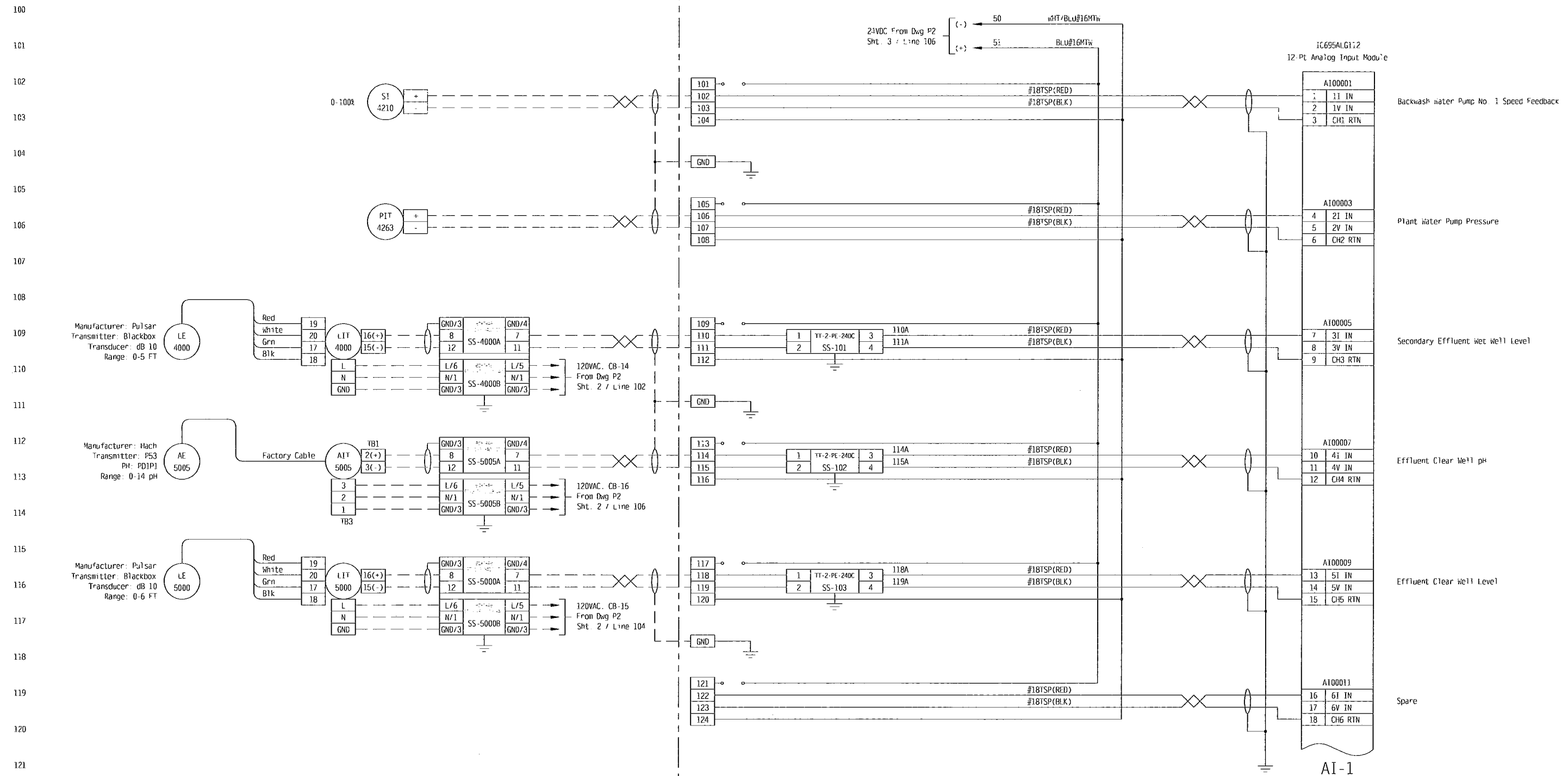
Aaron Associates
 478 West Main Street
 Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Power Distribution			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 3	OF SHEETS 3	DRAWING NO. 0904018-P2

AS BUILT

Field Devices

Cabinet Devices



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KEY:
FIELD WIRING - - - -
PANEL WIRING _____

AS-BUILT

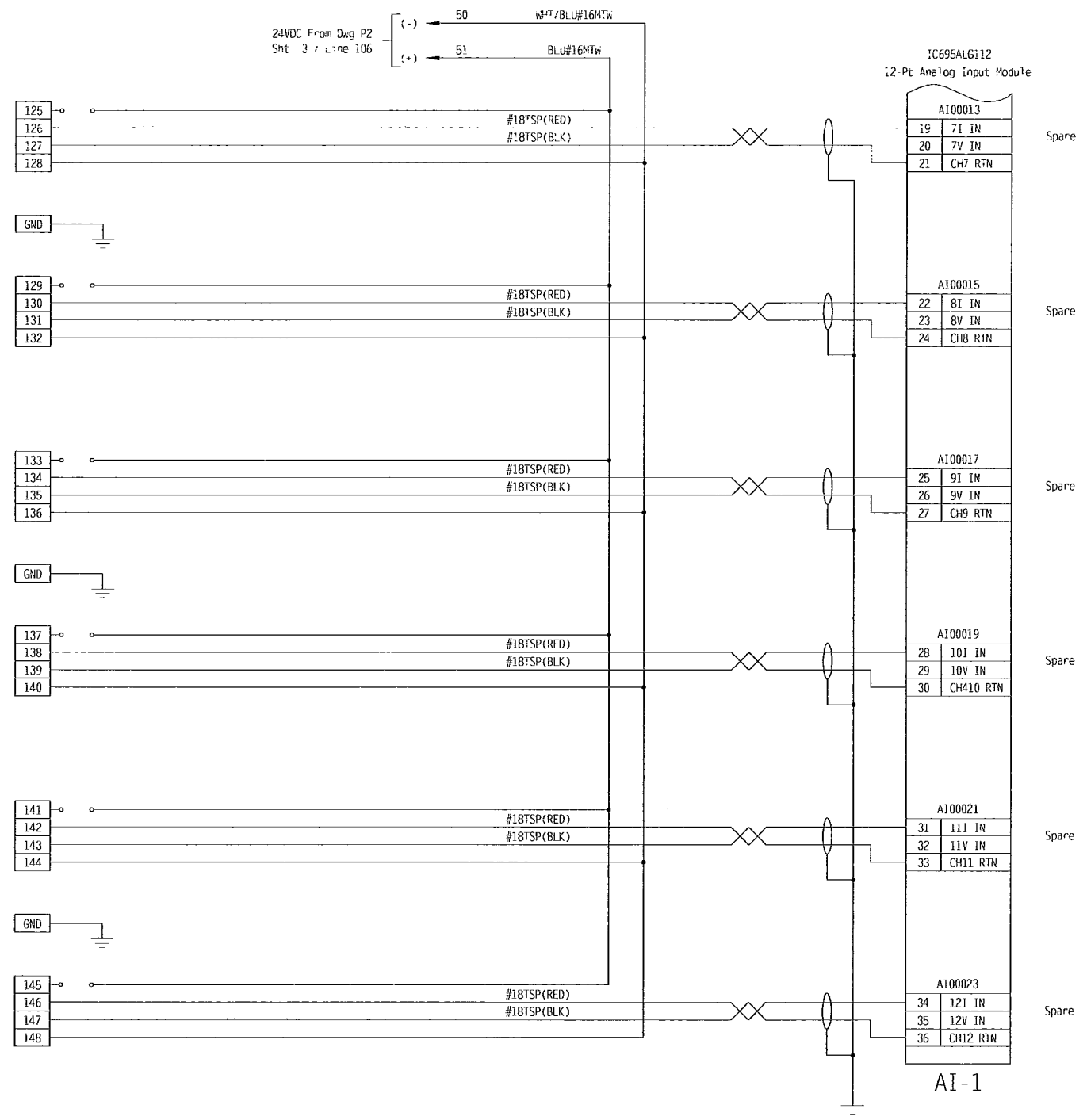
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Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #2 (STCP-02) Analog Input #1	
PROJECT: Stafford Springs Water Pollution Control Upgrade		SCALE: CGN	CHECKED BY: JPM
DATE: 01/18/10	SHEET: 1A	OF SHEETS: 11	APP'D BY: JPM
DRAWING NO. 0904018-W2			

Field Devices

Cabinet Devices

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AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

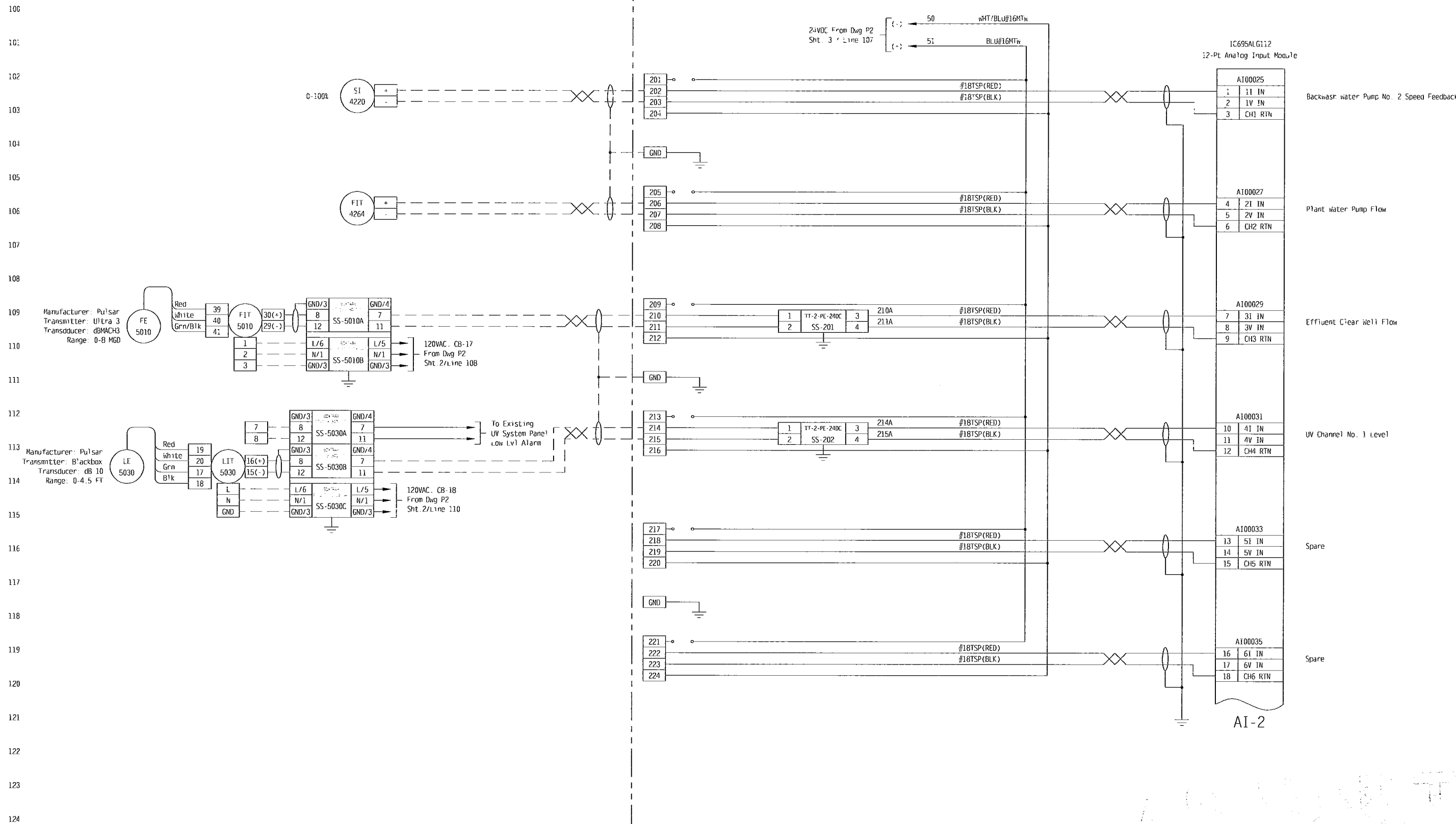
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Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Analog Input #1			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:
	CGN	JPM	JPM
DATE:	SHEET	OF SHEETS	DRAWING NO.
01/18/10	1B	11	0904018-W2

Field Devices

Cabinet Devices



KEY:
 FIELD WIRING - - - - -
 PANEL WIRING - - - - -

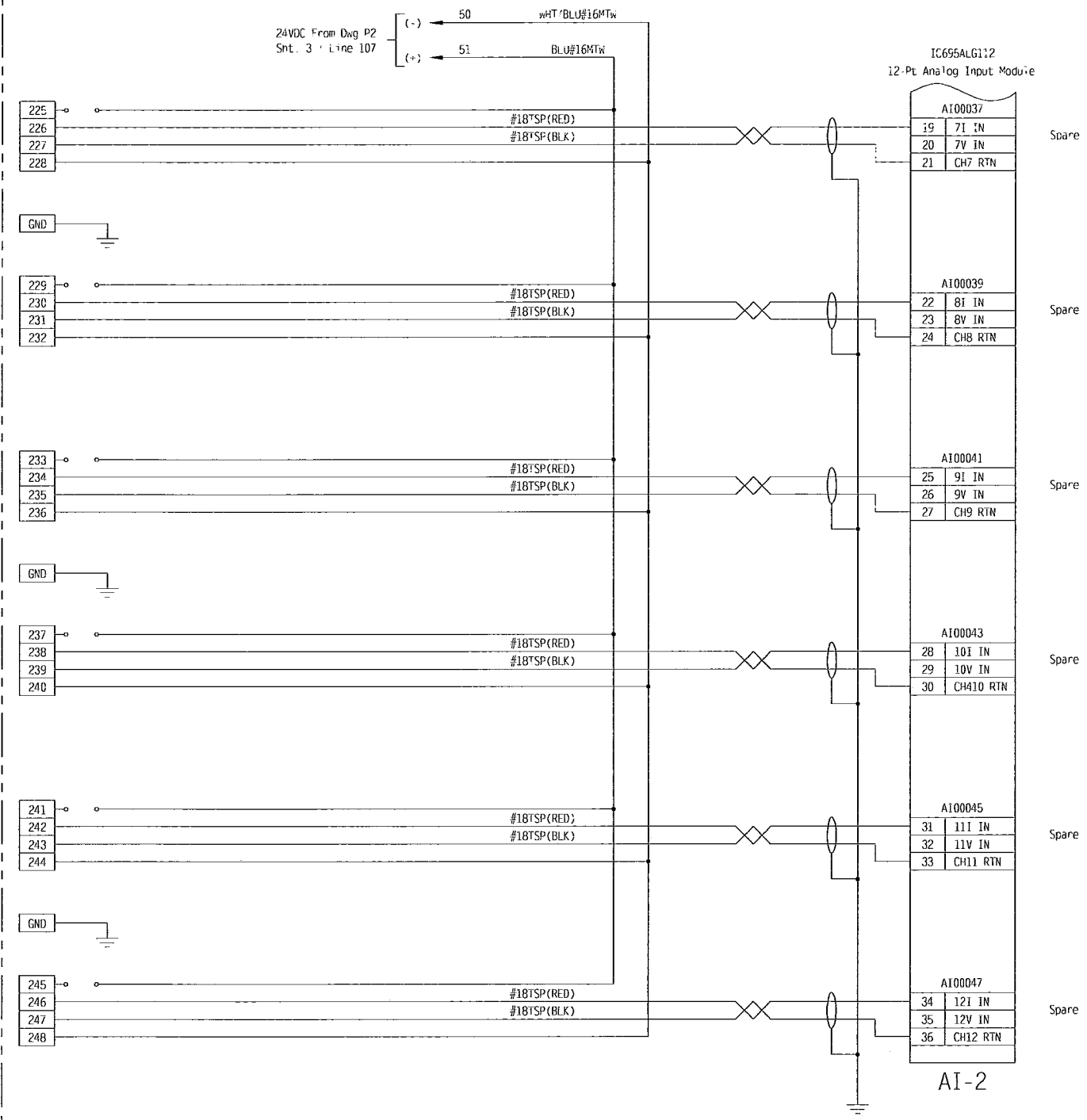
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2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates 478 West Main Street Waterbury, CT 06702		TITLE: Secondary Treatment Control Panel #2 (STCP-02) Analog Input #2 PROJECT: Stafford Springs Water Pollution Control Upgrade
SCALE: CGN	DRAWN BY: JPM	CHECKED BY: JPM
DATE: 01/18/10	SHEET: 2A	OF SHEETS: 11
DRAWING NO. 0904018-W2		APPD BY: JPM

Field Devices

Cabinet Devices

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KEY:
FIELD WIRING - - - - -
PANEL WIRING _____

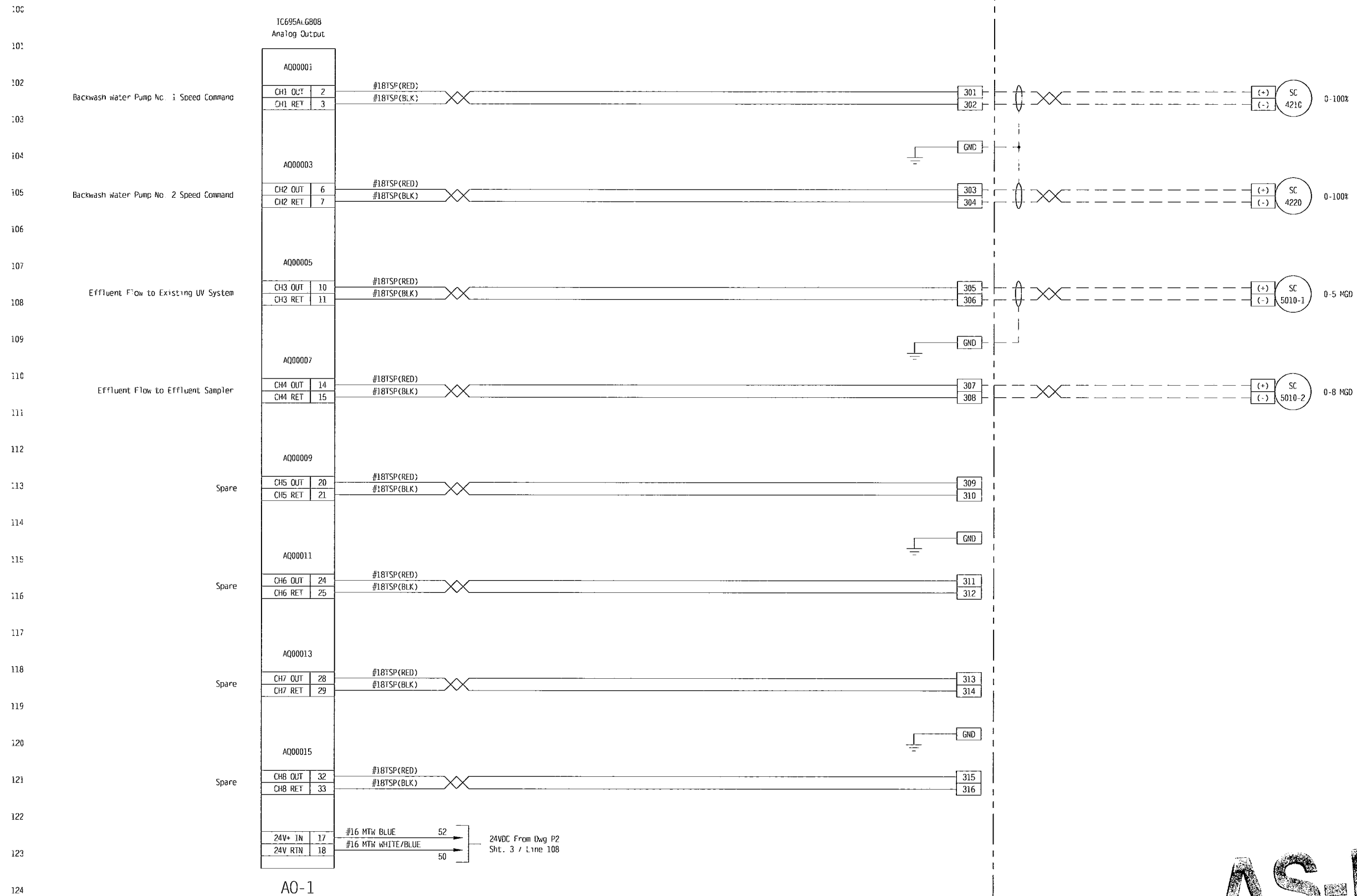
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Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Analog Input #2			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET: 2B	OF SHEETS: 11	DRAWING NO.: 0904018-W2

Cabinet Devices

Field Devices



AS-BUILT

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

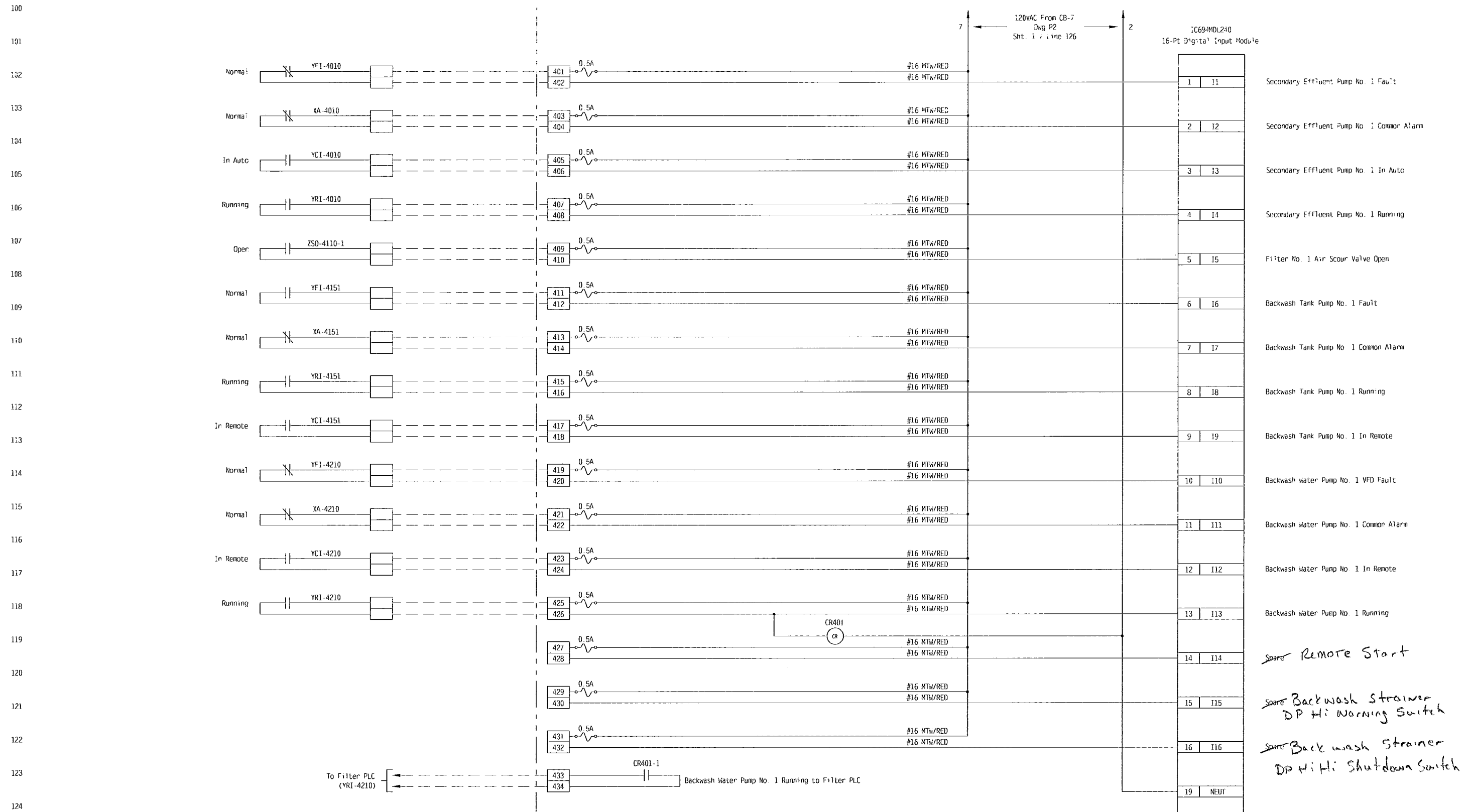
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Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Analog Output #1			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 3	OF SHEETS 11	DRAWING NO. 0904018-W2

Field Devices

Cabinet Devices



KEY:
 FIELD WIRING - - - - -
 PANEL WIRING - - - - -

AS-BUILT

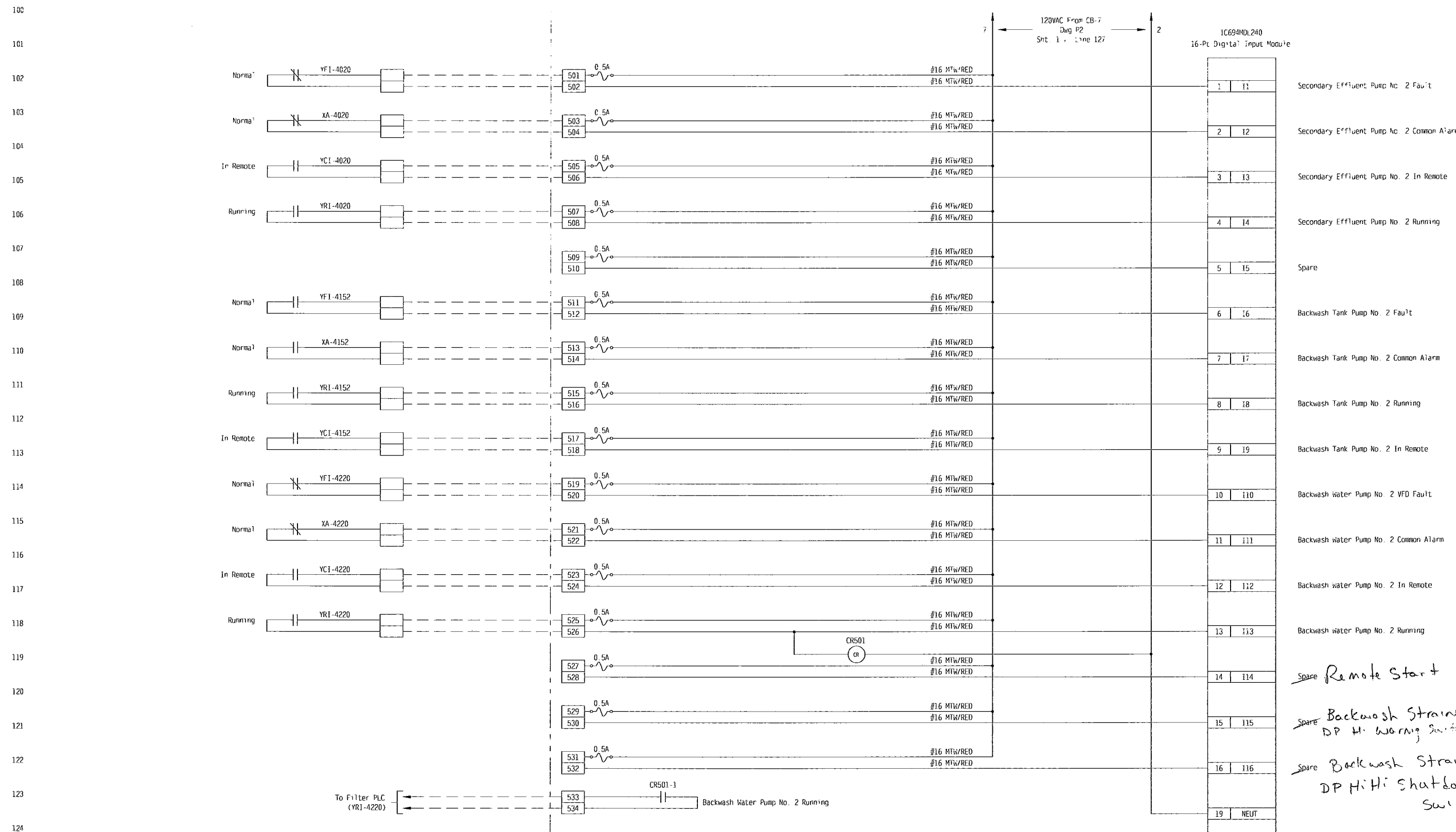
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6	6/10/11	As Built Revised	CGN
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2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates
 478 West Main Street
 Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Digital Input #1			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APPROVED BY: JPM
DATE: 01/18/10	SHEET 4	OF SHEETS 11	DRAWING NO. 0904018-W2

Field Devices

Cabinet Devices



Spare Remote Start
Spare Backwash Strainer DP Hi Warning Switch
Spare Backwash Strainer DP Hi Hi Shutdown Switch

DI-2

KEY:
 FIELD WIRING - - - - -
 PANEL WIRING - - - - -

Aaron Associates

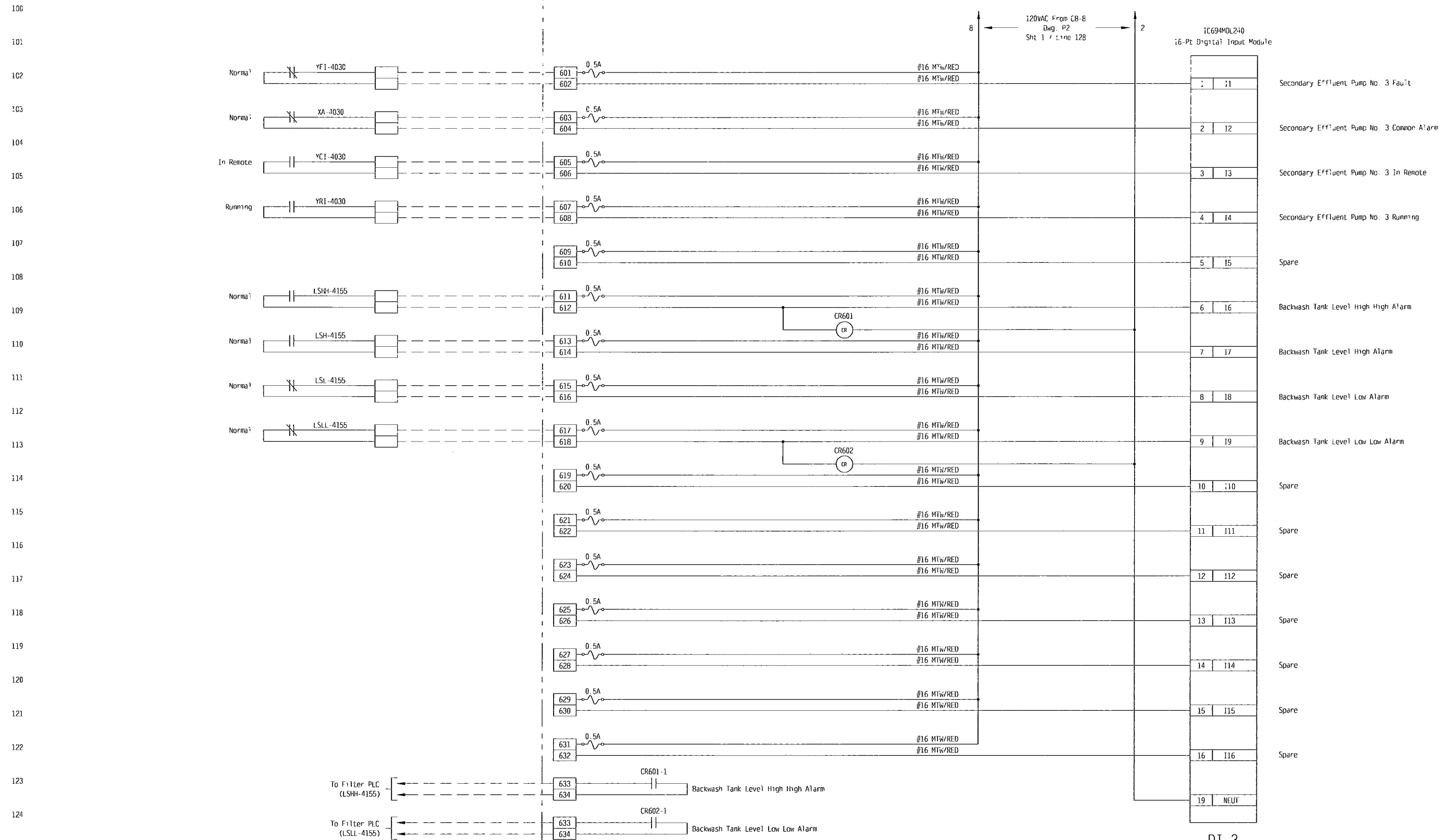
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5	04/15/11	Change Order for UPS wiring	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates
 478 West Main Street
 Waterbury, CT 06702

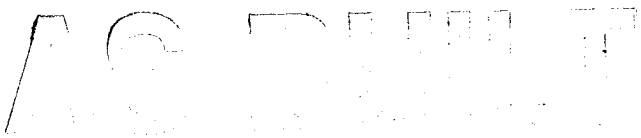
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PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE: CGN	CHECKED BY: JPM
DATE: 01/18/10	APP'D BY: JPM
SHEET: 5	DRAWING NO.: 0904018-W2
OF SHEETS: 11	

Field Devices

Cabinet Devices



KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -



REV	DATE	DESCRIPTION	BY
6	6/10/11	As Built Revised	CGN
5	04/15/11	Change Order for UPS wiring	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

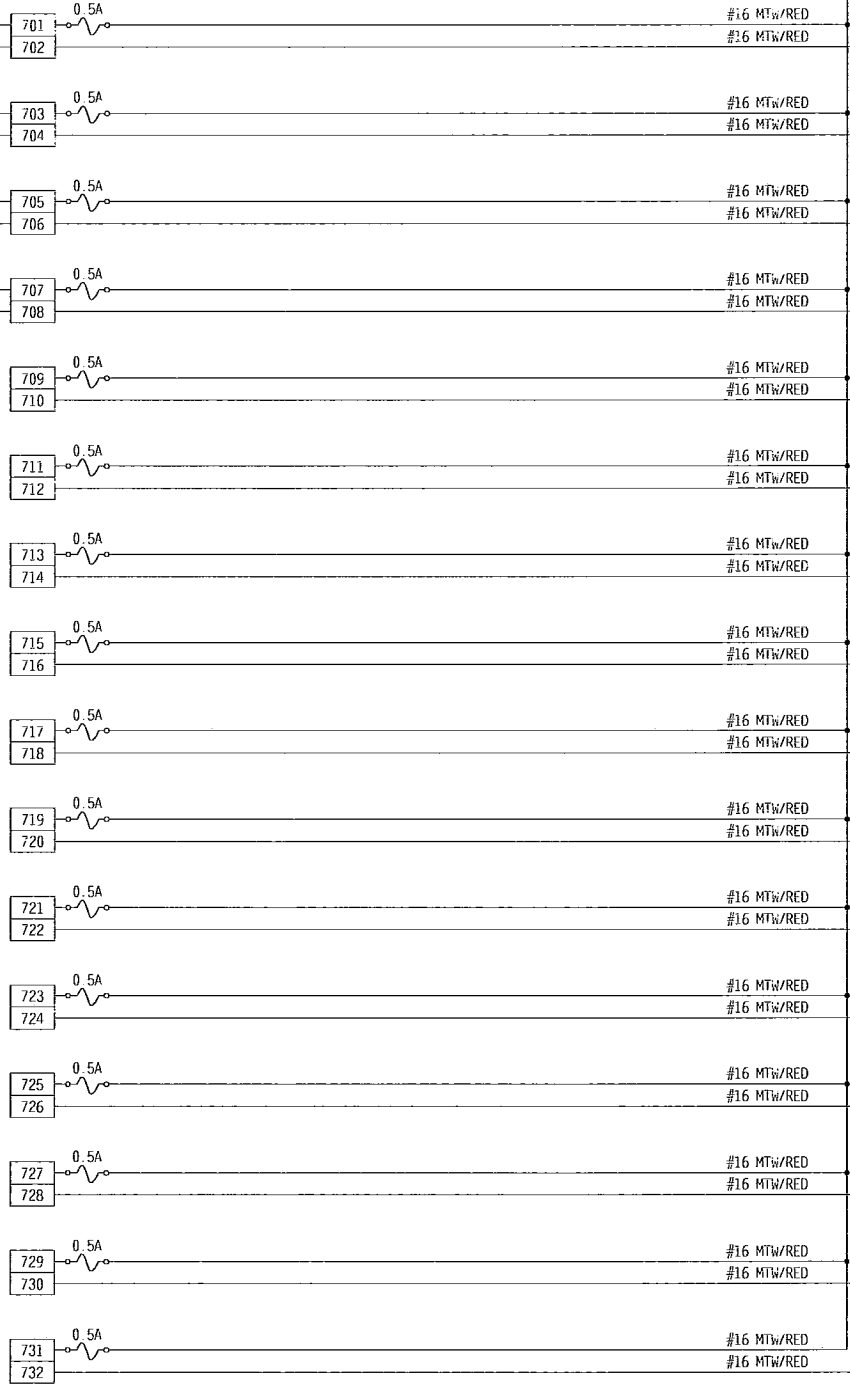
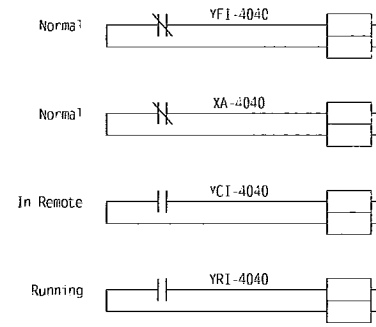
Aaron Associates		TITLE: Secondary Treatment Control Panel #2 (STCP-02)	
478 West Main Street		Digital Input #3	
Waterbury, CT 06702		PROJECT: Stafford Springs Water Pollution Control Upgrade	
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 6	OF SHEETS 11	DRAWING NO. 0904018-W2

DI-3

Field Devices

Cabinet Devices

100
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124



120VAC From CB-8
Dwg P2
Sht 1 / Line 129

IC694MDL24C
16-Port Digital Input Module

1	I1
2	I2
3	I3
4	I4
5	I5
6	I6
7	I7
8	I8
9	I9
10	I10
11	I11
12	I12
13	I13
14	I14
15	I15
16	I16
19	NEUT

Secondary Effluent Pump No. 4 Fault

Secondary Effluent Pump No. 4 Common Alarm

Secondary Effluent Pump No. 4 In Remote

Secondary Effluent Pump No. 4 Running

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

Spare

DI-4

KEY:
FIELD WIRING ---
PANEL WIRING ———

Handwritten signature/initials

REV	DATE	DESCRIPTION	BY
6	6/10/11	As Built Revised	CGN
5	04/15/11	Change Order for UPS wiring	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

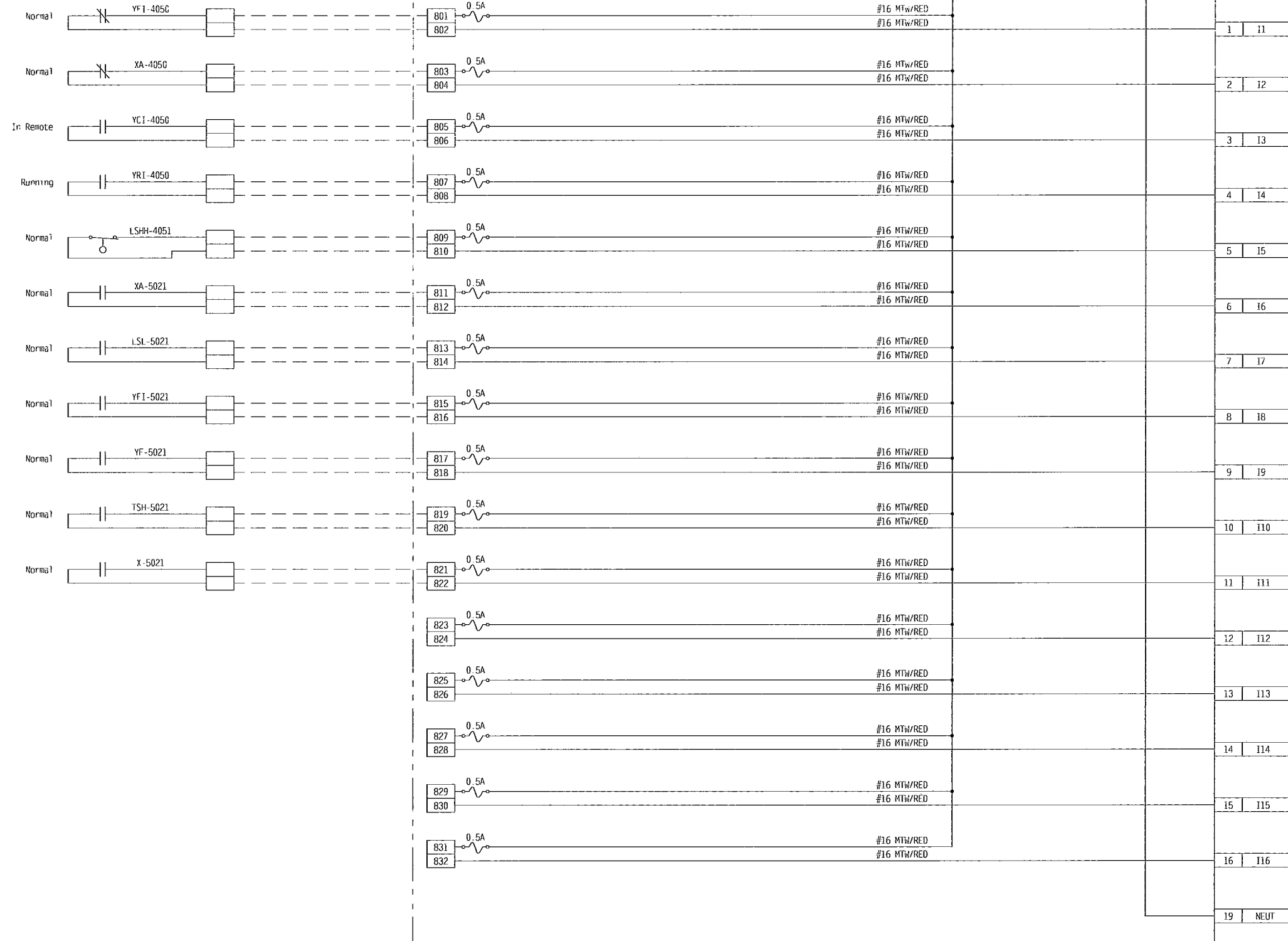
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Digital Input #4			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 7	OF SHEETS 11	DRAWING NO. 0904018-W2

Field Devices

Cabinet Devices

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DI-5

KEY:
FIELD WIRING ---
PANEL WIRING - - -

AS-BUILT

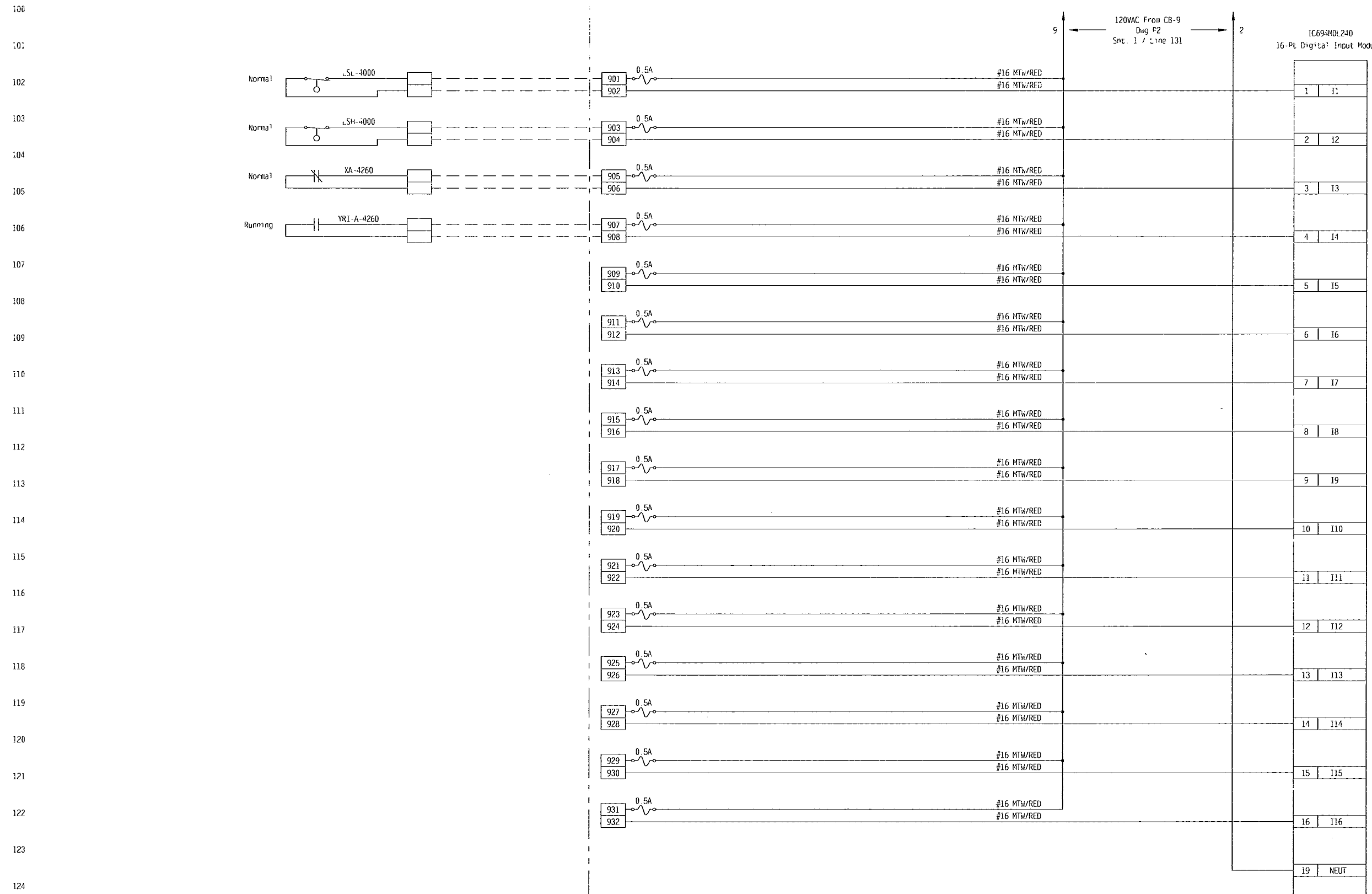
REV	DATE	DESCRIPTION	BY
6	6/10/11	As Built Revised	CGN
5	04/15/11	Change Order for UPS wiring	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE:			
Secondary Treatment Control Panel #2 (STCP-02) Digital Input #5			
PROJECT:			
Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY:	CHECKED BY:	APP'D BY:
	CGN	JPM	JPM
DATE:	SHEET	OF SHEETS	DRAWING NO.
01/18/10	8	11	0904018-W2

Field Devices

Cabinet Devices



- 1 | 1 | Secondary Effluent wet well Low Level
- 2 | 12 | Secondary Effluent wet well High Level
- 3 | 13 | Plant water Pump Common Alarm
- 4 | 14 | Plant water Pump No. 1 Running
- 5 | 15 | Spare
- 6 | 16 | Spare
- 7 | 17 | Spare
- 8 | 18 | Spare
- 9 | 19 | Spare
- 10 | 110 | Spare
- 11 | 111 | Spare
- 12 | 112 | Spare
- 13 | 113 | Spare
- 14 | 114 | Spare
- 15 | 115 | Spare
- 16 | 116 | Spare
- 19 | NEUT

DI-6

KEY:
FIELD WIRING ---
PANEL WIRING ---

AS-BUILT

REV	DATE	DESCRIPTION	BY
6	6/10/11	As Built Revised	CGN
5	04/15/11	Change Order for UPS wiring	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

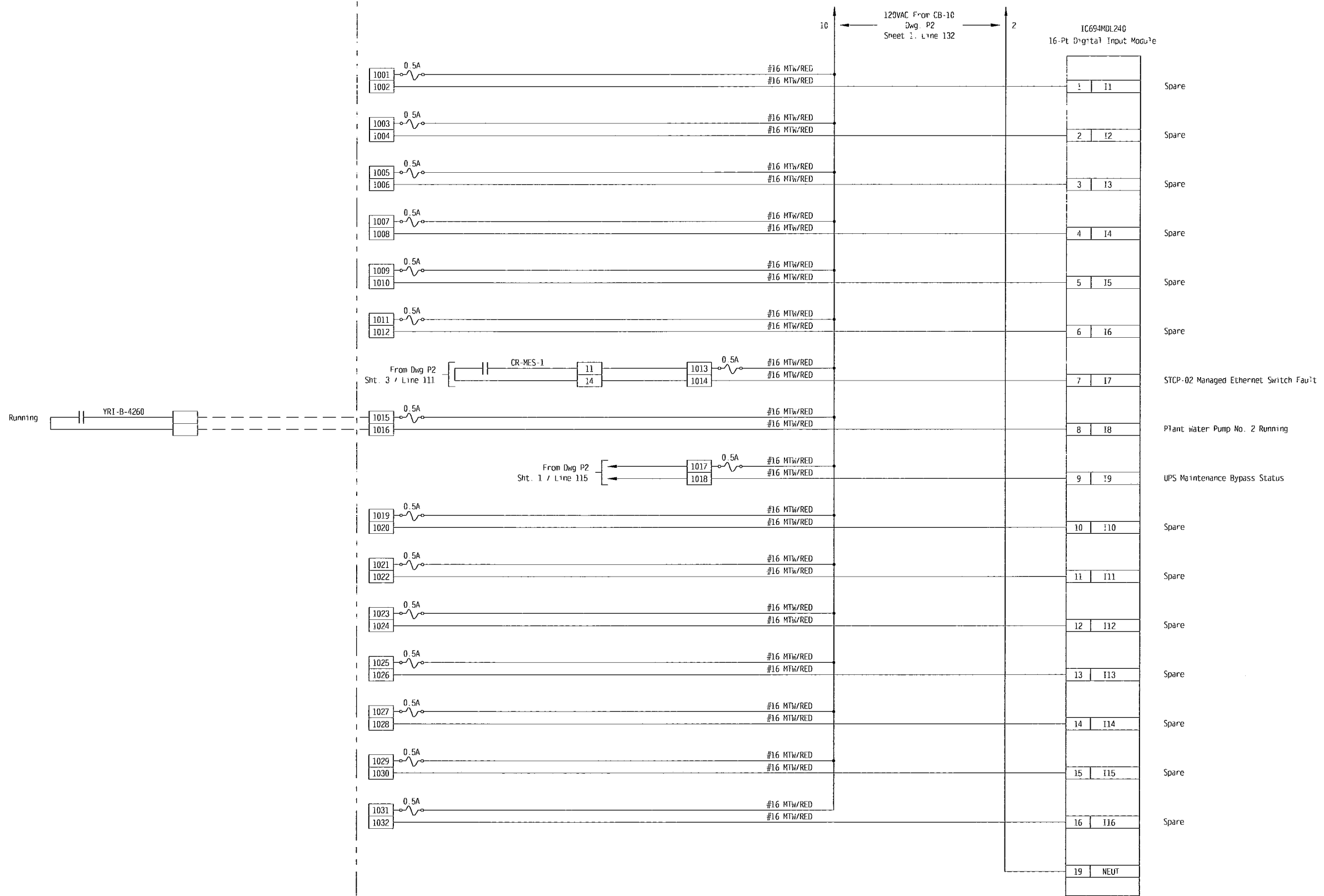
Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Digital Input #6			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 9	OF SHEETS 11	DRAWING NO. 0904018-W2

Field Devices

Cabinet Devices

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101
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DI-7

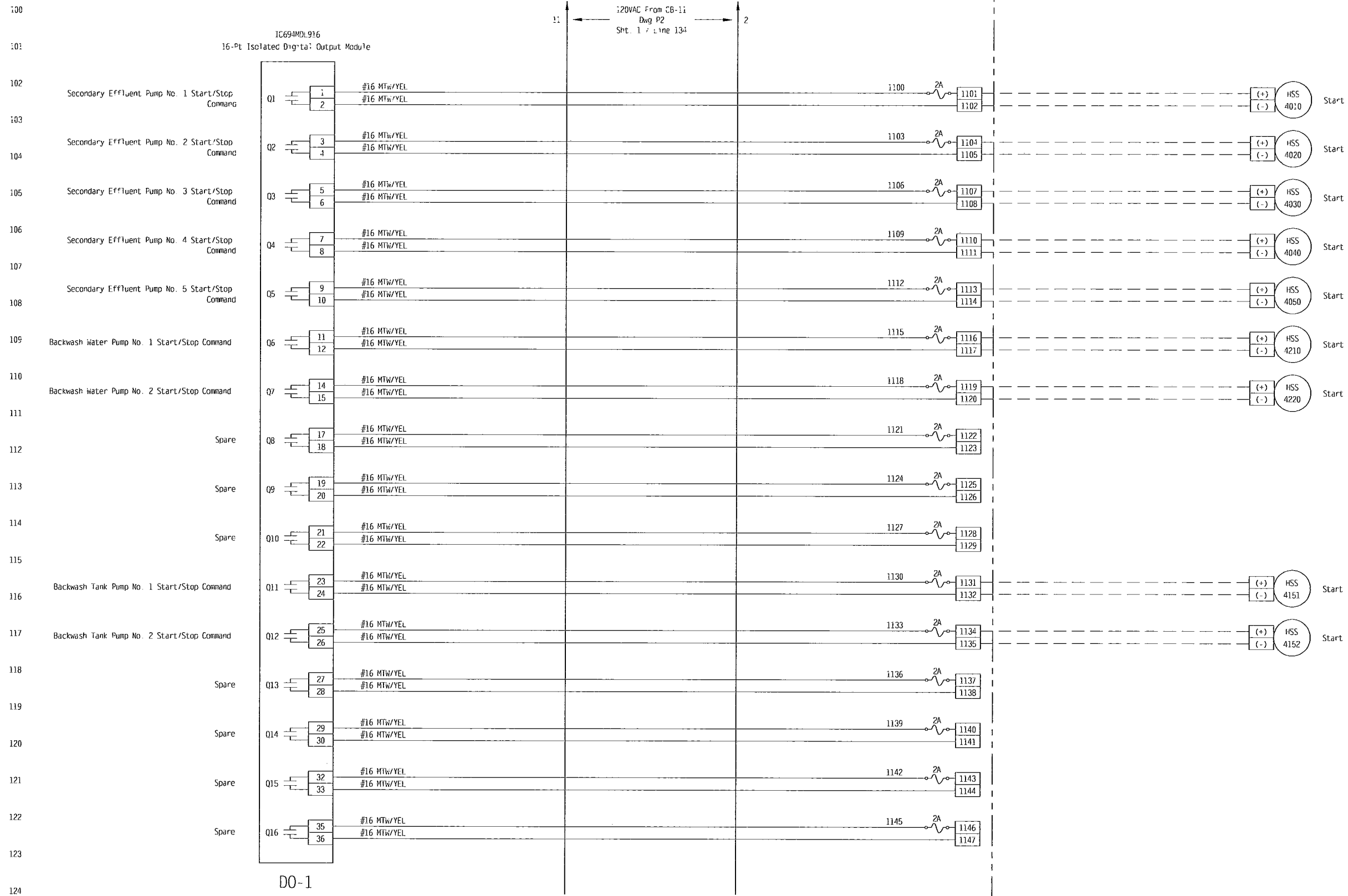
KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -

AS BUILT

6	6/10/11	As Built Revised	CGN	Aaron Associates 478 West Main Street Waterbury, CT 06702	TITLE: Secondary Treatment Control Panel #2 (STCP-02) Digital Input #7 PROJECT: Stafford Springs Water Pollution Control Upgrade	
5	04/15/11	Change Order for UPS wiring	JLR			
4	03/07/11	Revised per Change Order	CGN			
3	12/09/10	As Built	JPM			
2	07/09/10	Revised per Engineers comments	JPM			
1	01/18/10	Initial Submittal	CGN			
REV	DATE	DESCRIPTION	BY	SCALE: CGN	CHECKED BY: JPM	APPROVED BY: JPM
				DATE: 01/18/10	SHEET 10 OF SHEETS 11	DRAWING NO. 0904018-W2

Cabinet Devices

Field Devices



DO-1

KEY:
FIELD WIRING - - - - -
PANEL WIRING - - - - -



REV	DATE	DESCRIPTION	BY
6	6/10/11	As Built Revised	CGN
5	04/15/11	Change Order for UPS wiring	JLR
4	03/07/11	Revised per Change Order	CGN
3	12/09/10	As Built	JPM
2	07/09/10	Revised per Engineers comments	JPM
1	01/18/10	Initial Submittal	CGN

Aaron Associates
478 West Main Street
Waterbury, CT 06702

TITLE: Secondary Treatment Control Panel #2 (STCP-02) Digital Output #1			
PROJECT: Stafford Springs Water Pollution Control Upgrade			
SCALE:	DRAWN BY: CGN	CHECKED BY: JPM	APP'D BY: JPM
DATE: 01/18/10	SHEET 11	OF SHEETS 11	DRAWING NO. 0904018-W2

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SECTION 406121.10 - PROCESS CONTROL SYSTEM TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes process control system testing, where the Applications Engineering services are performed by a pre-selected third party.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
- C. Furnish all labor, materials, equipment and incidentals required to complete the testing of all devices and systems furnished and installed as detailed on Drawings, and as specified herein.
- D. A third party, referred to as Applications Engineering System Supplier (AESS), has been pre-selected to perform Applications Engineering. Provide support services to AESS as defined herein.
- E. AESS to program those PCSS provided PLCs, servers, workstations, industrial computers, tablets, cellular routers, protocol converters, firewalls, and switches shown on Drawings. Similar equipment provided by equipment vendors to be programmed by respective equipment vendor.
 - 1. AESS scope of work includes Programmable Logic Controller (PLC) programming, testing of PLC logic, Human Machine Interface (HMI) graphics development, HMI and Industrial Computer software configuration, database development, report development, and startup/training activities associated with the configured portions of the PLC/HMI system.

1.3 DEFINITIONS

- A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.
- B. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.

- C. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine level equipment.
- D. Operator Interface Terminal (OIT): A hardware component of the HMI used for device level control and monitoring.
- E. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.
- F. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.
- G. Uninterruptible Power Supply (UPS): A device capable of providing emergency battery power when the main power source fails.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 ACTION SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
- B. Testing Submittals - Submit, in one submittal, the following testing related documents:
 - 1. Status Signoff Forms:
 - a. Develop and submit project specific I/O Status signoff forms to be used during factory and field testing to organize and track each loop's inspection, adjustment, calibration, configuration, and testing status and sign off. Include sign-off forms for each testing phase showing all loops.
 - 1) Example forms are shown in the Appendices.
 - 2) Separate forms for factory and field testing can be used, or they can be combined, at the discretion of the PCSS.
 - 3) Submit testing forms prior to start of testing.
 - 2. Testing Procedures:
 - a. Submit detailed procedures proposed to be followed for the PCSS portion of each of the tests specified herein. The test procedures serve as the basis for the execution of the required tests to demonstrate that the system meets and functions as specified. At a minimum, provide the following test procedures:
 - 1) Network and Communications Testing.
 - 2) I/O Testing.
 - 3) UPS.
 - 4) Control panel power, indicators, and hardwired logic tests.

- b. Structure documents in an orderly and easy to follow manner to facilitate an efficient and comprehensive test.
- c. Test procedures indicate all pre-testing setup requirements, all required test equipment, and simulation techniques to be used.
- d. Do not start testing until all Testing Submittals have been approved.
- e. AESS will write the software related test procedures.

C. Application Development Submittal.

1. Within thirty calendar days after either approval of the PCSS submitted hardware submittal or notification from the Engineer; deliver to the AESS hardware and software for completing the PLC and HMI application development. Provide components of the same manufacturer and model number as specified and approved for the plant control system. Unless otherwise noted below, if spares of these units are required to be furnished, then this equipment can be counted towards the spares requirements. If spares for these units are not required, then this equipment is considered additional scope of supply over equipment specified elsewhere.
2. Refer to '406100A CDM - Appendix A - Hardware & Software Matrix' as well as Section 406895 - System Support Software for requirements for software installation
3. PCSS to deliver the following items:
 - a. All hardware and software except the following:
 - 1) SCADA Rack (Rack fans, Cat-6 patch panel)
 - 2) UPS system
4. PCSS is responsible for ensuring all equipment and supplies are received by the AESS. When configuration is complete, the PCSS is responsible for ensuring all equipment and supplies are delivered to the Stafford Springs WWTF (from the AESS testing facility located at 75 State Street, Boston, MA as noted below)
5. Notify AESS in writing a minimum of one week in advance of delivery. Schedule deliveries between the hours of 8:30 am and 4:00 pm, Monday through Friday, legal holidays excluded.
6. Deliver the equipment to:

CDM Smith
Attention – Stephen Segalla-Automation Group
75 State Street, Suite 701
Boston, MA 02109
617-452-6000
7. PCSS is responsible for all shipping and insurance costs of early development hardware to and from the AESS once configuration and software testing is completed in accordance with the project schedule. The PCSS will deliver the development system to Stafford Springs WWTF and connect all system components in advance of schedule AESS testing.

1.6 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For Test Documentation of system:

1. Upon completion of each required test, document the test by submitting a copy of the signed off Testing Status forms. Testing is not considered complete until the signed-off forms have been submitted and approved. Submittal of other test documentation, including "highlighted" wiring diagrams with field technician notes, are not acceptable substitutes for the formal test documentation.

1.7 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 "Process Control and Enterprise Management System General Provisions."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TESTING - GENERAL

- A. Refer to Section 406100 "Process Control and Enterprise Management Systems and General Provisions."
- B. Track results of testing on a project specific status sign off form or similar document. The PCSS is responsible for maintaining the sheet. Appendix of this Section has an example template for this sheet.
- C. Tests the PCSS is required to perform are as follows:
 1. Field Testing:
 - a. Operational Readiness Test (ORT).
 - b. Site Acceptance Test (SAT).
- D. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide all special testing materials and equipment required for a suitable means of simulation.
- E. PCSS to coordinate all required testing with Contractor, affected Subcontractors, Engineer, and Owner.
- F. Do not ship equipment to jobsite until Engineer or Owner has approved the system as ready for shipment.
- G. Engineer reserves the right to test or re-test any functions.
- H. Correction of Deficiencies:
 1. Correct deficiencies in workmanship and/or items not meeting specified testing requirements at no additional cost to Owner.

2. Repeat testing, as specified herein, after correction of deficiencies is made until specified requirements are met. Perform this work at no additional cost to Owner.

3.2 FIELD TESTING - OPERATIONAL READINESS TEST (ORT)

- A. Purpose of ORT is to check that process equipment, instrument installation, instrument calibration, instrument configuration, field wiring, control panels, and all other related system components are ready to monitor and control the processes. This test will determine if the equipment is ready for operation.
- B. This test takes place prior to startup. Prior to starting this test, install relevant process equipment and mechanically test, install instruments and control panels, and complete field wiring.
- C. Required Documents for Test:
 1. Master copy of the PCSS developed field testing signoff forms.
 2. Testing procedures.
- D. These inspections, calibrations, and tests do not require witnessing. However, Engineer may review and spot-check the testing process periodically. The PCSS to correct all deficiencies found prior to start-up.
- E. PCSS to maintain Sign-off forms and Calibration forms at job site and make them available to Engineer/Owner at any time.
- F. Perform the following steps as part of the ORT:
 1. PCSS hardware and I/O testing
 2. I/O Testing to the HMI and OITs with AESS.
 3. Testing of Automatic control strategies with AESS.
- G. PCSS hardware and I/O testing:
 1. Purpose of PCSS hardware and I/O signal testing is to check that process equipment, instrument installation, calibration, configuration, field wiring, and control panels are set-up correctly to monitor and control the processes. This test is commonly referred to as a "loop test" or an I/O checkout.
 2. This test follows the installation of the process control system components. Perform this test independently of the AESS as this test will determine if the system is ready for the AESS testing as defined below.
 3. PCSS in conjunction with the Contractor and AESS to test signals under process conditions. Preferred test method will always be to execute the test wherever possible to the end elements. For example, the preferred test will prove valve open/close limit switches by operating the valve, not by installing a jumper on the limit switch contacts. However, if equipment or process is not available to test signal over its entire calibrated range, PCSS may test using a simulation method and make a note on sign-off form.
 4. PCSS may load their own "dummy program" in PLC in order to facilitate their ORT requirements.
 5. An I/O Signal test to be performed by PCSS as part of ORT prior to AESS arriving on site to test the software:

- a. Discrete Input: At device or instrument, change signal condition from inactive to active state. Observe results on all indicators within the loop such as PLC I/O register, pilot light, horn, beacon etc. as shown on P&IDs.
 - b. Discrete Output: Test signals by forcing the output on in the output register, then verify equipment responds accordingly.
 - c. Analog Input: Test analog signal over entire engineering range at various intervals including 0, 50%, and 100% as well as on increasing and decreasing range. Observe results on all indicators within the loop such as PLC I/O register, recorders, digital indicators, etc.
 - d. Analog Output: Test signals by entering values in the output register to force the output to zero percent, 50 percent, and 100 percent of full scale, then verifying equipment responds accordingly.
6. PCSS maintains Field Testing Spreadsheet at job site and make them available to Engineer/Owner at any time.
 7. These inspections, calibrations, and tests do not require witnessing. However, Engineer will review and spot-check the PCSS test process periodically. PCSS to correct all deficiencies found prior to start-up.
 8. Prior to AESS checkout of I/O to HMI, PCSS is required to submit a Field Testing Sign off spreadsheet with ORT sections completed to engineer for review along with any instrument calibration and configuration reports for PCSS supplied instruments in order to document the calibration and configuration procedures of instruments and checkout of I/O.

H. Input/Output (I/O) Testing to the HMI and OITs with AESS.

1. Purpose of the I/O testing to HMI and OITs with AESS is to check that the Instruments and field equipment are connected properly and work from the end device, through PLC, to HMI and OIT units.
2. PCSS in conjunction with the Contractor and AESS to test signals under process conditions.
3. Perform the following I/O tests:
 - a. Discrete Input: At the device or instrument, change signal condition from the inactive to active state. Observe results on all indicators within loop such as HMI screens, OIT screens, pilot lights, horns, beacons, etc.
 - b. Analog Input: Test analog signal over entire engineering range at various intervals including 0, 50%, and 100% as well as on increasing and decreasing range. Observe results on all indicators within loop such as HMI screens, OIT screens, recorders, digital indicators, etc.
 - c. Discrete Output: Test signals by switching the equipment to manual control at HMI and OIT nodes and turning the output on or using other means to turn the output on. Then verify equipment responds accordingly.
 - d. Analog Output: Test signals by switching the equipment to manual control at HMI and OIT nodes and ramping the output up and down. Then verify equipment responds accordingly.

I. Testing of Automatic Control Strategies:

1. Verify all automatic control strategies using actual process equipment and instruments, or other means, to verify logic performs as expected. Verify faults and logical failure

scenarios for control strategies such as instrument failures, equipment failures, loss of communication between HMI Server and PLC, loss of peer-to-peer communication, out of range testing for analog inputs, loss of power, and all other strategies specified in control strategy document. This test to be run by AESS. PCSS to support AESS by simulating signals, jumping out switches, and any other related testing support as needed.

- J. Test UPS to verify UPS switch power correctly while keeping all UPS powered loads online. Also, test the sizing of UPS by switching off line power to UPS and verify if they maintain specified run time.
- K. For all panels with enclosures modified by this contract, test internal control panel temperature under full running conditions to ensure proper cooling/ventilation is being provided.
- L. After coordinating with Operations, perform a "Black Start" of the plant to confirm plant operation recovers as specified in Contract Documents. Black start means shutting off power to the plant and turning it back on. Perform separate tests by recovering the plant while on generator (if a generator is specified) and while on utility power.
- M. Upon successful completion of ORT, PCSS to submit a record copy of test results as specified in PART 1 and request scheduling of system startup.

3.3 FIELD TESTING - FUNCTIONAL DEMONSTRATION TEST (FDT)

- A. A separate FDT is not required.

3.4 FIELD TESTING - SITE ACCEPTANCE TEST (SAT)

- A. After system is started-up and running treatment process in automatic control to extent possible, system to undergo a test as defined in Section 019113 "General Commissioning Requirements".
- B. While this test is proceeding, Engineer and Owner have full use of system. Allow only plant operating personnel to operate equipment associated with live plant processes. Plant operations to remain the responsibility of Owner and decision of plant operators regarding plant operations is final.
- C. During this test, PCSS personnel to be present to address any potential issues that would impact system operation. PCSS is expected to provide personnel for this test who have an intimate knowledge of equipment supplied as part of this system. When PCSS personnel are not on-site, provide cell phone/pager numbers that Owner personnel can use to ensure that support staff are available by phone and/or on-site within four hours of a request by operations staff.
- D. PCSS to analyze and correct any malfunctions during test. In event of rejection of any part or function, perform repairs or replacement within 5 days.
- E. Throughout duration of SAT, do not make software or hardware modifications to system without prior approval from Owner or Engineer.

END OF SECTION 406121.10

APPENDIX 406121.10 -A: EXAMPLE INPUT/OUTPUT (I/O) STATUS SIGN OFF FORM

An example template for I/O Status signoff form to be used for documenting testing results to Owner is attached. PCSS is required, prior to testing, to create a project specific I/O Status signoff form based on attached template or approved equal. PCSS may obtain an electronic copy of template from Engineer or develop it on their own.

[Project Name] Appendix A - Input/Output (I/O) Status Sign-Off Form

4-Jun-14

PLC	Signal Tag	Description	Range or Active State when closed	P&ID	Signal	Rack	Slot	Channel	Instru- ment Alarm Setpoint	Calibrate, config., and Wiring complete	Date	I/O Tested	Date	Notes	
PLC-SC	LIT-4000-1	Secondary Clarifier No. 1 Sludge Level	0-10 ft	8	AI	2	1	0							
PLC-SC	LIT-4010-3	Secondary Clarifier No. 3 Sludge Level	0-10 ft	8	AI	2	1	1							
PLC-SC	SI-4100-1	RAS Pump No. 1 Speed Feedback	0-100%	14	AI	2	1	2							
PLC-SC	SI-4100-4	RAS Pump No. 4 Speed Feedback	0-100%	15	AI	2	1	3							
PLC-SC	FIT-4102-1	RAS Flow Pumps 1-3	0-1900 GPM	14	AI	2	1	4							
PLC-SC	SI-4110-1	WAS Pump No. 1 Speed Feedback	0-100%	14	AI	2	1	5							
PLC-SC	N/A	Spare Slot	N/A	N/A	Spare	2	5	N/A							
PLC-SC	SC-4100-1	RAS Pump No. 1 Speed Setpoint	0-100%	14	AO	2	7	0							
PLC-SC	SC-4100-2	RAS Pump No. 2 Speed Setpoint	0-100%	14	AO	2	7	1							
PLC-SC	SC-4100-3	RAS Pump No. 3 Speed Setpoint	0-100%	14	AO	2	7	2							
PLC-SC	SC-4110-1	WAS Pump No. 1 Speed Setpoint	0-100%	14	AO	2	7	3							
PLC-SC	Spare	Spare	N/A	N/A	AO	2	7	4							
PLC-SC	Spare	Spare	N/A	N/A	AO	2	7	5							
PLC-SC	TSH-4000-1	Secondary Clarifier No. 1 High Temp	Normal	8	DI	3	1	1							
PLC-SC	XA-4000-1	Secondary Clarifier No. 1 Motor Overload	Normal	8	DI	3	1	1							
PLC-SC	WAH-4000-1	Secondary Clarifier No. 1 High Torque	Normal	8	DI	3	1	2							
PLC-SC	WAH-4000-1	Secondary Clarifier No. 1 High High Torque	Normal	8	DI	3	1	3							
PLC-SC	YRI-4000-1	Secondary Clarifier No. 1 On/Off	On	8	DI	3	1	4							
PLC-SC	YCI-4000-1	Secondary Clarifier No. 1 In Remote	In Remote	8	DI	3	1	5							
PLC-SC	FAL-4100-1	RAS Pump No. 1 VFD Fault	Normal	14	DI	3	1	6							
PLC-SC	FAL-4100-1	RAS Pump No. 1 Low Flow	Normal	14	DI	3	1	7							Example completed line
PLC-SC	Spare	Spare	Normal	14	DI	3	1	8							
PLC-SC	YRI-4100-1	RAS Pump No. 1 Running	Running	14	DI	3	1	9							
PLC-SC	YCI-4100-1	RAS Pump No. 1 In Remote	In Remote	14	DI	3	1	10							
PLC-SC	FAL-4110-1	WAS Pump No. 1 VFD Fault	Normal	14	DI	3	1	11							
PLC-SC	FAL-4110-1	WAS Pump No. 1 Low Flow	Normal	14	DI	3	1	12							
PLC-SC	Spare	Spare	Normal	14	DI	3	1	13							
PLC-SC	YRI-4110-1	WAS Pump No. 1 Running	Running	14	DI	3	1	14							
PLC-SC	YCI-4110-1	WAS Pump No. 1 In Remote	In Remote	14	DI	3	1	15							
PLC-SC	HSS-4000-2	Secondary Clarifier No. 2 Start Command	Start	8	DO	4	6	0							
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	1							
PLC-SC	HSS-4100-2	RAS Pump No. 2 Start Command	Start	14	DO	4	6	2							
PLC-SC	HSS-7000-2	Sludge Holding Tank Blower No. 2 Start Command	Start	17	DO	4	6	3							
PLC-SC	HSS-4100-5	RAS Pump No. 5 Start Command	Start	15	DO	4	6	4							
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	5							
PLC-SC	HSS-4105-1	Secondary Sludge Pump No. 2 Start/Stop	Start	15	DO	4	6	6							
PLC-SC	HSS-4110-2	WAS Pump No. 2 Start/Stop Command	Start	15	DO	4	6	7							
PLC-SC	7160-FOI-1	Sludge Holdout LCP Pumping Indicator	Pumping	17	DO	4	6	8							
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	9							
PLC-SC	HSS-7115-2	Sludge Holding Tank Mixer No. 2 Start	Start	17	DO	4	6	10							
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	11							
PLC-SC	HSC-7117-2	Sludge Holding Tank Discharge Valve No. 2 Open CMD	Open	17	DO	4	6	12							
PLC-SC	HSC-7117-2	Sludge Holding Tank Discharge Valve No. 2 Close CMD	Close	17	DO	4	6	13							
PLC-SC	HSS-7120-2	TS Transfer Pump No. 2 Start Command	Start	17	DO	4	6	14							
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	15							

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SECTION 406126 - PROCESS CONTROL SYSTEM TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes process control system training for provided devices and systems.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.4 ACTION SUBMITTALS

- A. Preliminary Training Plan Submittal:
 - 1. Prior to preparation of Final Training Plans, submit outlines of each training course including course objectives and target audience, resumes of instructors, prerequisite requirements for each class, and samples of handouts for review.
- B. Final Training Plan Submittal:
 - 1. Upon receipt of Engineer's comments on preliminary training plan, submit specific proposed training plan with the following:
 - a. Definitions, objectives, and target audience of each course.
 - b. Schedule of training courses including proposed dates, duration, and locations of each class.
 - c. Complete copy of all proposed handouts and training materials bound and logically arranged with all materials reduced to a maximum size of 11 inch by 17 inch, then folded to 8.5 inch by 11 inch for inclusion into the binder.

1.5 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. Directly relate the training and instruction to the system being supplied. Training program represents a comprehensive program covering all aspects of the operation and maintenance of the system.
- B. Coordinate all training schedules with and at the convenience of Owner, including shift training required to correspond to Owner's working schedule.
- C. All onsite instructors must be intimately familiar with the operation and control of Owner's facilities.
- D. Provide detailed training manuals to supplement the training courses including specific details of equipment supplied and operations specific to the project. Provide the manuals in hardcopy for each student. Provide electronic copy of each training manual in PDF format for Owner's future use.
- E. Make use of teaching aids, manuals, or slide/video presentations as required. After training services, deliver training materials to Owner.
- F. Owner reserves the right to videotape all custom training sessions. Training tapes become sole property of Owner.
- G. Cost of Travel for off-site training:
 - 1. Cost of Travel for off-site training is paid directly by entity employing the staff doing the traveling.

3.2 TRAINING SUMMARY

- A. Provide following training courses listed in the summary table below:

Description	Instructor	Minimum Course Duration (hours)	Maximum Number of Trainees per Course	Number of Times Course to be Given	Intended Audience
Installed Control System Hardware	PCSS	4	10	1	Administrator,

Description	Instructor	Minimum Course Duration (hours)	Maximum Number of Trainees per Course	Number of Times Course to be Given	Intended Audience
- Overview and Operation - PLCs, Routers					Operations, Management
UPS Overview and Operation	PCSS	2	10	1	Administrator, Operations, Management

B. Definitions of Audience Roles:

1. Administrator: Personnel responsible for maintaining the HMI / SCADA system.
2. Maintenance: Personnel responsible for maintaining the field controller hardware and instrumentation system.
3. Operations: Personnel responsible for daily plant operations.
4. Management: Non-daily operations personnel.

3.3 ONSITE TRAINING

A. Training personnel are required to be intimately familiar with the control system equipment, its manipulation, and configuration. Training personnel are required to command knowledge of system debugging, program modification, troubleshooting, maintenance procedure, system operation, and programming, and capable of transferring this knowledge in an orderly fashion to technically oriented personnel.

B. Installed Control System Hardware Training:

1. Provide training for Owner's personnel in the functionality, maintenance, and troubleshooting, of the installed Control System. Conduct training after the Operational Readiness Test (ORT), but not more than one week after.
2. Provide training and instruction specific to the system that is being supplied.
3. Provide training consisting of classroom instructions and hands-on instruction utilizing Owner's system.
4. Provide detailed training on the actual configuration and implementation for this Contract covering all aspects of the system that will allow Owner's personnel to maintain, modify, troubleshoot, and develop future additions/deletions to the system. Provide training covering the following subjects:
 - a. System overview
 - b. System hardware components and specific equipment arrangements.
 - c. Periodic maintenance.
 - d. Troubleshooting and diagnosis.
 - e. Network configuration, communications, and operation.
 - f. TCP/IP addressing procedures for all Ethernet devices.
5. Programmable Logic Controller (PLC) Hardware and Software:

- a. Provide training for Owner's personnel in operation, maintenance, troubleshooting, etc. with PLC hardware and software system. Conduct the training after the Operational Readiness Test (ORT), but not more than one week after.
- b. Provide training and instruction specific to the system that is being supplied.
- c. Provide training consisting of classroom instructions and hands-on instruction utilizing Owner's system. Provide detailed training on the actual configuration and implementation for this Contract covering all aspects of PLC system that will allow Owner's personnel to maintain, modify, troubleshoot, and develop future additions/deletions to PLC system. Provide training covering the following subjects:
 - 1) PLC system overview.
 - 2) PLC system architecture.
 - 3) PLC system hardware components and specific equipment arrangements.
 - 4) PLC system startup, shut down, load, backup, and PLC failure recovery.
 - 5) Periodic maintenance.
 - 6) Troubleshooting and diagnosis down to the I/O card level.
 - 7) PLC configuration, communications, and operation.

C. UPS Overview and Operation Training:

1. Provide instruction for Owner's personnel in operation, maintenance, troubleshooting, etc. of the UPS and associated equipment. Conduct the training after the Operational Readiness Test (ORT), but not more than one week after.
2. Provide hands-on instruction utilizing the Owner's system.
3. At a minimum, training will cover the following subjects:
 - a. UPS system overview (including UPS, batteries, and UPS panel)
 - b. Normal UPS operation.
 - c. Maintenance bypass operation.
 - d. Runtime information.
 - e. Warnings and alarms.
 - f. Troubleshooting and diagnosis.
 - g. Periodic maintenance.

END OF SECTION 406126

SECTION 406213 - SERVER COMPUTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes server computers.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406823 “Reporting Software.”
 - 3. Section 406895 “System Support Software.”

1.3 DEFINITIONS

- A. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.
- B. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.7 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years' documented experience.

1.9 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Due to rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. The procedure for submitting and releasing the equipment is as follows:
 - 1. PCSS to submit for approval the required data for the equipment as part of the,, Hardware and Software Packages Submittal.
 - 2. Order equipment as late as possible dependent on the construction schedule to ensure the latest equipment available is provided. Just prior to ordering, resubmit for approval the required data of the latest available hardware and software equivalent in cost to that which is specified. Do not order equipment more than 3 months prior to when it is needed to be continuously used on the project.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.11 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.12 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Provide next day on-site service covering parts and labor for 5 year(s) from date of purchase. The on-site service is to be performed by an authorized representative of the manufacturer.

PART 2 - PRODUCTS

2.1 MICROSOFT WINDOWS SERVER CLIENT ACCESS LICENSES (CALs)

- A. Provide fifteen (15) Client Access Licenses (CALs), appropriated on a per-device basis, to connect all networked devices shown on the System Architecture.
- B. Provide ten (10) Remote Desktop Services Client Access Licenses (RDS CALs), appropriated on a per-device basis, to connect all networked devices shown on the System Architecture.

2.2 RACK MOUNTED SERVER

- A. Manufacturers:
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Dell PowerEdge R7515 Series.
 - b. Substitutions: Or equal
- B. General:
 - 1. Server configured for installation in rack environment occupying 2U of rack space.
- C. One (1) Quad-Core Xeon Processor: 3.00 GHZ or greater, minimum of 20 MB cache on each chip die, support for 2133MHz memory. Provide server with a second processor socket capable of accepting an equal processor.
- D. RAM
 - 1. HMI Server 1, HMI Server 2, Historian - 32 GB of RAM, fully buffered with ECC and 2133 MHz speed minimum.
 - 2. Domain Server - 8 GB of RAM, fully buffered with ECC and 2133 MHz speed minimum.
- E. Hot pluggable cooling fans with N+1 redundancy.
- F. Media Drives:
 - 1. External DVD ± Dual-layer Drive with both Read/Write Capability.
- G. Expansion slots:

1. (1) x16 PCI Express.
2. (3) x8 full-height PCI Express.
3. (3) x8 half-height PCI Express.

H. Internal Disk Array:

1. Disk Size

a. HMI Server 1, HMI Server 2

- 1) 1 TB unformatted of usable storage minimum for allocation across SSDs.

b. Historian

- 1) 4 TB unformatted of usable storage minimum for allocation across SSDs.

c. Domain Server

- 1) 500 GB unformatted of usable storage minimum for allocation across SSDs.

2. Solid State Drives (SSDs) configured in a hardware-based RAID 5 array with hot spare. Minimum of four drives.
3. Array controller able to expand RAID array without the need for reformatting of the entire array.
4. Drives to be hot swappable.
5. Latest compatible PERC RAID Controller (RAID 5)
6. Server to accommodate a minimum of eight 3.5" drives. If utilizing 2.5" SSDs, provide necessary 3.5" adapter accessory.
7. BOSS controller card + with 2 M.2 Sticks 240G (RAID 1)

I. Video graphics capable of 1920x1080 pixels, 70 Hz refresh rate and 32-bit true color minimum. VGA or HDMI output. 8 MB of dedicated video RAM minimum.

J. I/O Ports & Devices:

1. Minimum of four USB ports. At least one port needs to be USB 3.0, with the remainder being USB 2.0.

K. Interface Devices:

1. The rack mounted servers will connect to the rack mounted monitor/keyboard/mouse furnished under the 19" rack specifications.

L. Networking:

1. Two network cards in addition to any on-board network interface.
2. All network interfaces have the following features:
 - a. Support for latest Microsoft server operating system.
 - b. Gigabit Ethernet port, copper connection accepting standard CAT6 cables for Ethernet communications.
 - c. Support for PCI-X or PCI bus in the server.

- d. IEEE 802.3ab support for gigabit networking standard.
 - e. Support for Ethernet port teaming across network adapter cards for increased bandwidth and fault tolerance of both adapter and attached Ethernet switch.
 - f. IEEE 802.3ad Link aggregation support.
 - g. IEEE 802.Q VLAN support.
 - h. Auto sensing 10/100/1000 Mbps.
 - i. SNMP manageable.
 - j. TCP/IP offload engine to minimize use of computer CPU for networking tasks.
- M. Redundant power supplies each with separate power cord. Power supplies must operate from the voltage specified in Section 406100 and be auto switching.
- N. Operating System:
- 1. Latest release of Microsoft Windows Server Standard Edition. Provide all DVD media required to reinstall operating system and system drivers from bare metal server configuration.
 - a. Furnish operating system compatible with the HMI, PLC programming, IO drivers, and any other system software furnished on the project.
- O. Backup Software:
- 1. Backup software is required above the default Microsoft Windows Backup utility included with the operating system. Refer to Section 406895 “System Support Software” for backup software requirements.
- P. Other Software:
- 1. Refer to ‘406100A CDM - Appendix A - Hardware & Software Matrix’ for determination of software installed on each server.
 - 2. Latest release of Microsoft Office Professional with the following programs at a minimum:
 - a. Microsoft Excel.
 - b. Microsoft Word.
 - c. Microsoft Access.
 - d. Microsoft PowerPoint.
- Q. Miscellaneous:
- 1. Include front bezel by manufacturer.
 - 2. Include 19” Dell Ready Rail or equal rack sliding mounting rails with cable management arms.
- R. Warranty
- 1. ProSupport 5 Year Next Business Day Onsite Service
 - 2. ProSupport 5 Year 7x24 Hardware/Software Technical Support and Assistance

2.3 KEBOARD / VIDEO / MOUSE (KVM) SWITCH – IP BASED

- A. Manufacturers:
1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Dell.
 - b. Tripp Lite.
 - c. Hewlett Packard.
 - d. Substitutions: Or equal
- B. General:
1. Monitor/keyboard tray 19" rack mounted drawer with 17" built in Monitor and Keyboard with a pointer device.
 2. KVM fully accessible from both a webpage and the physical monitor/keyboard/pointer. The webpage interface allows access to all connected computers in the network rack.
 3. Keyboard to fit within the drawer and be equipped with a built-in pointing device.
 4. Monitor to be 17" diagonal size and capable of 1920x1080 pixel resolution minimum.
 5. Drawer to be 1U height and include hardware for mounting the monitor and keyboard. Monitor hardware allows the monitor to lay flat in drawer or fold up when the drawer is opened.
 6. Provide necessary cables and power supplies for operation and interface with the KVM switch. Provide a USB/VGA to CAT6 connector for each server being tied into the KVM.
 7. KVM allows sharing of the keyboard, video, and mouse between all servers mounted within the rack.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and control rooms for suitable conditions where servers will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Server computers will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
 - 2. Section 406121. 10 Process Control System Testing.

3.5 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406213

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SECTION 406216 - OPERATOR WORKSTATION COMPUTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes Operator Workstation Computers.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406823 “Reporting Software”.
 - 3. Section 406895 “System Support Software.”

1.3 DEFINITIONS

- A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.7 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.8 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Due to rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. The procedure for submitting and releasing the equipment is as follows:

1. PCSS to submit for approval the required data for the equipment as part of the,, Hardware and Software Packages Submittal.
2. Order equipment as late as possible dependent on the construction schedule to ensure the latest equipment available is provided. Just prior to ordering, resubmit for approval the required data of the latest available hardware and software equivalent in cost to that which is specified. Do not order equipment more than 3 months prior to when it is needed to be continuously used on the project.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.10 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 1. Warranty Period: Provide next day on-site service covering parts and labor for 5 year(s) from date of purchase. The on-site service is to be performed by an authorized representative of the manufacturer.

PART 2 - PRODUCTS

2.1 WORKSTATION

- A. Manufacturers:
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Dell Precision 5820.
 - b. Substitutions: Or equal
- B. General:
 - 1. Tower chassis workstation, with keyboard and mouse, configured to run software shown on Drawings and in Specifications.
- C. One (1) Intel Quad-Core processor, 3.0 GHz or greater, minimum of 10 MB L3 cache on chip die, 2133 MHz front side bus minimum.
- D. 32 GB of RAM, 2133MHz speed minimum, 2 DIMMS maximum.
- E. Media Drives:
 - 1. DVD \pm Dual-layer Drive with both Read and Write Capability.
- F. Expansion slots:
 - 1. Two Full Height PCI slots.
 - 2. One Full Height PCI Express slot.
- G. Internal Disk:
 - 1. 1 TB of usable storage minimum, Solid State Drives (SSDs) configured in a RAID 1 array.
- H. Video graphics capable of 1920 x 1080 pixels, 70 Hz refresh rate and 32-bit true color minimum. VGA, DVI, and HDMI or Display Port outputs. 512MB of dedicated video RAM minimum. Card must have at least 3 display outputs for connection to three separate monitors. If this is not possible with 1 display card, a second graphics card must be provided and must be the same model as the primary graphics card for dual operation.
- I. I/O Ports & Devices:
 - 1. Minimum of four USB 3.1 ports.
- J. Interface Devices:
 - 1. Generic USB 104 key (Windows) keyboard, no hot keys onboard.
 - 2. Two button USB optical mouse with scroll wheel.
 - 3. Monitor:

- a. LCD 24-inch nominal size minimum.
- b. Native Resolution: 1920 x 1080 resolution at 70 Hz minimum.
- c. 16 ms response time maximum.
- d. 250 nits (cd/m²) brightness minimum.
- e. 400 to 1 contrast ratio minimum.
- f. Vertical viewing angle of 85 degrees minimum.
- g. Horizontal viewing angle of 85 degrees minimum.
- h. Analog GRB, Digital DVI-D, and HDMI or Display Port video input connector types.
- i. Adjustable height stand.
- j. Soundbar.

K. Networking:

1. Two network cards in addition to any on-board network interface.
2. Required features for network interfaces:
 - a. Support for latest Microsoft operating system.
 - b. Gigabit Ethernet port, copper connection accepting standard CAT6 cables for Ethernet communications.
 - c. IEEE 802.3ab support for gigabit networking standard.
 - d. IEEE 802.Q VLAN support.
 - e. Auto sensing 10/100/1000 Mbps.
 - f. SNMP manageable.

L. Power supplies to operate from the voltage specified in Section 406100.

M. Operating System:

1. Latest release of 64-bit Windows Professional Operating System.

N. Backup Software:

1. Backup software is required above the default Microsoft Windows Backup utility included with the operating system. Refer to Section 406895 “System Support Software” for backup software requirements.

O. Other Software (See ‘406100A CDM - Appendix A - Hardware & Software Matrix’ for software to be installed on workstations):

1. Latest release of Microsoft Office Professional including the following programs at a minimum:
 - a. Microsoft Excel.
 - b. Microsoft Word.
 - c. Microsoft Access.
 - d. Microsoft PowerPoint.
2. Virus scan and protection software in accordance with Section 406895 “System Support Software.”

P. Warranty

1. ProSupport 5 Year Next Business Day Onsite Service
2. ProSupport 5 Year 7x24 HW/SW Technical Support and Assistance

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and rooms for suitable conditions where computers will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Operator workstation computers will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
 2. Section 406121. 10 Process Control System Testing.

3.5 STARTUP SERVICE

- A. Perform startup service.

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

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406216

SECTION 406219 - INDUSTRIAL COMPUTER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes industrial computers.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406895 “System Support Software.”

1.3 DEFINITIONS

- A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. None Required

1.8 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.9 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Not applicable to this Section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.11 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.12 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Provide service covering parts and labor for up to 5 year(s) from date of purchase.

PART 2 - PRODUCTS

2.1 PANEL MOUNTED INDUSTRIAL WORKSTATIONS

- A. Manufacturers:
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Noax Technologies - 21” Panel PC Series

- b. Advantech – 21” PPC Series
 - c. Substitutions: Or equal.
- B. General:
 - 1. Panel mounted industrial workstation with integrated touchscreen display.
 - 2. Mounted on control panels and configured to run the HMI software applications and other software depending on their use as shown.
- C. Operating System:
 - 1. Windows 11, 64-bit
- D. CPU operating frequency must be no less than a 2.5 GHz.
- E. Environmental:
 - 1. Construction: Stainless steel or aluminum case.
 - 2. Rating: The integrated display computer to be rated for the location it will be installed in: NEMA 12 (IP52).
 - 3. Temperature: Operating temperature of the computer to be in the range of 32 to 122 degrees F (0 to 50 degrees C).
- F. I/O Ports and Devices:
 - 1. Minimum of two USB 3.1 ports.
 - 2. Minimum of one Ethernet LAN 10/100 Mbps connection be available.
 - 3. Minimum of one serial communication port.
- G. Display supports touch analog input.
 - 1. Color Active Matrix TFT type.
 - 2. Color depth of the integrated display to be 24-bit.
- H. Fixed and Removable Drives:
 - 1. Minimum of 200 GB Solid State Drive (SSD) raw storage.
- I. 21” display supports a minimum native resolution of 1920x1080.
- J. Power supplies operate at the voltage specified in Section 406100.
- K. Backup Software:
 - 1. Backup software is required above the default Microsoft Windows Backup utility included with the operating system. Refer to Section 406895 “System Support Software” for backup software requirements.
- L. Other Software:
 - 1. See ‘406100A CDM - Appendix A - Hardware & Software Matrix’ for software to be installed on industrial computers.

M. Warranty

1. 5 Year Next Business Day Onsite Service
5 Year 7x24 Hardware/Software Technical Support and Assistance

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and rooms for suitable conditions where industrial computers will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Industrial computers will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
 2. Section 406121. 10 Process Control System Testing.

3.5 STARTUP SERVICE

- A. Perform startup service.

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

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406219

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SECTION 406229 - TABLET COMPUTERS AND MOBILE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes tablet computers and mobile devices.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406895 “System Support Software.”

1.3 DEFINITIONS

- A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.7 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.8 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Not applicable to this Section.
- B. Due to rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. The procedure for submitting and releasing the equipment as follows:
 - 1. PCSS submits for approval the required data for the equipment as part of the Hardware Package Submittal.
 - 2. Equipment to be ordered as late as possible dependent on the construction schedule to ensure the latest equipment available is provided. Just prior to ordering, resubmit for approval the required data of the latest available hardware and software equivalent in cost to that which is specified. No equipment to be ordered more than 3 months prior to when it is needed to be continuously used on the project.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.10 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.11 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. **Warranty Period:** Provide service covering parts and labor for 3 year(s) from date of purchase.

PART 2 - PRODUCTS

2.1 TABLET

- A. Manufacturers and their products are subject to compliance with requirements. Provide one of the following, and ensure the latest generation available is chosen:
 - a. Apple iPad.
 - b. Google Pixel Slate.
 - c. Microsoft Surface.
 - d. Substitutions: Or equal
- B. Tablet computers to be used throughout the plant for monitoring and/or control via wireless access points throughout the site and be setup to remotely view SCADA workstation desktop.
- C. Tablet screen size 10” or greater.
- D. Tablet have a touch screen utilizing capacitive technology.
- E. 1.4 GHz dual core processor or greater with minimum 1 MB of shared cache.
- F. 8 GB of RAM minimum.
- G. 128 GB of flash storage minimum.
- H. HD graphics with minimum native resolution screen of 1280 x 800.
- I. I/O Ports & Devices:
 - 1. Stylus.
 - 2. 720p HD 1.2 Megapixel Front facing camera.
 - 3. 720P HD 5 Megapixel Rear facing camera.
 - 4. Protective water resistant carrying/covering case.
- J. Battery life of 5.5 hours or greater.
- K. Operating System:
 - 1. Operating system compatible with the tablet provided.
- L. Other Software (see ‘406100A CDM - Appendix A - Hardware & Software Matrix’ for software to be installed):
 - 1. Microsoft Remote Desktop App.
 - 2. Virtual Network Computing (VNC) App.
 - 3. Anti-Virus Software.
 - 4. Abode Reader.

PART 3 - EXECUTION

3.1 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.2 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406229

SECTION 406243 - LARGE DISPLAY SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1. Section includes large display screens.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.

1.3 DEFINITIONS

- A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.
- B. Liquid Crystal Display (LCD): A flat panel display using liquid crystals as the primary form of operation.
- C. Light Emitting Diode (LED): A semiconductor light source that emits light when electrical current is applied.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.7 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.9 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Provide service covering parts and labor for at least 1 year(s) from date of purchase.

PART 2 - PRODUCTS

2.1 COMMERCIAL DISPLAY MONITOR

- A. Manufacturers:
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Panasonic.
 - b. Samsung.
 - c. Substitutions: Or equal
- B. General:

1. Provide an LCD television monitor to act as a computer display screen.

C. Physical:

1. 55" diagonal screen size.
2. LCD display with LED backlight.
3. Operating Time: 24/7
4. Orientation: Landscape and Portrait.
5. Aspect Ratio: 16:9.
6. Resolution: 3840 x 2160 or greater.
7. Contrast Ratio: 4000:1
8. Screen Refresh Rate: 60Hz or greater.
9. Response Time: 8ms (Typ, G to G)
10. Brightness: 400 cd/m² or greater.

D. Input/Outputs:

1. Two (2) HDMI ports.
2. One (1) DisplayPort
3. One (1) Digital Audio Input.
4. One (1) RJ45 Ethernet

E. Required Accessories:

1. VESA Mounting Kit.
2. All cables necessary for a complete and operational system as shown on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and rooms for suitable conditions where large display screens will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Large display screens will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
 - 2. Section 406121. 10 Process Control System Testing.

3.5 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406243

SECTION 406343 - PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes programmable logic controllers.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.3 DEFINITIONS

- A. Analog Input (AI): An electrical signal (1-5 Volts DC or 4-20 milliamps, for example) to be interpreted by a PLC.
- B. Analog Output (AO): An electrical signal (1-5 Volts DC or 4-20 milliamps, for example) sent from a PLC to a field device.
- C. Digital/Discrete Input (DI): A binary signal (0 or 1) to be interpreted by a PLC.
- D. Digital/Discrete Output (DO): A binary signal (0 or 1) sent from a PLC to a field device.
- E. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.
- F. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine level equipment.
- G. Operator Interface Terminal (OIT): A hardware component of the HMI used for device level control and monitoring.
- H. Peer to Peer: Communication between two or more devices, typically PLC’s, in which each device can control the communication exchange.
- I. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

- J. Remote I/O (RIO): I/O that is located remotely from the processor. Remote I/O can communicate over a variety of communication protocol and can use standard rack based I/O, or specialized Remote I/O hardware referred to as Distributed I/O.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Provide a minimum of 1 spare CPU for each type provided.

1.8 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Due to rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. The procedure for submitting and releasing the equipment is as follows:
 - 1. PCSS to submit for approval the required data for the equipment as part of the Hardware and Software Packages Submittal.
 - 2. Order equipment as late as possible dependent on the construction schedule to ensure the latest equipment available is provided. Just prior to ordering, resubmit the required data of the latest available hardware and software, equivalent in cost to that which is specified for approval. Do not order equipment more than 3 months prior to when it is needed to be continuously used on the project.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.10 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.11 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. **Warranty Period:** Provide service covering parts and labor for up to 5 year(s) from date of purchase.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. **Configuration:** Networked programmable controller incorporated into PTCP, STCP-01, and STCP-02 system control panels for controlling primary and secondary treatment system.

2.2 CHASSIS BASED PLC SYSTEM

- A. **Manufacturers:**
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide the following:
 - a. Emerson – RX3i Series
 - b. Substitutions: Not Permitted.
- B. **General:**
 - 1. Provide processor as required to meet system requirements.
 - 2. Listed and classified by UL, CSA, or FM approval as suitable for purpose specified and indicated.
 - 3. Contains the required memory and functional capacity to perform the specified sequence of operation with the scheduled inputs and output points.
 - 4. Designed for continuous industrial service.
 - 5. Provide products of a single manufacturer.
 - 6. Provide equipment models that are currently in production.
 - 7. In the event of power interruption, the system undergoes an orderly shutdown with no loss of memory and resumes normal operation without manual intervention when power is restored.

8. Provide PLCs that communicate between workstations, servers, instruments, switches, controllers, process actuators, etc. as shown on the Drawings.
9. PLC capable of stand-alone operation in the event of failure of the communication link to the HMI subsystem.

C. Identification

1. Identify all major assemblies and sub-assemblies, circuit boards, and devices using permanent labels or markings indicating:
 - a. Module product type such as analog or digital.
 - b. Module catalog number.
 - c. Module major revision number.
 - d. Module minor revision number.
 - e. Module manufacturer vendor.
 - f. Module serial number.

D. PLC Central Processing Unit (CPU):

1. General:
 - a. Provide Emerson IC695CPE310 Processor model with 10 MB user memory.
 - b. Minimum 16-bit microprocessor with system timing and is responsible with scheduling I/O updates with no user programming required to ensure discrete or analog update.
 - c. Executes user relay ladder logic programs, communicates with intelligent I/O modules, and performs on-line diagnostics.
 - d. Consists of a single module which solves application logic, stores the application program, stores numeric values related to the application processes and logic, and interfaces to the I/O.
 - e. Samples all discrete and analog inputs and outputs including internal coils and registers, and service special function modules every scan. The CPU processes the I/O with user programs(s) stored in memory and controls outputs based on the results of the logic operation.
 - f. Supply the CPU with a battery-backed time of day clock and calendar.
 - g. CPU family allows for user program transportability from one CPU model to another.

2.3 PLC SOFTWARE

A. Manufacturers:

1. Manufacturers and their products are subject to compliance with requirements. Provide software for the following:
 - a. Machine Edition PLC-Logic Developer Software as required to match supplied PLCs.
 - b. Substitutions: Not Permitted.

B. General

1. Provide professional, full suite of editing/development version of the PLC programming software.
2. Provide PLC configuration and application development software package complete with documentation and installation media.
3. Install the PLC software package and associated licensing and/or activation on the computers shown on the Drawings.
4. Allows for on-line/off-line program development, annotation, monitoring, debugging, uploading, and downloading of programs to the PLCs.
5. Provide all required hardware (including cables, cable adapters, etc.) for connection to PLCs.
6. Provide all software licenses required to achieve the functionality described in the Specifications.
7. Include a software license agreement allowing the Owner the right to use the software as required for any current or future modification, documentation, or development of the PLCs provide for this project.
8. Provide software capable of the following IEC 61131-3 functions:
 - a. Ladder logic.
 - b. Function block.
 - c. Sequential function chart.
 - d. Structured text.
9. Add-on instruction editor allows for the development of custom reusable function blocks. The software permits function block modification while on-line.
10. Software is Microsoft Windows-based and run on the supplied computers.
11. Software includes a security feature to prevent unauthorized personnel from modifying and downloading the programs.
12. Provide an I/O simulator which allows the PLC application load program to be tested on a PC with simulated analog and digital inputs and outputs, allowing I/O testing and debugging to be performed in a safe, isolated environment without the need for running the PLC CPU and process I/O boards.

C. Support

1. Provide 1 year of manufacturer technical support for assistance with PLC hardware components and PLC programming software.

2.4 SOURCE QUALITY CONTROL

- A. Section 014000 “Quality Requirements” for requirements for testing, inspection, and analysis.
- B. Testing: Test programmable controller according to NEMA IA 2.2.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and rooms for suitable conditions where PLCs will be installed.

- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Programmable Logic Controllers will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 - 1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
 - 2. Section 406121. 20 "Process Control System Testing."

3.5 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406343

SECTION 406613 - SWITCHES AND ROUTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes switches and routers.
- B. AESS is responsible for performing configuration services for equipment provided under this section.
- C. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406343 “Programmable Logic Controllers.”

1.3 DEFINITIONS

- A. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.
- B. Control System Security Provider (CSSP): The entity who provides all programming, configuration, and services related to the implementation of cybersecurity countermeasures.
- C. Fiber optic Ethernet switch (FOES): An Ethernet based networking device with a combination of fiber optic and copper physical connections.
- D. Local Area Network (LAN): A localized group of network devices (e.g. buildings, homes, offices, etc..).
- E. Managed Ethernet switch (MES): An Ethernet based networking device that permits the management, configuration, and monitoring of a local area network.
- F. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.
- G. Power over Ethernet (PoE): A method of providing electrical current over an Ethernet connection.

- H. Small form-factor pluggable (SFP): A hot-pluggable network interface module connecting a device motherboard (Ethernet switch, router, etc..) to a fiber optic or copper networking cable.
- I. Unmanaged Ethernet Switch (UMES): An Ethernet based networking device with a fixed configuration (i.e. “plug-and-play” devices).
- J. Virtual Private Network (VPN): An encrypted connection between a private network and a public network (the internet).
- K. Wide Area Network (WAN): A network that covers a broad geographic area, typically through use of a public network (e.g. communication across cities, national boundaries, etc..).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions”.
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions”.

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. 2 SFP modules for each type provided.

1.8 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.10 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Provide service covering parts and labor for up to 1 year(s) from date of purchase.

PART 2 - PRODUCTS

2.1 RACK-MOUNTABLE MANAGED ETHERNET SWITCH

- A. Manufacturers:
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide the following:
 - a. Red Lion NT328G-04SFP-AC2
 - b. Substitutions: Not Permitted
- B. General:
 - 1. Provide a modular, rack-mountable, managed Ethernet switch for connection to the network as shown in the Drawings and specified herein.
 - 2. Provide ethernet switches by the same manufacturer for the project, regardless of type.
- C. Physical Features:
 - 1. Modular 19-inch rack-mountable enclosure.
 - 2. Construction such that additional copper and fiber ports can be added and removed.
 - 3. SFP slots: 4 x 1G/10G SFP slots.
 - 4. Copper ports: 24 x 10/100/1000BaseT(X) ports.
 - 5. Operating temperature: 0 to 130 degrees F (-17 to 54 degrees C)
 - 6. Power: 120VAC redundant power supplies.
 - 7. Enclosure: Metal case.
 - 8. Rating: UL Class 1, Division 2 Groups A, B, C, and D.
- D. Network Features:

1. Layer 3 routing.
2. Spanning Tree Protocol (STP)
3. Rapid Spanning Tree Protocol (RSTP) (IEEE 802.1w)
4. Full duplex on all port.
5. Auto negotiation and manual configurable speed and duplex.
6. Wire speed switching fabric.
7. IGMP snooping.
8. IGMP filtering.
9. Configuration password protected.
10. Configuration backup capability required.
11. SNMP V3.
12. Lock port function for blocking unauthorized access based on MAC address.

E. Accessories:

1. SFP modules / transceivers:
 - a. 4 multi-mode 10G modules with LC Connectors. Confirm this matches the existing switch connectors as required and indicated in submittal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and rooms for suitable conditions where computers will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Switchers and routers will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
 - 2. Section 406121. 10 Process Control System Testing.

3.5 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. For Managed Ethernet Switches:
 - a. Enable the lock port function to block unauthorized access based on MAC address for each switch and router. Assign static IP addresses to devices connecting to switch.
 - b. Lock down all spare switch and router ports.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

3.7 SWITCHES AND ROUTERS SCHEDULE

- A. Provide the devices in the following schedules:

Table 1. Ethernet Switch Schedule

Switch Designation	Type	Mount	Fiber Uplinks (1G/10G SFP)	Copper Ports (10/100/1000 BaseT(X), RJ45)
WWTP-CPB-SR-MES-1	Rack-Mountable Managed Ethernet Switch	Rack Mount	4	24
WWTP-CPB-SR-MES-2	Rack-Mountable Managed Ethernet Switch	Rack Mount	4	24

END OF SECTION 406613

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SECTION 406616 - FIREWALL HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes firewall hardware.
- B. AESS is responsible for performing configuration services for equipment provided under this section.
- C. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406895 “System Support Software”

1.3 DEFINITIONS

- A. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.
- B. Control System Security Provider (CSSP): The entity who provides all programming, configuration, and services related to the implementation of cybersecurity countermeasures.
- C. Local Area Network (LAN): A localized group of network devices (e.g. buildings, homes, offices, etc..).
- D. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.
- E. Wide Area Network (WAN): A network that covers a broad geographic area, typically through use of a public network (e.g. communication across cities, national boundaries, etc..).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

B. Shop Drawings:

1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.7 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.9 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: Provide service covering parts and labor for up to 3 year(s) from date of purchase.

PART 2 - PRODUCTS

2.1 FIREWALL HARDWARE

- A. Manufacturers:
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Palo Alto Networks PA Series
 - b. Substitutions: Or equal.
- B. General:
 - 1. Provide a Next Generation Firewall (NGFW) firewall for installation as shown on the drawings to protect the network.
- C. Physical Features:
 - 1. 120VAC power supply.
 - 2. Minimum four (4) LAN Ethernet ports at 100/1G.
 - 3. Minimum one (1) WAN Ethernet port at 100/1G.
 - 4. Minimum one (1) USB port.
- D. Throughput Features:
 - 1. Firewall throughput: 250 Mbps minimum.
 - 2. IPSec VPN throughput: 50 Mbps minimum.
- E. Software Features:
 - 1. Deep Packet Inspection (DPI).
 - 2. TLS/SSL encrypted traffic inspection.
 - 3. Website filtering.
 - 4. IPsec VPN support for 50 clients minimum.
 - 5. Support for Two-Factor Authentication (2 FA) using certificates/authentication profiles, one-time passwords, smart cards, and software tokens. Refer to section “406895 – System Support Software”, paragraph 2.5 for 2FA software and requirements.
- F. Accessories:
 - 1. Include rack-mounting kit for installation in server rack environment or shelf for installation in control panel.
 - 2. 3 years of manufacturer licensed support for a fully featured device. Fully licensed support includes:
 - a. Active intrusion prevention, SSL decryption and file blocking.
 - b. 24/7/365 technical phone and email support.
 - c. Full access to all new device firmware, patches and upgrades.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and rooms for suitable conditions where firewall hardware will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Firewall hardware will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 - 1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
 - 2. Section 406121. 10 Process Control System Testing.

3.5 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Configure firewall for layer 2 configuration to work with Owner's SCADA network.
 - 3. Configure firewall for the IPsec tunnels for remote access.
 - 4. Configure rules on the firewall to not allow access to/from the Internet (outside access).
 - 5. Configure rules on the firewall to allow traffic only from the terminal server to the Internet.
 - 6. Configure management port of firewall.
 - 7. Configure firewall to the IP address of the ISP router.
 - 8. Disable remote VPN capability of firewall.

9. Devices external from the SCADA network cannot communicate through this firewall.
10. Configuration protects the SCADA network from unauthorized intrusion. The Owner uses internet for both business and SCADA. Configure the firewall such that the SCADA computers/hardware is isolated from the business computers/hardware.
11. Coordinate with Owner as required to obtain administrative network configuration.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406616

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SECTION 406626 - DEVICE NETWORK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes network attached storage server.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406895 “System Support Software.”
 - 3. Section 406213 “Server Computers”

1.3 DEFINITIONS

- A. Network Attached Storage (NAS): Networked devices in a centralized location containing one or more storage drives, often organized into redundant storage containers.
- B. Rack Units (U): A unit of measure, equal to 1.75 inches. It is most frequently used to define the height of the equipment being installed in a 19-inch or 23-inch rack frame.
- C. Redundant Array of Independent Disks (RAID): A method of combining multiple physical disk drives into one or more logical units for data redundancy.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1.8 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.9 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Due to rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. The procedure for submitting and releasing the equipment is as follows:
 - 1. PCSS to submit for approval the required data for the equipment as part of the Hardware and Software Packages Submittal.
 - 2. Order equipment as late as possible dependent on the construction schedule to ensure the latest equipment available is provided. Just prior to ordering, resubmit for approval the required data of the latest available hardware and software equivalent in cost to that which is specified. Do not order equipment more than 3 months prior to when it is needed to be continuously used on the project.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.11 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.12 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Provide next day on-site service covering parts and labor for 5 year(s) from date of purchase. The on-site service is to be performed by an authorized representative of the manufacturer.

PART 2 - PRODUCTS

2.1 MODBUS/TCP TO ETHERNET/IP PROTOCOL CONVERTER

- A. Manufacturers
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Prosoft; PLX31-EIP-MBTCP
 - b. Substitutions: Or equal
- B. General:
 - 1. Modbus/TCP to Ethernet/IP protocol converters convert input data in one protocol to output data in another protocol.
- C. Physical:
 - 1. Din rail mountable.
 - 2. Minimum of one (1) 10/100BaseT(X) Ethernet port.
- D. Connectivity:
 - 1. Ethernet/IP
 - a. Protocol converter as server:
 - 1) Minimum of five (5) class 3 connections.
 - b. Protocol converter as client:
 - 1) Minimum of two (2) class 3 connections.
 - 2. Modbus/TCP
 - a. Protocol converter as client:
 - 1) Minimum of ten (10) connections.
 - b. Protocol converter as server:
 - 1) Minimum of five (5) connections to clients using MBAP messaging.

- 2) Minimum of five (5) connections to clients using encapsulated Modbus messaging.

E. Features:

1. SD card for module configuration backup.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and rooms for suitable conditions where device network equipment will be installed.
- B. Prepare written reports, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Network attached storage will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
 2. Section 406121. 10 Process Control System Testing.

3.5 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406626

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SECTION 406643 - WIRELESS NETWORK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes wireless network equipment.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406613 “Switches and Routers”

1.3 DEFINITIONS

- A. Virtual Private Network (VPN): An encrypted connection between a private network and a public network (the internet).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1.8 .QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.9 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Due to rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. The procedure for submitting and releasing the equipment is as follows:
 - 1. PCSS to submit for approval the required data for the equipment as part of the Hardware Packages Submittal.
 - 2. Order equipment as late as possible dependent on the construction schedule to ensure the latest equipment available is provided. Just prior to ordering, resubmit for approval the required data of the latest available hardware and software equivalent in cost to that which is specified. Do not order equipment more than 3 months prior to when it is needed to be continuously used on the project.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.11 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.12 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Provide service covering parts and labor for up to 3 year(s) from date of purchase.

PART 2 - PRODUCTS

2.1 CELLULAR ETHERNET ROUTING GATEWAYS

A. Manufacturers

1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Cradlepoint IBR650C.
 - b. Sierra Wireless RV55
 - c. Substitutions: Or equal

B. General:

1. Provide 4G LTE Cellular Ethernet Routing Gateways that are capable of working with Verizon bands and as shown on the Drawings and specified herein.

C. Physical Features:

1. RJ45 ports: 10/100 Mbps Ethernet.
2. Power: 24 VDC.
3. Enclosure: DIN rail mountable (supply a shelf in telemetry enclosure if freestanding unit is supplied).
4. Operating temperature: 0 to 130 degrees F (-17 to 54 degrees C)

D. Additional Features:

1. Main site cellular gateway (router): Supports VPN passthrough for IPSec and OpenVPN.
2. Provide gateways with a static cellular IP address as assigned by the cellular carrier.
3. Provide gateways with any cellular network specific components (i.e. SIM cards) necessary to achieve a fully functional communication system.
4. Integrated firewall.
5. Multi-carrier cellular support.
6. Employ gateways with a VPN tunnel for each of the remote sites.
 - a. Communicate the data transmitted and received by the main site cellular gateway using a secure VPN tunnel.
 - b. Digital certificates or password-based VPN authentication are acceptable measures for VPN encryption.

E. Antennas:

1. Provide one internal antenna and one external antenna.
2. External antenna is to be mounted outdoors and rated for such service.
3. Antennas shall be 3 dB minimum Omni.

F. Accessories

1. Provide mounting kits.
2. Provide surge suppressors.

3. Provide minimum transmission cable length required for installation plus 1 foot of slack cable for ease of maintenance.
4. Provide all required parts needed to achieve a fully functional communication system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, roofs, and rooms for suitable conditions where wireless network equipment will be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.3 IDENTIFICATION

- A. Refer to control system architecture for tagging designations

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Wireless network equipment will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:
 1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
 2. Section 406121. 10 Process Control System Testing.

3.5 STARTUP SERVICE

- A. Perform startup service.

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

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406643

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SECTION 406733 - PANEL WIRING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for internal wiring of control panels and consoles.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Existing Panel Drawings – “406100B CDM – Appendix B – SCADA Control Panel Drawings”

1.3 DEFINITIONS

- A. American Wire Gage (AWG): Measurement of the cross-sectional area of a conductor.
- B. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.
- C. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.
- D. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.7 QUALITY ASSURANCE

- A. Perform work in accordance with UL 508.
- B. Provide components compatible with functions required to form complete working system.
- C. Provide UL 508 label on complete assembly.
- D. Maintain one copy of panel drawings on site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.9 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace computers that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Provide service covering parts and labor for up to 5 year(s) from date of purchase.

PART 2 - PRODUCTS

2.1 CONTROL PANEL - INTERNAL CONSTRUCTION

- A. Internal Electrical Wiring:
 - 1. Provide stranded, type MTW interconnecting wiring:
 - a. Use 600-volt insulation rated for not less than 90 degrees Celsius.
 - b. Segregate wiring for systems operating at voltages in excess of 120 VAC from other panel wiring
 - 1) Locate either in a separate section of a multi-section panel or behind a removable Plexiglas or similar dielectric barrier.

- c. Develop panel layout such that technicians have complete access to 120 VAC and lower voltage wiring systems without direct exposure to higher voltages.
2. For power distribution wiring on the line side of fuses or breakers:
 - a. Use 12 AWG minimum.
 - b. For control wiring on the secondary side of fuses:
 - 1) Use 16 AWG minimum.
 - 2) Utilize 18 AWG shielded, twisted pair cable insulated for not less than 600 volts for electronic analog circuits.
3. Cover power distribution blocks with protective guards to meet “finger-safe” requirements of IP20.
4. Route power and low voltage DC wiring systems in separate wireways.
 - a. Cross different system wires at right angles.
 - b. Separate different system wires routed parallel to each other by at least 6-inches.
 - c. Terminate different wiring systems on separate terminal blocks.
 - d. Do not fill wiring troughs to more than 60 percent visible fill.
5. Terminations:
 - a. Terminate wiring onto single tier terminal blocks:
 - 1) Uniquely and sequentially number each terminal block.
 - 2) Direct wiring between field equipment and panel components is not acceptable.
 - 3) Multi-level terminal blocks or strips are not acceptable.
 - b. Arrange terminal blocks in vertical rows and separated into groups (power, AC control, DC signal).
 - 1) Provide each group of terminal blocks with a minimum of 25 percent spares.
 - c. Use compression type, fused, unfused, or switched terminal blocks.
 - 1) Use two terminals per point for discrete inputs and outputs (DI and DO) with adjacent terminal assignments.
 - 2) Wire all active and spare PLC and controller points to terminal blocks.
 - d. Use three terminals per point for analog inputs and outputs (AI and AO) per shielded pair connection with adjacent terminal assignments for each point.
 - 1) The third terminal is for shielded ground connection for cable pairs.
 - a) Ground the shielded signal cable at the PLC cabinet.
 - b) Wire all active and spare PLC and controller points to terminal blocks.
 - e. Use sleeve-type wire and tube markers with heat impressed letters and numbers.

- f. Use only one side of a terminal block row for internal wiring.
 - 1) Field wiring side of the terminal not to be within 6-inches of the side panel or adjacent terminal or within 8-inches of the bottom of free standing panels, or within 3-inches of stanchion mounted panels, or 3-inches of adjacent wireway.
- g. Isolate circuit power from the SCADA cabinet to field devices (switches, dry contacts etc.) that are used as discrete inputs to the PLC input cards with an isolating switch terminal block with flip cover that is supplied with a dummy fuse.
 - 1) Use Allen Bradley Model 1492-H7 or equal.
 - 2) One isolating switch terminal block per loop numbered piece of equipment and one per spare I/O point is acceptable.
- h. Isolate all PLC discrete outputs to the field with an isolating fuse switch terminal block with a flip cover and a neon blown fuse indicator.
 - 1) Use Allen Bradley 1492-H4 or equal.
6. Clearly identify wiring to hand switches and other devices, which are live circuits independent of the panel's normal circuit breaker protection as such.
7. Clearly tag and color code wiring.
 - a. Tag numbers and color coding to correspond to panel wiring diagrams and loop drawings prepared by the PCSS.
 - b. Power wiring, control wiring, grounding, and DC wiring to utilize different color insulation for each wiring system used.
 - c. Color coding scheme to be in accordance with UL 508a.
8. Each field instrument furnished under Division 40 and shown on the Drawings as deriving input power from the control panel(s) to have a separate power distribution circuit with a circuit breaker or fuse and blown fuse indication.
 - a. Power instruments requiring 120VAC power as shown on the drawings.
9. Wiring trough for supporting internal wiring:
 - a. Plastic type with snap-on covers.
 - b. Side walls to be open top type to permit wire changing without disconnecting.
 - c. Trough to be supported to the subpanel by stainless steel screws.
 - d. Do not bond trough to the panel with glue or adhesives.
10. Provide each panel with a single tube, LED light fixture, 20 Watt in size (minimum)
 - a. Mounted internally to the ceiling of the panel.
 - b. Light fixture to be switched and be complete with the lamp.
11. Each panel to have a specification grade duplex convenience receptacle with ground fault interrupter:

- a. Mount internally within a stamped steel device box with appropriate cover.
 - b. Convenience receptacle is not to be powered from a UPS
 - c. Protect by a dedicated fuse or circuit breaker.
12. Each panel to be provided with an isolated copper grounding bus for all signal and shield ground connections.
- a. Shield grounding to be in accordance with the instrumentation manufacturer's recommendations.
13. Provide each panel with a separate copper power grounding bus (safety) in accordance with the requirements of the National Electrical Code.
14. Each panel to have control, signal, and communication line surge suppression in accordance with Section 407856 "Isolators, Intrinsic Safety Barriers, and Surge Suppressors."
15. Microprocessor-based electronic devices in the panel that are powered by 120VAC to be powered by the UPS.
16. Provide each panel with a circuit breaker to interrupt incoming power.
17. Additional electrical components including transformers, motor starters, switches, circuit breakers, etc. to be in compliance with the requirements of Division 26.
- B. Relays not provided under Division 26 and required for properly completing the control function specified in Division 40, Division 26 or shown on the Drawings to be provided under this Section.
- C. Orientation of devices including PLC and I/O when installed to be per the manufacturer's recommendations.
1. No vertical orientation of PLC racks are allowed unless specifically indicated by the manufacturer as an acceptable mounting alternative and also approved by the Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

END OF SECTION 406733

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SECTION 406823 - REPORTING SOFTWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes SCADA reporting software
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406213 “Server Computers.”
 - 3. Section 406216 “Operator Workstation Computers.”
 - 4. Section 406219 “Industrial Computers”
 - 5. Section 406229 “Tablet Computers and Mobile Devices.”

1.3 DEFINITIONS

- A. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine level equipment.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.6 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. None Required

1.8 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.9 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Due to rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. Procedure for submitting and releasing the equipment be as follows:
 - 1. PCSS to submit for approval the required data for the equipment as part of the Software Package Submittal.
 - 2. Order equipment as late as possible dependent on the construction schedule to ensure the latest equipment available is provided. Just prior to ordering, resubmit for approval the required data of the latest available hardware and software equivalent in cost to that which is specified. No equipment to be ordered more than 3 months prior to when it is needed to be continuously used on the project.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.11 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

PART 2 - PRODUCTS

2.1 REPORTING SOFTWARE

- A. Manufacturers:

1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Ocean Data Systems – Dream Report
 - b. Substitutions: Or equal

- B. General:
 1. Reporting software to be a separate software package from the HMI and will run on the Historian server.
 2. Reporting software to be the manufacturer’s latest version available at the time of submission.
 3. Reporting software licensed to allow at least two concurrent users and development for at least ten report templates.
 4. Additional licenses, if required for the reporting package, provided to include support for the selected HMI software.
 5. Reporting software provided with a minimum of 5 years of support from the manufacturer.

- C. Reports:
 1. Process report generation software to provide the means to process and store data for historical records.
 - a. Software to be flexible so that contents of the reports can be easily modified. The software to provide for collecting, processing and storing values.
 2. Reports to include:
 - a. 2 Monthly Operator Reports
 - b. 2 Nutrient Analysis Report
 - c. 1 Copper-Lead Report
 - d. 1 Comprehensive Process Report
 - e. 1 Daily Report for Flows, Dissolved Oxygen, Nitrate and all Pump Station Flows
 3. Provide interface to the HMI software/Historian for automatic collection of daily/hourly/15-minute/one-minute summarized data from historical file.
 - a. Interfaces run with no user intervention and run as a Windows Service.
 4. Following data collection functions to be provided:
 - a. Instantaneous values may be collected based on the change value of the data point.
 - b. Instantaneous values to be averaged every 15 minutes. For some state reports, this 15-minute data will be retained.
 - c. 15-minute averages to be maintained for 72 hours.
 - d. 15-minute averages to be reduced to hourly averages and maintained for 60 days.
 - e. Hourly averages to be reduced to daily averages and maintained for 18 months.
 5. For each 24-hour period, the maximum and minimum values and totalized value for flow signals to be maintained for 18 months.

6. All averages to have the capability of being archived to removable media.
7. Provide log information on demand for screen display and archival to removable media.
8. Reporting software to be able to interface with the HMI Software and Historian Software and be compatible with the operating system supplied with the computers.
9. Provide calculation extension capability to perform calculations on data that have been accumulated for report generation. Calculations to include:
 - a. Standard operators (+, -, *, and /).
 - b. Functions (abs, retrieve forward or backward any day, exponential and logs, reciprocal, round, if-then-else, averages, and summations for daily, moving, weekly, monthly, and fiscal periods).
 - c. Difference (with specified rollover or without).
10. Provide capability to calculate loadings, percent removals, MCRT, and CT at a minimum. Results can be calculated daily, hourly, or minutely. These calculated data values to be stored in the database, thus ensuring the consistency of the data and allowing the same data to be readily available for analysis. Historical equations to allow definitions of the calculation by date.
11. Generate reports from process and operation data stored in historical files or a database. The reporting software to retrieve these data upon specifying a time period.
12. Date and time configuration to be developed to meet the facility requirements. For example, a "day range" may start at 7:00:00 AM and end at 6:59:59 AM instead of midnight-midnight.
13. Reports to be capable of being initiated automatically based upon time of day, month and year, or by event trigger. Reports also to be capable of being generated manually upon operator'(s) request.
14. When the reports are generated manually, the reporting system supports operator interaction through the HMI software to generate the required reports. The operator interface should prompt the user to enter a day, a month and a year to retrieve the data.
15. User interface displays to allow the operator to define the destination of the report (e.g., display, printer, computer file, email, etc.) and when it is to be printed (e.g., immediately, on demand, or automatically at a specified time).
16. Automatically start the reporting system when restarting the workstation to ensure data is not lost during power fail or system fail.
17. Reporting system to include several security settings that will give permissions to develop and modify data while limiting unauthorized access to data monitoring and/or data entry.
18. Software supports ability to print data quality tags alongside the value.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Reporting software will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports in accordance with the following:

1. Section 406100 “Process Control and Enterprise Management Systems General Provisions.”
2. Section 406121. 10 Process Control System Testing.

3.2 STARTUP SERVICE

- A. Perform startup service.
 1. Complete installation and startup checks according to manufacturer's written instructions.

3.3 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Service agreement includes software support for five years.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406823

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SECTION 406895 - SYSTEM SUPPORT SOFTWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes system support software.
- B. Related Requirements:
 - 1. Section 406100 “Process Control and Enterprise Management Systems General Provisions” for submittal requirements.
 - 2. Section 406213 “Server Computers.”
 - 3. Section 406216 “Operator Workstation Computers.”
 - 4. Section 406219 “Industrial Computers.”
 - 5. Section 406229 “Tablet Computers and Mobile Devices.”
 - 6. Hardware-Software Matrix - “406100A CDM - Appendix A - Hardware & Software Matrix”
 - 7. Section 406616 “Firewall Hardware”

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions”.
- B. Shop Drawings:
 - 1. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions” for.

1.4 INFORMATIONAL SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

1.5 CLOSEOUT SUBMITTALS

- A. Refer to Section 406100 “Process Control and Enterprise Management System General Provisions.”

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. See required spare requirements for each software in the ‘Products’ section below.

1.7 QUALITY ASSURANCE

- A. Provide components compatible with functions required to form complete working system.

1.8 TECHNOLOGY OBSOLESCENCE MITIGATION

- A. Due to rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. The procedure for submitting and releasing the equipment is as follows:
 - 1. PCSS to submit for approval the required data for the equipment as part of the Software Packages Submittal.
 - 2. Order equipment as late as possible dependent on the construction schedule to ensure the latest equipment available is provided. Just prior to ordering, resubmit for approval the required data of the latest available hardware and software equivalent in cost to that which is specified. Do not order equipment more than 3 months prior to when it is needed to be continuously used on the project.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 016000 “Product Requirements” for delivery, storage, and handling requirements.

1.10 FIELD CONDITIONS

- A. Refer to Section 406100 “Process Control and Enterprise Management Systems General Provisions.”

PART 2 - PRODUCTS

2.1 VIRUS SOFTWARE SUITE

- A. Manufacturers:
 - 1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:

- a. Sophos Endpoint Protection.
- b. McAfee Antivirus.
- c. Substitutions: Or equal

B. Type:

1. Virus software package business-level suite that utilizes a central management location and deployable agents for networked computers.
2. Compatible with all computer hardware/software on the network.
3. Provide threat detection, isolation, and a live response to detected threats.
4. Provide agent licenses for all servers and computers as shown on Appendix A – Hardware & Software Matrix.

C. Required Accessories:

1. Include minimum of 5 year of manufacturers support / automatic updates.

2.2 BACKUP SOFTWARE:

A. Manufacturers:

1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Acronis True Image.
 - b. Macrium Reflect.
 - c. Veeam.
 - d. Substitutions: Or equal

B. Type:

1. Business-level backup software above the default Microsoft Windows Backup utility.

C. Function/Performance:

1. Centrally managed package.
2. Support for Windows operating system installed on servers, workstations, industrial computers, and laptops.
3. Perform full system backups including all open files, system state, and open database files without having to stop any services or applications running on the server.
4. Full restore of system from bare metal state.
5. Capable of backing up to Local Drives, USB Drives, or Network Drives.
6. Restore individual files from backup media to original or alternative locations on the system.
7. Backup job scheduler capable of supporting multiple schedules for full, incremental and partial backup jobs.
8. Capable of doing full system images and standard file backups.
9. Configurable data retention policy settings.

10. Log files with the status of all backup and restore activities. Log file easily exports to a text file.
11. Central Manager to include a dashboard menu which provides a brief system overview.
12. The server on which the centrally managed software exists to maintain the licenses for each system.

D. Required Accessories:

1. Include minimum of 1 year of manufacturers support / automatic updates

2.3 REALVNC SOFTWARE

A. General:

1. Provide RealVNC remote desktop viewing software for all SCADA servers, workstations, industrial computers, and tablets.

B. Required Accessories:

1. Include 1 year of manufacturers support / automatic updates.
2. Include an additional 20% spare, or 2 seats, whichever is greater for the licenses.

2.4 IDENTITY PROVIDER FOR MULTIFACTOR AUTHENTICATION SERVICES

A. General:

1. An identity provider (IdP) is a third-party service that stores and manages users' digital identities and provides user authentication. Users logging into the system remotely from networks external to the control system network shall be required to authenticate using Multifactor Authentication (MFA). After users enter correct login information, the IdP shall prompt to authenticate using time-based one-time passwords (TOTP) sent to registered mobile devices.
2. IdP shall be compatible with the Palo Alto firewall (or equal) as specified in section "406616 – Firewall Hardware".
3. IdP shall be compatible with Radius and MS Active Directory.
4. IdP shall support one-time passwords for authentication through phone call, text message and email.
5. IdP shall offer a mobile device application for remote authentication.
6. Licensed through yearly and/or monthly subscription and number of users.
 - a. Initial subscription shall be 1 year and for 5 concurrent users

B. Manufacturers:

1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Duo Multifactor Authentication by Cisco
 - b. Substitutions: Or equal

2.5 SOFTWARE ALARM DIALERS

A. Manufacturers

1. Manufacturers and their products are subject to compliance with requirements. Provide one of the following:
 - a. Win-911 Software
 - b. No Substitutions

B. General:

1. Capable of being used with cell phones, landline phones and most wireless communications.
2. Communicate directly with the SCADA database.
3. Communicate with the HMI software.
4. Equipped with security options.

C. Function:

1. Provide real-time alarm notification over speakers, intercom systems, email, pagers and telephones.

D. Accessories:

1. Physical Hardware: The software accompanied by a compatible modem, as recommended by the manufacturer, to allow the software and computer to dial pagers and phone systems.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. System support software will be considered defective if it does not pass tests and inspections.
- B. Prepare test and inspection reports in accordance with the following:
 1. Section 406100 "Process Control and Enterprise Management Systems General Provisions."
 2. Section 406121 "Process Control System Testing"

3.2 STARTUP SERVICE

- A. Perform startup service.
 1. Complete installation and startup checks according to manufacturer's written instructions.

3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 406895

APPENDIX A - NEUROS QUOTE

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December 14th, 2022

Rick Hartenstein

Stafford WPCF

50 River Road

Stafford, CT 06076

Ph (860) 684-4914 /hartenstein@staffordct.org

Subject: Blower Local Control Panel Upgrade Project (AM-2021-0481C)

Reference project: 09-0009 Stafford, CT

Dear Mr. Hartenstein,

APG-Neuros is pleased to submit its proposal to upgrade the existing Local Control Panel (LCP). Our proposal offers the upgrade of LCP from existing MicroLogix 1100 to Allen-Bradley PLC and HMI to enhance blower's operation, performance, and protection.

The upgrade of the Local Control Panel from MicroLogix 1100 to Allen-Bradley PLC includes the replacement/addition of below mentioned components. All these components are added to the blower package for a smoother operation and better protection of the blowers against power surges or frequency distortions or voltage drops.

1. Allen-Bradley PanelView 7" coloured touch screen (HMI)

2. Allen-Bradley CompactLogix L24 PLC

CompactLogix L24 PLC it's our main PLC platform. Our program in CompactLogix has evolved into a very sophisticated program after a lot of upgrades, and 10 years of field experience. It utilizes the latest algorithm which includes the market leading preventative maintenance features to implement the true "Condition Based Maintenance" in our blower. Therefore, it is more intuitive and robust controller than MicroLogix 1100.

Below are some features of the latest program that have been implemented:

- **Minimum Speed Adjustment to Surge Protection:**
Allen-Bradley PLC automatically adjusts the Blower speed based on the current operating conditions to protect the blower's core from surge. When the blower operating point approaches the surge boundary, the PLC automatically increases the speed of the blower such that surge is avoided and the blower BOV is not engaged.

- **Dynamic Adjustment to Ambient Conditions:**
Allen-Bradley PLC automatically performs dynamic adjustments to the blower operating range during seasonal ambient temperature variations such that attainable maximum and minimum flows are always optimized
- **Auto-Reset:**
After a power outage blower will fault out on VFD related faults. When the main power is restored, blower's PLC will automatically reset all the faults and change the status from Fault to Ready. Upon receiving a run signal from SCADA, blower will be started
- **Soft-Stop:**
When PLC receives a stop command, it will reduce the blowers speed down to 81% for certain amount of time (30 seconds by default) then disables the VFD and shuts down the blower gradually. This will reduce the amount of back flow that could be caused by disabling the VFD immediately.
- **History Screen:**
History Screen has been updated. Up to 12 parameters are logged when a fault occurs. Also, up to 60 faults can be stored.

3. Integral Uninterruptable Power Supply (UPS) for PLC

UPS functions as a buffer to protect the equipment against a momentary power failure or interruption. It also can be used to prevent any PLC program loss during an abrupt black out.

4. Upgraded VFD Control Board and Keypad

The updated VFD control boards are loaded with the sensor less closed loop software that leads to a far more efficient operation of the motor and leads to decreased motor heating when compared to the standard open loop Volts/Hertz model.

5. VPN (Virtual Private Network) Router

The industrial grade VPN router allows for secure connection of the Turbo Blower PLCs to the central server running the Remote Monitoring System. This server can only be accessed by authorized personnel having a security certificate and password, providing for additional level of security. Once the users are authenticated, they will have access to the monitoring and trending data. VPN can be connected either with the Wi-Fi of the site or external cellular internet connection.

By accessing the Remote Monitoring System, following activities can be done:

- View all analog values of the blower in real time via secure web portal
- Export historical data to Excel from web portal for manipulation and viewing of the raw data
- Track blower faults (fault code, date, time, and blower serial number)
- Remote Technical Support by a Field Service Team Member to monitor and analyze the data via the Remote Monitoring System, and make necessary updates or modifications to the Turbo blower control system

- Continuous monitoring of the blower's operation
- Email alert when there is a fault, real time monitoring

Following are the advantages of using Remote Monitoring System:

- Compact & flexible, does not change customer's network configuration.
- Simple to deploy in MCP and easy to add on site; Ex: IGNITION SCADA
- Improves Field service trouble-shooting capabilities
- Fast investigation of customer's issues with historical data trends
- Reduction in maintenance costs
- Preventive maintenance & less field service technician visits
- Crucial during start-up phase and system operation stabilization

6. Atmospheric Pressure Sensor

Ambient pressure sensor measures the pressure of the surrounding in real-time. PLC uses this pressure to perform dynamic adjustment to ambient conditions to optimize the performance of the blower

7. Surge Protective Device

Surge protective devices (SPD) protects the electrical and control components from excessive voltage and current. Type 1 SPD to protect the 480V loads (VFD) and Type 2 SPD to protect the 120V loads (PLC controller box).

8. Phase Monitoring Relay

This makes APGN's blower capable of phase monitoring to quickly open the blow off valve and protect the blower if a voltage spike greater than 110% occurs.

Price: See Quote AM-2021-0481C for details.

Please see the price details on the next page.

Proposal valid until March 21st, 2023.

We look forward to your consideration of our offer.

Sincerely,

Julio Fajardo

Aftermarket Sales Manager

A 1270 Michèle-Bohec, Blainville, QC J7C 5S4 Canada

A 160 Banker Road, Plattsburgh, NY 12901 United States

P 1-866-592-9482 ext. 2116

E jfajardo@apg-neuros.com



Quotation

Log number:	AM-2021-0481C
Date:	12/14/2022

Delivery address:	Invoice address:
Stafford WPCF Attn: Rick Hartenstein 50 River Road Stafford, CT 06076 P: (860) 684-4914 / hartenstein@staffordct.org	To be advised

Project Description	
Project name:	Stafford, CT 09-0009
Models:	(2) NX50-C050, (2) NX100-C050

ITEM	QUANTITY	DESCRIPTION	PRICE	TOTAL
1	2	PLC Upgrade from MicroLogix 1100 to CompactLogix L24 for NX50 <i>Includes:</i> <ul style="list-style-type: none"> Allen-Bradley Compactlogix (L24) PLC Allen-Bradley PanelView Plus, 7" HMI Allen-Bradley I/O modules and cards Integral Uninterruptible Power Supply (UPS) for PLC UPS Battery Upgraded VFD keypad and card to comply with upgraded PLC New Local Control Panel box (blue box) with wiring, Ethernet switch, Relay, Fuse Terminal, MCCB, CAT 5E cables, etc. <p style="text-align: center;">Lead Time: 22-26 Weeks</p>	\$32,162.00	\$64,324.00
2	2	Blower Component Upgrade <i>Includes:</i> <ul style="list-style-type: none"> Atmospheric pressure sensor Line Voltage Surge Protector Surge Protective Device Phase Monitoring Relay VPN Router 	\$2,668.00	\$5,336.00
3	3	Field Service Engineer for one day (up to 8 hr on site) <i>Site visit for installation and testing of new LCP</i>	\$1,500.00	\$4,500.00
4	1	Estimated travel expenses* <i>* To be adjusted on final invoice.</i>	\$1,350.00	\$1,350.00
5	1	Estimated Field Service Engineer Travel Time* <i>*Estimated time: 10 hr at \$94/hr</i>	\$940.00	\$940.00
6	1	Estimated Shipping* <i>From Plattsburgh NY to Stafford, CT</i> <i>*To be adjusted on final invoice</i>	\$200.00	\$200.00
PO: To be advised				
			TOTAL	\$76,650.00

(Quotation in US\$)

Julio Fajardo

14-Dec-22

DATE

* Quotation valid until: 3/21/2023

* Payment methods: CK, wire transfer, Credit card

* Payment NET 30 days

* Shipping: PPA

Thank you for choosing APG-Neuros!

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