



**Dublin San Ramon
Services District**
Water, wastewater, recycled water

WWTP HVAC Replacements (CIP 22-P010) Project

Volume 1 of 2

Divisions 0, 1, 23, 26, Appendix, Drawings

CONTRACT DOCUMENTS

January 2026

Steven Delight

Steven V. Delight, District Engineer

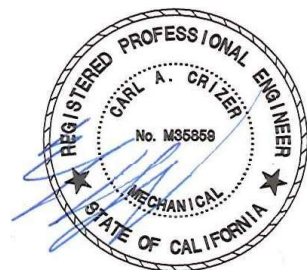


Engineered for Impact

305 South 11th Street
San Jose, California 95112-2218
877.725.2755 | 877.925.1477 (f)

WWW.SALASOBRIEN.COM

**National Strength.
Local Action.**



THIS PAGE LEFT INTENTIONALLY BLANK

Dublin San Ramon Services District
WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT

TABLE OF CONTENTS

DIVISION 0	BIDDING AND CONTRACT REQUIREMENTS	PAGE NUMBER
00010	Notice Inviting Bids	00010-1
00100	Instructions to Bidders	00100-1
00200	Information Available to Bidders	00200-1
00300	Bid Form	00300-1
00310	Bid Schedule	00310-1
00410	Bidder's Bond	00410-1
00412	Iran Contracting Act Certification	00412-1
00430	Designation of Subcontractors	00430-1
00440	Site Visit Affidavit	00440-1
00450	Schedule of Major Equipment and Material Suppliers—Not Used	
00458	Certification of Drug-Free Workplace Requirements	00458-1
00460	Certification of Bidder's Experience and Qualifications	00460-1
00461	Certification of Electrical Subcontractor's Experience and Qualifications	00461-1
00470	Acknowledgement of Insurance Requirements	00470-1
00471	Acknowledgement of Insurance Requirements for Designated Subcontractors	00471-1
00480	Non-collusion Affidavit	00480-1
00490	Affidavit of Safety Compliance	00490-1
00500	Agreement	00500-1
00610	Bond of Faithful Performance	00610-1
00620	Payment Bond	00620-1
00630	Escrow Agreement for Security Deposits in Lieu of Retention	00630-1
00650	General Liability Endorsement	00650-1
00651	Auto Liability Endorsement	00651-1
00700	General Conditions	00700-1
1.0	General	00700-1
1.1	Contract Agreement	00700-1

1.2	Written Notice and Service Thereof	00700-2
1.3	Rights of Action	00700-2
1.4	Plans and Specifications	00700-2
1.5	Applicability of all Paragraphs of Specifications	00700-3
1.6	Contract Interpretation by the Construction Manager	00700-3
1.7	Order of Precedence	00700-4
1.8	Bonds	00700-4
1.9	Penalty for Collusion	00700-5
1.10	Rights and Remedies	00700-5
2.0	Contract Administration	00700-5
2.1	Administration of the Contract	00700-5
2.2	Owner's Representative	00700-5
2.3	Construction Manager	00700-6
2.4	Design Consultant	00700-7
3.0	Owner	00700-8
3.1	General	00700-8
3.2	Attention to Work	00700-8
3.3	Observation and Inspection	00700-8
3.4	Owner's Right to Use or Occupy	00700-8
3.5	Owner's Right to Carry out the Work	00700-9
3.6	Owner's Right to Perform Work and to Award Separate Contacts	00700-9
3.7	Responsibility of the Owner	00700-9
4.0	Contractor	00700-10
4.1	Status of Contractor and Subcontractors	00700-10
4.2	Contractor's Representative	00700-10
4.3	Use and Protection of Owner's Site and Adjacent Property	00700-11
4.4	Fees and Permits	00700-12
4.5	Compliance with Laws	00700-12
4.6	Compliance with Environmental Laws	00700-16
4.7	Safety	00700-17
4.8	Provisions for Handling Emergencies	00700-22
4.9	Nonstandard Working Hours	00700-22
4.10	Cooperation with Other Contractors	00700-22
5.0	Control of Work and Material	00700-23
5.1	Means, Methods and Appliances	00700-23
5.2	Character of Workers	00700-23
5.3	Supply of Sufficient Workers	00700-23
5.4	Materials and Workmanship	00700-23
5.5	Existing Utilities	00700-24
6.0	Progress of the Work	00700-26
6.1	Commencement of Work	00700-26
6.2	Contract Time	00700-26
6.3	Delays	00700-27
6.4	Time Extensions	00700-28
6.5	Liquidated Damages	00700-30

6.6	Suspension of Work	00700-29
6.7	Right to Terminate Contract	00700-31
7.0	Changes in the Work	00700-32
7.1	Change Orders	00700-32
7.2	Differing Site Conditions	00700-33
7.3	Resolution of Disputes	00700-34
8.0	Payment	00700-37
8.1	Basis of Payment	00700-37
8.2	Partial Payments	00700-38
8.3	Right to Withhold Amounts	00700-41
8.4	Security Substitution for Withholds	00700-42
8.5	Warranty of Title	00700-42
8.6	Substantial Completion	00700-43
8.7	Final Inspection and Payment	00700-43
00800	Supplementary General Conditions	00800-1
1.0	Modifications to the General Conditions	00800-1
1.1	Time Allowed for Completion	00800-1
1.2	Damages for Delays	00800-1
1.3	Weather Days	00800-1
1.4	Contract Administration	00800-2
1.5	Alternative Dispute Resolution of Claims—Not Used	
2.0	Liability and Insurance	00800-2
2.1	General Requirements	00800-2
2.2	Subcontractors	00800-3
2.3	Coverage Requirements	00800-7
2.4	Deductibles and Self-Insured Retentions	00800-5
2.5	Additional Insureds	00800-5
2.6	Primary Coverage	00800-5
2.7	Claims Made Policies	00800-5
2.8	Waiver of Subrogation	00800-6
2.9	Verification of Coverage	00800-6
2.10	Insurance During Guarantee Period	00800-6
3.0	Indemnification	00800-6
4.0	Injury or Illness Reports	00800-7
5.0	State Revolving Fund Loan Program—Not Used	
6.0	Wage Rate Requirements	00800-8
6.1	Prevailing Wages	00800-8
6.2	Traveling Subsistence	00800-8
6.3	Penalty	00800-8
7.0	Partnering—Not Used	
8.0	Record Drawings and Additional Information	00800-8
9.0	Substantial Completion	00800-9

9.1	Retention Release—Not Used
10.0	Project Liaison—Not Used
00823	Escrow Bid Documents—Not Used

DIVISION 1 – GENERAL REQUIREMENTS

01010	Summary of Work	01010-1
1.0	Work Covered by Contract Documents	01010-1
2.0	Work Sequence and Constraints	01010-1
3.0	Early Occupancy of Portions of Work	01010-6
4.0	Owner Furnished Materials	01010-7
5.0	Trench Excavation	01010-7
6.0	Work Under Other Contracts	01010-7
7.0	Work Percentages	01010-7
8.0	Underground Facilities	01010-7
9.0	Project Sign	01010-8
10.0	Access for Operational Personnel	01010-9
01025	Measurement and Payment	01025-1
1.0	Measurement and Payment	01025-1
2.0	Bid Items	01025-2
3.0	Contractor's Cost Breakdown	01025-4
4.0	Payment Schedule for Pipeline Projects—Not Used	
01026	Allowances—Not Used	
01035	Modification Procedures	01035-1
1.0	Changes in Contract Price	01035-1
2.0	Negotiated Change Orders	01035-1
3.0	Force Account Payment	01035-2
4.0	Direct Cost Categories	01035-3
5.0	Markup Allowances	01035-4
6.0	Increased or Decreased Quantities	01035-5
7.0	Cost Pricing Data and Access to Records	01035-7
8.0	Time Extensions for Change Orders	01035-8
9.0	Cost-Reduction Incentive	01035-8
01050	Field Engineering	01050-1
1.0	Datum	01050-1
2.0	Quality Assurance	01050-1
3.0	Project Survey Requirements	01050-2
4.0	Record Documents	01050-2
01060	Regulatory Requirements and Permits	01060-1
1.0	Applicable Codes	01060-1
2.0	Fees and Permits	01060-1
3.0	Storm Water Quality Controls	01060-2
01090	References	01090-1
1.0	Codes and Standards	01090-1

2.0	Definitions of Words and Terms	01090-1
01200	Project Meetings	01200-1
1.0	Pre-Construction Conference	01200-1
2.0	Progress Meetings	01200-1
3.0	Partnering Meetings	01200-1
4.0	Submittal Meetings	01200-1
5.0	Quality Assurance Meetings	01200-2
6.0	Pre-Installation Meetings	01200-2
7.0	Special Meetings	01200-2
8.0	Post Construction Guaranty Period Meeting	01200-2
01308	Project Plan	01308-1
1.0	General	01308-1
2.0	Project Plan Requirements	01308-1
01310	Progress Schedules and Reports	01310-1
1.0	General	01310-1
2.0	Responsible Scheduling Person	01310-2
3.0	Construction Schedule	01310-3
4.0	Weather Conditions and Weather Day Allowance	01310-9
5.0	Schedule Updates	01310-9
6.0	Time Impact Analysis	01310-11
7.0	Weekly Schedule	01310-13
8.0	Final Schedule Submittal	01310-13
01322	Web Based Document Control	01322-1
1.0	Web Database	01322-1
2.0	Equipment	01322-3
3.0	Execution	01322-3
01340	Shop Drawings, Product Data and Samples	01340-1
1.0	Submittals	01340-1
2.0	Material and Equipment Substitutions	01340-2
3.0	Submittal and Material List	01340-3
4.0	Transmittal Procedures	01340-3
5.0	Review Procedure	01340-5
6.0	Effect of Review of Contractor's Submittals	01340-6
7.0	Seismic Design and Anchorage of Equipment and Other Appurtenant Facilities	01340-6
01345	Requests for Information and Clarifications	01345-1
1.0	General	01345-1
2.0	RFI Procedures	01345-1
01400	Quality Control	01400-1
1.0	Contractor's Quality Control	01400-1
2.0	Inspection and Testing	01400-2
3.0	Test Water	01400-6
01510	Temporary Utilities	01510-1

1.0	Electrical Services	01510-1
2.0	Water	01510-1
3.0	Temporary Lighting	01510-1
4.0	Heating and Ventilation	01510-1
5.0	Sanitary Conveniences	01510-1
01560	Temporary Controls	01560-1
1.0	Temporary Facilities	01560-1
2.0	Staging and Falsework	01560-1
3.0	Protection of Work, Property and Persons	01560-1
4.0	Fences	01560-1
5.0	Temporary Enclosures	01560-2
6.0	Above Grade Protection	01560-2
7.0	Working Hours	01560-2
8.0	Dust Control	01560-3
9.0	Fire Extinguisher	01560-3
10.0	Use of Explosives	01560-3
11.0	Removed Materials	01560-3
12.0	Construction Cleaning	01560-3
13.0	Noise Abatement	01560-3
14.0	Drainage Control	01560-3
15.0	Erosion Control	01560-4
16.0	Warning Devices and Barricades	01560-4
17.0	Traffic Regulations	01560-4
18.0	Roads and Fences	01560-5
19.0	Parking and Staging Areas	01560-6
20.0	Trees and Shrubs	01560-6
21.0	Office of Contractor at Site	01560-6
22.0	Contractor's Work and Storage Area	01560-6
23.0	Construction Manager's Field Office	01560-6
24.0	Public Access at Treatment Plant	01560-9
01600	Material and Equipment	01600-1
1.0	Salvaging and Storage of Equipment and Materials	01600-1
2.0	Hazardous Materials	01600-1
3.0	Disposal of Excavated Material	01600-1
01612	Seismic Design Criteria	01612-1
1.0	Summary	01612-1
2.0	References	01612-1
3.0	System Description	01612-1
4.0	Submittals	01612-2
01614	Wind Design Criteria	01614-1
1.0	Summary	01614-1
2.0	References	01614-1
3.0	System Description	01614-1
4.0	Submittals	01614-1
01660	Testing and Training	01660-1

1.0	Testing	01660-1
2.0	Training of Owner Personnel	01660-7
01710	Final Clean-Up	01710-1
1.0	Final Site Clean-Up	01710-1
2.0	Final Building Clean-Up	01710-1
01720	Project Record Documents	01720-1
1.0	Record Documents	01720-1
01730	Operation and Maintenance Data	01730-1
1.0	Operation and Maintenance Manuals	01730-1
01740	Warranties and Bonds	01740-1
1.0	Guarantee of Work	01740-1
01750	Spare Parts and Maintenance Materials	01750-1
1.0	Responsibility for Spare Parts and Tools	01750-1

DIVISION 23—HVAC

23 01 30	HVAC Air-Distribution System Cleaning
23 05 53	Identification for HVAC Piping and Equipment
23 05 93	Testing, Adjusting, and Balancing for HVAC
23 07 13	Duct Insulation
23 07 19	HVAC Piping Insulation
23 09 13	Building Automation System
23 09 34	Variable-Frequency Motor Controllers for HVAC
23 21 13	Hydronic Piping
23 21 14	Hydronic Specialties
23 21 23	Hydronic Pumps
23 31 00	HVAC Ducts and Casings
23 33 00	Duct Accessories
23 34 23	HVAC Power Ventilators
23 38 16	Laboratory Fume Hoods
23 64 13	Absorption Water Chillers
23 64 23	Scroll Water Chillers
23 74 13	Outdoor Central Station Air-Handling Units
23 74 14	Roof Top Air Conditioning Units
23 74 16	Packaged Rooftop Air-Conditioning Units
23 05 05	Selective Demolition for Electrical
23 05 10	Electrical General Provisions
23 05 12	Basic Material and Methods

DIVISION 26—ELECTRICAL

26 05 05	Selective Demolition for Electrical
26 05 10	Electrical General Provisions
26 05 12	Basic Material and Methods

APPENDIX

Appendix A Forms

DRAWINGS

DIVISION 0 – BIDDING AND CONTRACT REQUIREMENTS

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 00010

NOTICE INVITING BIDS

Notice is hereby given that sealed bids will be received by the Dublin San Ramon Services District office located at 7051 Dublin Boulevard, Dublin, CA 94568, at any time prior to **2 p.m. on Thursday, February 19, 2026** for furnishing all labor, materials, equipment, and services for the construction of improvements designated as:

WWTP HVAC Replacements (CIP 22-P010) Project

Any bids received after the scheduled closing time for receipt of bids shall be returned unopened.

Bids will be publicly opened, examined and declared on said day and hour, and will be referred to the Board for subsequent action.

The successful bidder will have 280 calendar days to substantially complete the project from the Notice to Proceed. The estimated cost of construction is \$3.25 million.

A prebid conference will be held at **10 a.m.**, local time, on **Tuesday, February 3, 2026** at the wastewater treatment plant (WWTP), 7399 Johnson Dr., Bldg. A, Pleasanton, CA and attendance is mandatory for all contractors submitting a bid. A site visit prior to bidding is mandatory for the contractor to be qualified to bid on the project.

All of said work is to be done at the places and in the particular locations, of the form, sizes and dimensions and of the materials, and to the lines and grades and at the elevations as shown on the plans and specifications made therefor and approved by the Owner.

This project is subject to labor compliance monitoring and enforcement by the California Department of Industrial Relations.

The Owner hereby advises all bidders that the successful bidder shall:

1. Employ the appropriate number of apprentices on the job site as set forth in California Labor Code 1777.5;
2. Provide Workers' Compensation coverage, as set forth in California Labor Code Sections 1860 and 1861;
3. Keep and maintain the records of work performed on the public works project, as set forth in California Labor Code Section 1812;
4. Keep and maintain the records required under California Labor Code Section 1776 which shall be subject to inspection pursuant to California Labor Code Section 1776 and California Code of Regulations, Division 1, Chapter 8, Subchapter 3, Article 6, Section 16400 (e); and
5. Be subject to other requirements imposed by law.

In accordance with the provisions of the California Labor Code Sections 1722.1, 1725.5, 1770, 1773, 1773.1, 1773.6 and 1773.7 as amended, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages in accordance with the standards set forth in Section 1773 for the locality in which the Work is to be performed. A copy of said wage rates is available on-line at http://www.dir.ca.gov/dlsr/statistics_research.html#PWD. It shall be mandatory

upon the Contractor to whom the Work is awarded and upon any subcontractor to pay not less than said specified rates to all workers employed by them in the execution of the Work. Said prevailing rate of per diem wages will be made available to any interested party upon request, and a copy thereof shall be posted at the job site by the Contractor.

The Owner will not recognize any claim for additional compensation because of the payment by the contractor of any wage rate in excess of the prevailing wage rates on file as aforesaid. The possibility of a wage increase is one of the elements to be considered by the contractor in determining his/her or its bid and will not, under any circumstances, be considered as the basis of a claim against the Owner on the contract.

The successful bidder and its subcontractors shall employ workers, trades and craftsmen, which constantly display and demonstrate proper moral, ethical and professional conduct to all fellow workers, employees and representatives of the Owner and other involved entities.

Each bid must conform and be responsive to the invitation, the Plans and Specifications, and all documents comprising the Contract Documents. Each bid shall be presented under sealed cover and shall be accompanied by a certified check or bidder's bond, made payable to the Owner, in an amount not less than ten percent (10%) of the bid. The said check or bidder's bond shall be given as a guarantee that the successful bidder will execute the contract in conformity with the form of agreement contained within the contract documents, and will furnish bonds and insurance policies as specified within ten (10) days after notification of the award of the Contract to the successful bidder. The contract documents that the successful bidder must submit within ten (10) days of notification of award include, but are not limited to, a payment or labor and materials bond in an amount of at least 100 percent of the amount payable by the terms of the project contract and that satisfies the requirements of California Civil Code Section 3248, and a performance bond in an amount of at least 100 percent of the amount payable by the terms of the contract. All project bonds must be executed by an admitted surety insurer in accordance with applicable law and acceptable to the Owner.

Cost for work described in each addenda issued during the time of bidding shall be included in the Bid and the addenda shall become a part of the Contract documents.

Bidders shall develop and submit bids at their own expense. The Owner will not reimburse any costs associated with the development and submittal of any and all Bids.

In accordance with California Public Contract Code Section 3400, bidders may propose equals of products listed in the plans and specifications by manufacturer name, brand or model number, unless the technical specifications or plans specify that the product is only available from one source, or is necessary to match others in use.

The Owner reserves the sole right to reject any or all bids and to waive any informality in a bid.

No bidder may withdraw its bid for a period of sixty (60) calendar days after the date set for the opening thereof. The Bidder shall guarantee the total bid price for a period of sixty (60) calendar days from the date of bid opening.

Any bid protest must be submitted in writing to the District Secretary at 7051 Dublin Boulevard, Dublin, CA 94568, before 5 p.m. of the fifth working day following bid opening as further described in

00100-21.0, **BID PROTEST**. The above time and content requirements are mandatory, and failure to comply therewith shall constitute a waiver of any further right to pursue a bid protest, including filing a Government Code claim or legal proceedings. Bid protests shall be acted upon by the District's Board.

At the successful Contractor's option, securities may be substituted for the required retention, in accordance with the provisions of Section 22300 of the State of California Public Contract Code.

In accordance with the provisions of California Public Contract Code Section 3300, the Owner has determined that the Contractor shall possess, as a minimum, a valid **Class A License or Class C20**. In accordance with the provisions of California Business and Professions Code Section 7028.15, a bid submitted to the Owner by a Contractor who is not licensed in accordance with Chapter 9 of the California Business and Professions Code shall be considered non-responsive and shall be rejected by the Owner.

The Contractor shall not be qualified to submit a bid to perform the Work unless it is registered and qualified to perform public work pursuant to Labor Code Section 1725.5 at the time that the bid is submitted. Failure to have registered and thereby be qualified shall render the bid non-responsive.

The Contract Documents can be found online at the following web address:
<https://www.dsrsd.com/do-business-with-us/bid-opportunities-results>.

The Contract Documents, including half-size drawings, may be purchased for a non-refundable charge of **\$145** at Studio Blue Reprographics, 7132-A Johnson Drive, Pleasanton, CA (925)463-9660. This charge includes the appropriate state sales tax and ground shipping costs. Full-size drawings are available for the cost of reproduction and shipping, if applicable. At the bidder's request and expense, the Contract Documents may be sent by overnight mail. Bidders can supply their shipper account number to expedite processing. Partial sets of Bid Documents are not available from the Owner.

Questions concerning this project should be submitted in writing via regular mail, email, or fax and directed to:

NAME: Ryan Yamamoto
ADDRESS: 7051 Dublin Boulevard
Dublin, CA 94568
PHONE: (925) 875-2265
FAX: (925) 829-1180
E-MAIL: ryamamoto@dsrsd.com

By: 
Nicole Genzale, District Secretary
Date: 

*** END OF SECTION ***

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 00100

INSTRUCTIONS TO BIDDERS

1.0 GENERAL

The work to be performed is described in the Contract Documents titled, **WWTP HVAC Replacements (CIP 22-P010) Project**. Codes and standards, definitions of words and terms, and abbreviations shall be as specified in Section 01090, **REFERENCES**.

2.0 EXAMINATION OF CONTRACT DOCUMENTS

All bidders shall carefully examine the Contract Documents and satisfy themselves as to their sufficiency; and shall not at any time after the submission of the bid dispute or complain of such Contract Documents and the directions explaining them or interpreting them, nor assert that there is any misunderstanding in regard to the location, extent, nature of amount of work to be performed. The bidder shall notify the Owner of any discovered conflicts, errors of discrepancies in the Contract Documents prior to the submission of its bid. Intended bidders shall have visited the site of the work and familiarized themselves with the conditions there existing as well as all other conditions relating the construction and labor under which the work will be performed and affecting cost, progress or performance of the work. The submitting of a bid shall be considered an acknowledgement on the part of the Bidder of its familiarity with conditions at the site of work.

3.0 PRE-BID CONFERENCE AND ACCESS TO THE SITE

A mandatory pre-bid conference for all bidders will be held at the time and place stipulated in Section 00010, **NOTICE INVITING BIDS**. Subcontractors, suppliers and other interested parties are invited and encouraged to attend this conference. Parties interested in an additional site visit may attend one as specified in Section 00010, **NOTICE INVITING BIDS**. Additional site visits are not to be used in lieu of the mandatory pre-bid conference for all bidders. Additional site visits are for the convenience of bidders in preparing the Bid.

4.0 POSTPONEMENT OF OPENING

The Owner reserves the right to postpone the date and time for receiving and/or opening of bids at any time prior to the date and time established in the Notice Inviting Bids in accordance with applicable law. Postponement notices may be faxed and will subsequently be mailed to planholders of record in the form of addenda.

5.0 ADDENDA

Addenda may be issued to all known planholders during the Bid period. Any and all addenda issued shall become a part of the Contract Documents and shall be fully considered by all bidders during preparation of bids.

6.0 PREPARATION OF BID FORMS

Bids shall be made on the blank bid forms prepared by the Owner and issued separately from this

project manual. Bid forms included in this project manual shall be used for reference only. Bids shall give the prices proposed in figures, shall give all other information requested herein, and shall be signed by the bidder or an authorized representative, including address. By submission of a proposal on the separate forms provided by the Owner, the bidder attests that the bidder has reviewed a complete set of the project manual and is aware of its entire contents, including any addenda. Bidder is required to provide a complete bid on all schedules listed in Section 00310, **BID SCHEDULE**.

Bids shall be made on the blank bid forms contained in the Documents and delivered to the Owner at the above address before the time set for the opening of bids as provided in Section 00010, **NOTICE INVITING BIDS**. All blanks in the bid forms must be appropriately filled in.

A complete set of bid forms shall be placed in an envelope, sealed, and addressed to:

Dublin San Ramon Services District
Attention: Ryan Yamamoto
7051 Dublin Boulevard
Dublin, CA 94568
BID: WWTP HVAC Replacements (CIP 22-P010) Project

The submitting of a bid shall be considered an acknowledgment on the part of the Bidder of familiarity with the Project, and its coordination requirements with this Contract's Work.

7.0 OPENING OF BIDS

After the expiration of the time for submission of bids, all bids will be publicly opened, read, declared, and referred to the District Board for action. Any bids received after the time for receiving and opening bids as set forth in the Invitation to Bid or as postponed by addenda will not be opened. Any such bids will be returned, unopened, to the Bidder.

8.0 BID PRICES

Bid prices shall include everything necessary for the completion of construction and fulfillment of the contract. Bid prices shall include all federal, state and local taxes including sales and use taxes. Costs for developing, submitting, and presenting bids are the sole responsibility of the bidder and claims for reimbursement will not be accepted by the Owner.

If the product of a unit price and an estimated quantity does not equal the extended amount quoted, the unit price shall govern, and the correct product of the unit price and the estimate quantity shall be deemed to be the amount bid. If the sum of two or more items in a bidding schedule does not equal the total amounts quoted, the individual item amounts shall govern and the correct total shall be deemed to be the amount of the bid.

9.0 BIDDER'S EXPERIENCE AND QUALIFICATIONS

All Bidders must complete and submit with their Bid Section 00460, **CERTIFICATION OF BIDDER'S EXPERIENCE AND QUALIFICATIONS**. The listed Electrical Subcontractor must complete and submit with the Bid Section 00461, **CERTIFICATION OF ELECTRICAL SUBCONTRACTOR'S EXPERIENCE AND QUALIFICATIONS**. Failure to provide this information with the Bid may render the Bid non-responsive

and may be the basis for rejection of the Bid and/or may result in a determination that the Bidder is not a responsible Bidder for the Project. The information furnished will be reviewed to determine if the Bidder is qualified and responsible to be awarded the Contract.

The Contractor shall not be qualified to submit a bid to perform the Work unless it is registered and qualified to perform public work pursuant to Labor Code Section 1725.5 at the time that the bid is submitted. Failure to have registered and thereby be qualified shall render the bid non-responsive.

10.0 BID IRREGULARITIES

Each bid and the information requested shall be enclosed in a sealed envelope and labeled as specified herein. Bidders are warned against making erasures or alterations of any kind, and bids which contain omissions, erasures, or irregularities of any kind may be rejected. No oral, telegraphic, email, facsimile or telephonic bids or modifications will be considered.

11.0 MODIFICATION OF BID

Modification of a bid already received will be considered only if the modification is received prior to the time established for receiving bids. Modifications shall be made in writing, executed, and submitted in the same form and manner as the original bid.

12.0 SUBCONTRACTORS AND MAJOR SUPPLIERS

In accordance with California Public Contracting Code Section 4100, et. Seq., each bid shall have listed in Section 00430, **DESIGNATION OF SUBCONTRACTORS**, the name, type or trade, portion of work to be performed, location of the place of business, and the California contractor license number and the Public Work Contractor registration number of each subcontractor who will perform work or labor or render service to the bidder in or about the construction of the work or improvement, or of any subcontractor licensed by the State of California who, under subcontract to the bidder, will specifically fabricate and install a portion of the work or improvement according to detailed drawings contained in the Contract Documents, in an amount in excess of one-half of one percent of the bidder's total bid or \$10,000, whichever is greater.

If the Contractor fails to designate in its proposal a subcontractor for any portion of the work as required above, the bidder shall be deemed to have agreed to perform such portion of the work itself and shall not be permitted to subcontract said portion of the work without the written permission of the Owner in accordance with applicable law.

A subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5.

Failure by a listed subcontractor to be registered to perform public work as required by subdivision (a) of Labor Code section 1725.5 shall be grounds under Section 4107 of the Public Contract Code for the contractor, with the consent of the awarding authority, to substitute a subcontractor who is registered to perform public work pursuant to Section 1725.5 in place of the unregistered subcontractor.

13.0 BID GUARANTY BOND AND CONTRACT AWARD

Bids shall be accompanied by a cashier's check, a certified check or a bidder's bond executed by an admitted surety in an amount not less than ten (10) percent of the aggregate of the bid, payable to the order of the Owner. Said check or bond shall be a guarantee that the successful bidder, if awarded the work, will within ten (10) days after notice of its award to the successful bidder: (1) enter into a contract, (2) furnish a bond of faithful performance and a labor and material bond, and (3) furnish insurance policies and endorsements. In case of refusal or failure to enter into said Contract or to conform to any of the requirements stated above in connection therewith including the failure of the Contractor to be currently registered and qualified to perform public work pursuant to Labor Code Section 1725.5, the bid guaranty check or bond, as the case may be, shall be forfeited to the Owner, the proceeds therefrom being hereby agreed upon as liquidated damages to the said Owner on account of the delay in the execution of the Contract and required bonds and the performance of the work thereunder, and the necessity of accepting a higher or less desirable bid resulting from such failure or refusal to execute the Contract and the bonds as required.

Upon the execution of the Contract and the approval on behalf of the Owner of the accompanying bonds and insurance policies and endorsements, all certified checks that accompany Proposals and that have not heretofore been returned, will be returned, each to its maker. If Owner awards a contract, Award of the Contract will be made to the lowest responsive, responsible bidder complying with these instructions, the Section 00010, **NOTICE INVITING BIDS**, and such other pertinent provisions of the Contract Documents as may apply WITHIN THE TIME PERIOD SPECIFIED IN Section 00010, **NOTICE INVITING BIDS**. If award is made, it will be based on the lowest responsive; responsible bid whose base bid and alternate(s) as listed in Section 00300, **BID FORM**, yields the lowest total Contract price. Inclusion of any or all alternates in the contract shall be at the sole discretion of the Owner.

The Owner, however, reserves the right to reject any or all bids. The Owner also reserves the right to waive irregularities or informalities in a bid or bidding procedure, to the extent allowed by law.

In addition, the Owner may reject each bid not accompanied by Section 00412, **IRAN CONTRACTING ACT CERTIFICATION**, in which the Total Amount set forth on the Bid Schedule is \$1,000,000 or more, unless Owner's Board of Directors, in its sole discretion, (1) determines that it is in the best interest of the Owner to contract with the Bidder, and (2) makes a public finding that the Owner would be unable to obtain the goods or services for which the contract is offered if it did not exempt the Bidder from the obligation to submit the **IRAN CONTRACTING ACT CERTIFICATION**. The determination and finding described in the preceding sentence shall be based on substantial evidence, which may include but shall not be limited to evidence submitted by the bidder seeking the determination and finding. Public Contract Code section 2205 establishes penalties for false certifications, including civil penalties equal to the greater of \$250,000 or twice the amount of the contract for which the false certification was made, contract termination, and three-year ineligibility to bid on contracts.

14.0 CONTRACTOR'S LICENSE

Each bidder shall be licensed in accordance with the provisions of the Contractors License Law of California as stipulated in Section 00010, **NOTICE INVITING BIDS**. See Paragraphs 00100-9.0, **BIDDER'S EXPERIENCE AND QUALIFICATIONS**, and 00100-12.0, **SUBCONTRACTORS AND MAJOR SUPPLIERS**, for additional registration requirements.

15.0 LOCAL BUSINESS LICENSE

The Contractor shall have a local business license from City of Pleasanton for the work contemplated before the Contract can be executed.

16.0 WORK PERCENTAGES

The Contractor shall perform with its own organization no less than the work percentage specified in Section 01010-7.0, **WORK PERCENTAGES**.

17.0 COLLUSION

If the Owner has reason to believe that collusion exists among bidders, the Owner will reject the bids of the known participants in such collusion and may, at its option, require that all bidders certify under penalty of perjury, that no collusion has occurred or exists. The Owner also, at its option, may reject all bids received. In accordance with Public Contract Code Section 7106 the Contractor shall complete and file with its proposal Section 00480, **NON-COLLUSION AFFIDAVIT**. Public Contract Code Section 7106 requires that the affidavit must be duly sworn.

18.0 INTERPRETATIONS

No oral representations or interpretations will be made to any bidder as to the meaning of the Contract Documents. Requests for an interpretation shall be made in writing and delivered to the individual specified in Section 00010, **NOTICE INVITING BIDS**, at least seven (7) days before the bids are opened as provided in Section 00010, **NOTICE INVITING BIDS**.

19.0 SAFETY COMPLIANCE

The Owner requires that the Contractor conduct its operations in a manner to eliminate or reduce hazards and risks associated with the Contractor's activities, to prevent accidents and injuries, and to prevent property damages. Each Bidder shall certify under penalty of perjury that it will provide evidence that it can comply with the required mandatory Safety Programs delineated in Section 00490, **AFFIDAVIT OF SAFETY COMPLIANCE**.

If the Bidder does not submit an Affidavit of Safety Compliance with the Bid, the Bid may be deemed non-responsive or the Bidder deemed a non-responsible Bidder and be disqualified.

20.0 WITHDRAWAL OF BID

In accordance with Public Contract Code 5101 and 5103, within five days after the opening of bids, a bidder may be permitted to withdraw its bid providing the bidder can establish to the Owner's satisfaction that a mistake was made in preparing the bid. A bidder desiring to withdraw shall give written notice to the Owner, specifying, in detail, how the mistake occurred and how the mistake made the bid materially different than it was intended to be. Withdrawal will not be permitted for mistakes resulting from errors in judgment or carelessness in inspecting the site of the work or in reading the Contract Documents.

21.0 BID PROTEST

Any Bid protest must be submitted in writing to the District Secretary before 5 p.m. on the fifth (5th) working day following Bid opening.

- A. The initial protest document must contain a complete statement of the basis for the protest, and all supporting documentation.
- B. The party filing the protest must have actually submitted a Bid for the Work. A subcontractor of a party submitting a Bid for the Work may not submit a Bid protest. A party may not rely on the Bid protest submitted by another Bidder, but must timely pursue its own protest.
- C. The protest must refer to the specific portion of the bid document which forms the basis for the protest.
- D. The protest must include the name, address and telephone number of the person representing the protesting party.
- E. The party filing the protest must concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest which may be adversely affected by the outcome of the protest. Such parties shall include all other Bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.
- F. The Owner will give the Bidder that is the subject of the protest five (5) working days after the receipt of the protest to submit a written response. The responding Bidder shall transmit the response to the protesting Bidder concurrent with delivery to the Owner.
- G. The procedure and time limits set forth in this paragraph are mandatory and are the Bidder's sole and exclusive remedy in the event of Bid protest. The Bidder's failure to comply with these procedures shall constitute a waiver of any right to further pursue the Bid protest, including filing a Government Code Claim or legal proceedings
- H. If the Owner determines that a protest is frivolous, the protesting bidder may be determined to be non-responsible and that bidder may be determined to be ineligible for future contract awards.

22.0 EXISTING CONDITIONS

The submitting of a bid shall be considered an acknowledgement on the part of the Bidder of familiarity with conditions at the site of the Work. The Bidder further acknowledges that the site examination has provided adequate and sufficient information related to existing conditions which may affect cost, progress or performance of the Work.

All Bidders shall submit affidavits, duly sworn and notarized, as presented in Section 00440, **SITE VISIT AFFIDAVIT**, that they have visited and familiarized themselves with the Project Site.

23.0 BIDDER'S CHECKLIST

This checklist has been prepared and furnished to aid Bidders in including all necessary supporting information with their bid. Bidders' submittals should include, but are not limited to, the following:

	<u>Item</u>	<u>Checked</u>
1.	Bid Form (Section 00300)	_____
2.	Bid Schedule (Section 00310)	_____
3.	Bidder's Bond (Section 00410)	_____
4.	Iran Contracting Act Certification (Section 00412)	_____
5.	Designation of Subcontractors (Section 00430)	_____
6.	Site Visit Affidavit (Section 00440)	_____
7.	Schedule of Major Equipment and Material Suppliers (Section 00450)	_____
8.	Certification of Drug-Free Workplace Requirements (Section 00458)	_____
9.	Certification of Bidder's Experience and Qualifications (Section 00460)	_____
10.	Certification of Electrical Subcontractor's Experience and Qualifications (Section 00461)	_____
11.	Acknowledgement of Insurance Requirements (Section 00470)	_____
12.	Acknowledgement of Insurance Requirements for Designated Contractors (Section 00471)	_____
13.	Non-Collusion Affidavit (Section 00480)	_____
14.	Affidavit of Safety Compliance (Section 00490)	_____

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 00200

INFORMATION AVAILABLE TO BIDDERS

1.0 SUBSURFACE CONDITIONS

Subsurface investigation has not been conducted at the site of the Work. Contractors, as bidders, are expected to make a personal inspection of the site and otherwise satisfy themselves as to the conditions affecting the work as detailed in these Contract Documents.

The Owner disclaims responsibility for the Bidder's interpretation of data, such as, projecting or extrapolating from the test holes to other locations on the site of the Work, soil bearing values and profiles, and soil stability, as well as the presence, level, and extent of underground water for subsurface conditions during construction operations.

2.0 RECORD DRAWINGS AND ADDITIONAL INFORMATION

Previous construction activities have occurred at portions of the site. Specification Section 00800-8.0, **RECORD DRAWINGS AND ADDITIONAL INFORMATION**, lists known available information for review by Bidders.

3.0 SITE ACCESS DURING BID PERIOD

Additional access to the site(s) for investigations may be desired to assist the bidders in the development of their bid. This access shall be provided as described in Section 00100-1.0, **GENERAL**.

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 00300

BID FORM

To the:
Dublin San Ramon Services District
Attn: Ryan Yamamoto
7051 Dublin Boulevard
Dublin, CA 94568

Date: _____

Name of Bidder: _____

Business Address: _____

The undersigned as bidder declares that it has reviewed a complete set of the Project Manual and carefully examined the location of the proposed work, the Contract Documents, and the plans and specifications therein referred to, and the bidder proposes and agrees if this proposal is accepted, that it will contract with the Owner and hereby proposes to furnish all labor, materials, necessary machinery, tools, apparatus, and other means of construction and services, and do all the work specified in the Contract Documents in the manner and time hereinafter set forth required for the construction of the work involved in the improvements designated as:

WWTP HVAC Replacements (CIP 22-P010) Project

ADDENDUM RECEIPT: The receipt of the following Addenda to the Contract Documents is acknowledged:

Addendum No. _____	Addendum No. _____	Addendum No. _____
Addendum No. _____	Addendum No. _____	Addendum No. _____

The bidder proposes and agrees to contract with the Owner to perform all the above work, including subsidiary obligations as defined in said specifications for the prices indicated in Section 00310, **BID SCHEDULE**.

Further in submitting its bid, the undersigned Bidder understands and agrees that the Total Base Bid amount is determined by the sum total of all bid item amounts in the Bid Schedule. Bid Items include all work as defined in Section 01025, **MEASUREMENT AND PAYMENT**. No base bid items will be excluded from the awarded contract. If award is made, it will be based on the lowest responsive, responsible bid whose Total Base Bid yields the lowest Contract Price. The Bid prices shall remain valid until Award of the Contract.

Only one contract will be awarded.

The undersigned has filled in all information required herein and understands that failure to do so is grounds for rejecting the bid by the Owner.

The Owner reserves the right to change, delete or add new work to the Contract as per the terms of the General Conditions of the Contract Documents and applicable law.

The undersigned has checked carefully all the above figures and understands that the Owner will not be responsible for any errors or omissions on the part of the undersigned in making up this proposal.

The undersigned understands that the Owner reserves the sole right to reject any or all bids and to waive any informality in any bid in accordance with California law. Award will be made, if any, which, in the judgment of the Owner, is in the best interest of the Owner.

It is agreed that this proposal may not be withdrawn within the Award period time as specified in Section 00010, **NOTICE INVITING BIDS**, except as allowed in Public Contract Code 5103.

Enclosed herewith is a (certified check, cashier's check, bond) for not less than ten (10) percent of the total amount of this proposal and the undersigned agrees that, in case of its default in executing the Contract, or furnishing the necessary bonds and insurance policies and other required documents within ten (10) days after notice of the Award to the successful Bidder, the said check or bond and the money payable thereon shall become forfeit to and remain the property of the Owner, as liquidated damages without proof of loss within ten (10) days of notice of default by Owner. In the event Bidder provides the Owner with a Proposal Guaranty Bond, it shall be on the form enclosed herewith in Section 00410, **BIDDER'S BOND** and be issued by a corporate surety. The corporate surety shall be authorized to conduct business in California. At its discretion, the Owner may request that a certified copy of the certificate of authority of the surety issued by the Insurance Commissioner of the State of California be submitted by the surety to the Owner. At its discretion, the Owner may also require the surety to provide copies of its most recent annual statement and quarterly statement filed with the Department of Insurance pursuant to Article 10 (commencing with Section 900) of Chapter 1 of Part 2 of Division 1 of the Insurance Code. The Bond and the corporate surety will be reviewed and approved by the Owner's counsel in accordance with applicable law.

In accordance with the Specifications, the undersigned further agrees to so plan the work and to prosecute it with such diligence that said work shall be commenced within ten (10) days after the date of issuance of the notice to proceed and shall be completed within the time specified in Section 00800-1.1, **Time Allowed for Completion**.

The undersigned agrees, if awarded the Contract, that there shall be paid by the undersigned and by all subcontractors under him, to all laborers, workers and mechanics employed in the execution of such Contract or any subcontract thereunder, not less than the general prevailing rate of per diem wages, and rates for overtime and legal holidays in the locality in which the work is to be performed, as ascertained and determined, pursuant to California Labor Code Sections 1770, 1773, 1773.1, 1773.6, and 1773.7 as amended. The Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages in accordance with the standards set forth in Section 1773 for the locality in which the Work is to be performed. A copy of said wage rates is available on-line at www.dir.ca.gov/DLSR/PWD. It shall be mandatory upon the Contractor to whom the Work is awarded and upon any subcontractor under the Contractor to pay not less than said specified rates to all workers employed by them in the execution of the Work. Said prevailing rate of per diem wages will be made available to any interested party upon request, and a copy thereof shall be posted at the job site by the Contractor. The representations made herein, including the bidder's licensing information hereinafter furnished, are made under penalty of perjury. The undersigned understands that any bid not containing said licensing information, or containing any information which is subsequently proven false, may be considered non-responsive, and be rejected by the Owner

and/or be a basis for determining the bidder not responsible or eligible to perform the project.

Signed _____

Name _____

Contractor _____

By _____

Title _____

Contractor License No. _____

License Classification _____

Expiration Date _____

Dated _____

Address _____

Telephone _____

Email _____

CERTIFICATES. Shall be attached to the bid form and submitted with the bid.

- A. Bids by corporations must be executed in the corporate name by the president, a vice-president, or other corporate officer. Such Bid shall be accompanied by the enclosed Certificate of Authority to sign, attested by the secretary or assistant secretary. The corporate address and state of incorporation must appear below the signature.
- B. Bids by partnerships must be executed in the partnership name and be signed by a managing partner, accompanied by the enclosed Certificate of Authority to sign, and his/her title must appear under the signature and the official address of the partnership must appear below the signature.
- C. Bids by joint venture must be executed in the joint venture name and be signed by a joint venture managing partner, accompanied by the enclosed Certificate of Authority to sign, and his/her title must appear under the signature and the official address of the joint venture must appear below the signature. Additionally, the Bid shall bind the joint venture.
- D. If the Bid is made by an individual, bidder's name, signature, and post office address must be shown.

Name of Bidder _____

BID PROPOSAL CERTIFICATE
(if Corporation)

STATE OF CALIFORNIA)
) ss
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Board of Directors of the _____

(Name of corporation and post office address),
a corporation existing under the laws of the State of _____, held
on _____, 20____, the following resolution was duly passed and adopted:

“RESOLVED, that _____, as _____
President of the Corporation, be and is hereby authorized to execute the Bid Proposal
dated _____, 20____, for the **WWTP HVAC Replacements (CIP
22-P010) Project**, for the Dublin San Ramon Services District, and that his/her execution
thereof, attested by the

(Secretary or title of Person who signs on behalf of the Corporation),
and with the Corporate Seal affixed, shall be the official act and deed of this
Corporation.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the
corporation this _____, day of _____, 20____.

(1)
(Title of Person who signs on behalf of Corporation)

- (1) Include a certified copy of the bylaws or resolution of the Board of Directors of the corporation showing authority of the officer signing the Bid to execute contracts on behalf of the corporation.

Name of Bidder _____

BID PROPOSAL CERTIFICATE
(if Partnership)

STATE OF CALIFORNIA)
) ss
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Partners of the _____
_____ a partnership existing under the laws of the State of _____, held
on _____, 20_____, the following resolution was duly passed and adopted:

“RESOLVED, that _____, as _____
the General Partner of the Partnership, be and is hereby authorized to execute the Bid
Proposal dated _____, 20____, for the **WWTP HVAC
Replacements (CIP 22-P010) Project**, for the Dublin San Ramon Services District, and
that his/her execution thereof, attested by the

shall be the official act and deed of this Partnership.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____,
20 ____.

Signature of General Partner

List all Partners

Name of Bidder _____

BID PROPOSAL CERTIFICATE
(if Joint Venture)

STATE OF CALIFORNIA)
) ss
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Principals of the _____

a joint venture existing under the laws of the State of _____, held
on _____, 20_____, the following resolution was duly passed and adopted:

“RESOLVED, that _____, as
_____ of the joint venture, be and is
hereby authorized to execute the Bid Proposal dated _____, 20_____, for
the **WWTP HVAC Replacements (CIP 22-P010) Project**, for the Dublin San Ramon
Service District, and that his/her execution thereof, attested by the _____,
shall be the official act and deed of this Joint Venture and shall bind the Joint Venture.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____,
20_____.

(Representative of one of the Joint Venture firms)

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

Name of Bidder: _____

SECTION 00310

BID SCHEDULE

WWTP HVAC Replacements (CIP 22-P010) Project

1.0 BASE BID

Item	Description	Unit	Estimated Quantity	Unit Bid Price	Total Bid Price
1.	Mobilization/Demobilization (not to exceed 5% of total bid)	LS	1	\$_____	\$_____
2.	Complete the Work for Building A in accordance with the Contract Documents	LS	1	\$_____	\$_____
3.	Complete the Work for Building C in accordance with the Contract Documents	LS	1	\$_____	\$_____
4.	Complete the Work for Building H in accordance with the Contract Documents	LS	1	\$_____	\$_____
5.	Complete the Work for Building T (Chiller Unit is Owner-Furnished) in accordance with the Contract Documents	LS	1	\$_____	\$_____
6.	Fees and Permits	LS	1	\$_____	\$_____
7.	Baseline Project Schedule	LS	1	\$_____	\$_____
8.	Monthly Schedule Updates	EA	10	\$_____	\$_____
9.	Operation and Maintenance Manuals	LS	1	\$_____	\$_____
10.	Start-Up, Testing and Training	LS	1	\$_____	\$_____
11.	All Other Work	LS	1	\$_____	\$_____
Total Base Bid Items 1 through 11 inclusive and all work incidental thereto and connected therewith.					\$_____

Total Base Bid: _____
(In Words)

Bid amount of each of the above Bid Items must be filled in and completed.

Bid items shall be as specified in Section 01025, **MEASUREMENT AND PAYMENT**.

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

Name of Bidder: _____

SECTION 00410

BIDDER'S BOND

We, _____, as Principal, and _____ as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the Dublin San Ramon Services District (herein called "the Owner") for the payment of the penal sum of _____ dollars (\$ _____), lawful money of the United States, which is ten percent (10%) of the total amount bid by bidder to the Owner. Principal has submitted the accompanying bid for the construction of the **WWTP HVAC Replacements (CIP 22-P010) Project**.

If the Principal is awarded the contract and enters into a written contract, in the form prescribed by the Owner, at the price designated by his bid, and files the bonds required by the Agreement with the Owner, and carries all insurance in type and amount which conforms to the contract documents and furnishes required certificates and endorsements thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

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

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

Executed on _____

Principal

By: _____
Signature

Title

Name of Bidder: _____

Any claims under this bond may be
addressed to:

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

(Telephone number of Surety's agent in
California)

(Attach Acknowledgment)

SURETY

By _____
(Attorney-in-Fact)

NOTICE:

No substitution or revision to this bond form will be accepted. All bonds submitted must have a certified copy of the bonding agent's power of attorney attached. Also each Surety must be an "Admitted Surety" (i.e., qualified to do business in California), and proof of verification from the California Department of Insurance or a certificate from County Clerk must also be attached.

SECTION 00412

IRAN CONTRACTING ACT CERTIFICATION

Pursuant to Public Contract Code section 2204, each bidder submitting a Bid in which the Total Amount set forth on its Bid Schedule is \$1,000,000 or more must also submit with its bid this **IRAN CONTRACTING ACT CERTIFICATION**, and the failure to submit the IRAN CONTRACTING ACT CERTIFICATION may render the bid non-responsive except as otherwise specified in Paragraph 00100-13.0, **BID GUARANTY BOND AND CONTRACT AWARD**.

The undersigned Bidder certifies as follows (check the applicable circumstance):

- _____ The company submitting the accompanying bid is not on the current list of persons engaged in investment activities in Iran created by the California Department of General Services ("DGS") pursuant to Public Contract Code section 2203(b), and is not a financial institution extending twenty million dollars (\$20,000,000) or more in credit to another person, for 45 days or more, if that other person will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS.
- _____ The company submitting the accompanying bid has previously received written permission from the District, pursuant to subdivision (c) or (d) of Public Contract Code section 2203, to submit a bid. A copy of the written permission from the District is submitted with the accompanying bid.

I, the person signing below, hereby certify that I am duly authorized to execute this certification on behalf of the Company identified below, and that I am aware that Public Contract Code section 2205 establishes penalties for providing false certifications, including civil penalties equal to the greater of \$250,000 or twice the amount of the contract for which the false certification was made; contract termination; and three-year ineligibility to bid on contracts.

Name of Company Submitting Bid

Signature for Company Submitting Bid

Name and Title of Signatory

Date

*** END OF SECTION ***

THIS PAGE LEFT INTENTIONALLY BLANK

Name of Bidder: _____

SECTION 00430

DESIGNATION OF SUBCONTRACTORS

(To Accompany Bid)

In accordance with California Public Contract Code, Section 4100 et. seq., as amended, the following is submitted concerning subcontractors: Each bidder shall set forth below (a) name, the location of the place of business, and the California contractor license number and the Public Work Contractor registration number of each subcontractor who will perform work or labor, fabricate a portion of the work or improvement according to detailed drawings in the project plans, or render service to the Contractor in or about the construction of the work in an amount in excess of one-half (1/2) of one percent (1%) of the Contractor's total bid or \$10,000 whichever is greater; and (b) the portion of the work (type and trade) which will be done by each such subcontractor. If a Contractor fails to specify a subcontractor or, if a contractor specifies more than one subcontractor for the same portion of work to be performed under the contract in excess of one-half (1/2) of one percent (1%) of the contractor's total bid for any portion of the work as above stated, the Contractor agrees that he/she is fully qualified to perform that portion himself/herself, and that the contractor shall perform that portion himself/herself. Subcontractors work for which no subcontractor was designated in the original bid and which is in excess of one-half (1/2) of one percent (1%) of the total contract price, will be allowed only with written consent of the Owner in accordance with applicable law. The Contractor shall provide to the Owner the license number of each listed subcontractor within ten (10) days of issuance of the Notice to Proceed.

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

Name of Bidder: _____

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

Name of Subcontractor: _____

Contractor License No.: _____ PWC Registration No.: _____

Business Location: _____

Description of Work to be Performed: _____

Amount of Work to be Performed: _____

*** END OF SECTION ***

00430-2

Name of Bidder: _____

SECTION 00440

**SITE VISIT AFFIDAVIT
TO BE EXECUTED
BY BIDDER AND SUBMITTED WITH BID**

(To Accompany Bid)

State of California)
) ss.
County of)

_____, **being first duly sworn**, deposes and says that he or
(Contractor's Authorized Representative)

she is

_____ of _____, the party making the foregoing
(Title of Representative) (Contractor's Name)

bid, has visited the Site of the Work as described in the Contract and has examined and familiarized him or herself with the existing conditions, as well as all other conditions relating to the construction which will be performed. The submission of a bid shall be considered an acknowledgement on the part of the Bidder of familiarity with conditions at the site of Work. The Bidder further acknowledges that the site examination has provided adequate and sufficient information related to existing conditions which may affect cost, progress or performance of the Work.

Signature

Name of Bidder

Title

Date

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

Name of Bidder: _____

SECTION 00458

CERTIFICATION OF DRUG-FREE WORKPLACE REQUIREMENTS

DRUG-FREE WORKPLACE CERTIFICATION

CONTRACTOR/APPLICANT:

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

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

CERTIFICATION

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

OFFICIAL'S NAME: _____

DATE EXECUTED: _____ EXECUTED IN COUNTY OF: _____

CONTRACTOR/APPLICANT SIGNATURE: _____

TITLE: _____

***** END OF SECTION*****

THIS PAGE LEFT INTENTIONALLY BLANK

Name of Bidder: _____

SECTION 00460

**CERTIFICATION OF BIDDER'S
EXPERIENCE AND QUALIFICATIONS**

(To Accompany Bid)

The undersigned Bidder certifies that it is, at the time of bidding, and shall be, throughout the period of the contract, licensed under the provisions of Chapter 9, Division 3, of the Business and Professions Code of the State of California, to do the type of work contemplated in the Contract Documents. Bidder further certifies that it is skilled and regularly engaged in the general class and type of work called for in the Contract Documents.

The Bidder represents that it is competent, knowledgeable, and has special skills concerning the nature, extent, and inherent conditions concerning the work to be performed. Bidder further acknowledges that there are certain inherent conditions existent in the construction of the particular facilities which may create, during the construction program, unsafe conditions hazardous to persons and property. Bidder expressly acknowledges that it is aware of such risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the construction work with respect to such hazards.

A Contractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for the public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5.

A. ESSENTIAL REQUIREMENTS FOR QUALIFICATION

If the answer to any of questions 1 through 3 is "no", or if the answer to any of questions 4 through 7 is "yes", the Bidder will be deemed ineligible or not responsible for purposes of the Contract.

1. Bidder possesses a valid and current California Contractor's license as required for the project for which it intends to submit a bid.
☐ Yes ☐ No
2. Bidder will comply with and provide all insurance as defined in Section 00800-2.0, **LIABILITY AND INSURANCE**.
☐ Yes ☐ No
3. Bidder has current Workers' Compensation insurance coverage as required by the Labor Code or is legally self-insured pursuant to Labor Code section 3700 et. seq.
☐ Yes ☐ No
4. Has your contractor's license been revoked at any time in the last five (5) years?
☐ Yes ☐ No
5. Has a surety firm completed a contract on your behalf, or paid for completion because your firm was default terminated by the project owner within the last five (5) years?
☐ Yes ☐ No

Name of Bidder: _____

6. At the time of submitting this qualification form, is your firm ineligible to bid on or be awarded a public works contract, or perform as a subcontractor on a public works contract, pursuant to either Labor Code section 1777.1 or Labor Code section 1777.7?
☐ Yes ☐ No
7. At any time during the last five (5) years, has your firm or any of its owners or officers been convicted of a crime involving the awarding of a contract of a government construction project, or the bidding or performance of a government contract?
☐ Yes ☐ No

B. COMPANY EXPERIENCE

The Bidder has been engaged in the contracting business, under the present business name for _____ years and has experience in work of a nature similar to this project which extends over a period of _____ years (Bidder must show at least seven (7) years of related experience).

The Bidder, as a Contractor, has never failed to satisfactorily complete a contract awarded to it, except as follows:

For the bid to be considered responsive, the bid must list at least \$5 million in total construction cost on no more than five (5) projects completed within the last five (5) years by the Bidder of the following types of projects:

Commercial and industrial buildings, public administrative facilities, schools and hospitals (new build, retrofit and/or commercial tenant improvements) where the structural, electrical, mechanical/HVAC and plumbing systems were part of the Contractor's contract.

The Bidder can include project(s) currently under construction, but only the total amount paid by the Owner(s) as of three (3) months prior to the bid date on uncompleted project(s) can be included in the construction volume for purposes of this certification. Any projects listed below which are not as defined above will not be considered by the Owner in meeting this experience requirement.

If the Bidder is a Joint Venture of two or more companies, each participant in the Joint Venture shall meet this prior project experience requirement and provide project information for each Joint Venture participant in the format below.

1. **Project Name:** _____

Owner: _____

Total Construction Cost: \$ _____

Value of Work Performed by Bidder: \$ _____

Construction Time: _____ **Calendar Days**

Owner's Representative: _____

Name of Bidder: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

2. Project Name: _____

Owner: _____

Total Construction Cost: \$ _____

Value of Work Performed by Bidder: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

3. Project Name: _____

Owner: _____

Total Construction Cost: \$ _____

Value of Work Performed by Bidder: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

4. Project Name: _____

Owner: _____

Total Construction Cost: \$ _____

Value of Work Performed by Bidder: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

Name of Bidder: _____

5. **Project Name:** _____

Owner: _____

Total Construction Cost: \$ _____

Value of Work Performed by Bidder: \$ _____

Construction Time: _____ **Calendar Days**

Owner's Representative: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

C. SAFETY QUALIFICATION CRITERIA

The following information will be used in conjunction with other Contractor safety information to determine if the Bidder meets the minimum safety requirements for this project. If the Bidder's current Workers' Compensation Experience Modification Rate (EMR) is equal to or less than 1.0 (100%), then the Bidder will be deemed to meet the minimum safety requirements, subject to post-bid verification of the EMR as described below. If the Bidder's current Workers' Compensation Experience Modification Rate (EMR) is greater than 1.25 (125%), then the bid will be deemed non-responsive, and the bid will be rejected.

However, if the Bidder's EMR is greater than 1.0 and less than or equal to 1.25, the Bidder will be requested to submit additional information related to his/her EMR and safety record, including but not limited to OSHA Form 300A "Summary of Work-Related Injuries and Illnesses" for the previous three (3) calendar years. Failure to submit the required information within two (2) working days after the District's request will result in the bid being deemed non-responsive, and the bid will be rejected. Following review of the additional safety information submitted, the District reserves the right to either deem the bid responsive or reject the Contractor's bid as non-responsive.

The Bidder shall list its current EMR (available from your insurance carrier).

Year

EMR

The Owner will contact the Bidder's Workers' Compensation Insurance carrier to verify the EMR. The Bidder shall authorize its carrier to release this information. Failure to authorize the release of this information may result in the bid being deemed non-responsive and the bid being rejected as non-responsive.

Worker's Compensation Insurance Company: _____

Contact Person for Insurance Company: _____

Telephone Number: _____

Name of Bidder: _____

Signed this _____ day of _____, 20 _____.

Name of Bidder

Contractor's License No.

Expiration Date

Signature of Bidder

Title of Signator

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

Name of Bidder: _____

SECTION 00461

**CERTIFICATION OF ELECTRICAL WORK
EXPERIENCE AND QUALIFICATIONS**

(To Accompany Bid)

If Bidder will be self-performing the Electrical Work, references in this form to “Electrical Subcontractor” or “Subcontractor,” shall be understood to mean “Bidder” and complete Sections C and F only.

If a/an Electrical Subcontractor will be performing the Electrical Work, complete ALL sections of this Form, specifically Section A, B, C, D, E and F.

The undersigned electrical subcontractor certifies that it is, at the time of bidding, and shall be, throughout the period of the contract, licensed under the provisions of Chapter 9, Division 3, of the Business and Professions Code of the State of California, to do the type of work contemplated in the Contract Documents. The electrical subcontractor further certifies that it is skilled and regularly engaged in the general class and type of work called for in the Contract Documents.

The electrical subcontractor represents that it is competent, knowledgeable, and has special skills concerning the nature, extent, and inherent conditions concerning the work to be performed. The electrical subcontractor further acknowledges that there are certain inherent conditions existent in the construction of the particular facilities which may create, during the construction program, unsafe conditions hazardous to persons and property. The electrical subcontractor expressly acknowledges that it is aware of such risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the construction work with respect to such hazards.

A. ESSENTIAL REQUIREMENTS FOR QUALIFICATION

If the answer to any of questions 2 through 4 is “no”, or if the answer to any of questions 5 through 8 is “yes”, the Electrical Subcontractor will be ineligible or not responsible for purposes of the Contract.

1. Name of Electrical Subcontractor: _____
2. Electrical Subcontractor possesses a valid and current California Contractor’s license as required for the project for which it intends to submit a bid.
☐ Yes ☐ No
3. Electrical Subcontractor will comply with and provide all insurance as defined in Section 00800-2.0, **LIABILITY AND INSURANCE.**
☐ Yes ☐ No
4. Electrical Subcontractor has current Workers’ Compensation insurance coverage as required by the Labor Code or is legally self-insured pursuant to Labor Code section 3700 et. seq.
☐ Yes ☐ No
5. Has the electrical subcontractor’s license been revoked at any time in the last five (5) years?
☐ Yes ☐ No

Name of Bidder: _____

6. Has a surety firm completed a contract on the electrical subcontractor's behalf, or paid for completion because the electrical subcontractor's firm was default terminated by the project owner within the last five (5) years?
☐ Yes ☐ No
7. At the time of submitting this qualification form, is the electrical subcontractor's firm ineligible to bid on or be awarded a public works contract, or perform as a subcontractor on a public works contract, pursuant to either Labor Code section 1777.1 or Labor Code section 1777.7?
☐ Yes ☐ No
8. At any time during the last five (5) years, has the electrical subcontractor's firm, or any of its owners or officers been convicted of a crime involving the awarding of a contract of a government construction project, or the bidding or performance of a government contract?
☐ Yes ☐ No

B. COMPANY EXPERIENCE

The Electrical Subcontractor has been engaged in the contracting business, under the present business name for ____ years and has experience in work of a nature similar to this project which extends over a period of _____ years (Electrical Subcontractor must show at least five (5) years of related experience).

The Electrical Subcontractor, has never failed to satisfactorily complete a contract awarded to him, except as follows:

C. PROJECT-SPECIFIC EXPERIENCE

For the Owner to consider the Electrical Subcontractor properly experienced in work of similar nature to this project, the Electrical Subcontractor must list at least \$2 million in construction volume (i.e., Cost of Electrical Work) on no more than five (5) projects completed within the last five (5) years of the following types of projects:

Commercial and industrial buildings, public administrative facilities, schools and hospitals (new build, retrofit and/or commercial tenant improvements where the electrical and instrumentation systems were part of the Electrical Subcontractor's contract; or wastewater treatment plants where the electrical and instrumentation systems were part of the Electrical Subcontractor's contract.

The Electrical Subcontractor can include project(s) currently under construction, but only the total amount paid by the Owner(s) as of three (3) months prior to the bid date on uncompleted project(s) can be included in total construction volume for purposes of this Certification. The Electrical Subcontractor is allowed to list up to a maximum of five (5) projects of the types listed above, that combined, will add up to at least the cost in completed volume of work listed above. Any projects listed below which are not as defined above will not be considered by the Owner in meeting this pre-requisite experience requirement. For example, pump stations are not considered a treatment plant.

Name of Bidder: _____

If the Electrical Subcontractor is a Joint Venture of two or more companies, each participant in the Joint Venture shall meet this prior project experience requirement and provide project information for each Joint Venture participant in the format found below.

1. **Project Name:** _____
Owner: _____
Total Contract Amount: _____
Cost of Electrical Work: _____
Construction Time: _____ **Calendar Days**
Owner's Representative: _____
Owner's Telephone No.: _____
Date of Substantial Completion: _____
2. **Project Name:** _____
Owner: _____
Total Contract Amount: _____
Cost of Electrical Work: _____
Construction Time: _____ **Calendar Days**
Owner's Representative: _____
Owner's Telephone No.: _____
Date of Substantial Completion: _____
3. **Project Name:** _____
Owner: _____
Total Contract Amount: _____
Cost of Electrical Work: _____
Construction Time: _____ **Calendar Days**
Owner's Representative: _____
Owner's Telephone No.: _____
Date of Substantial Completion: _____

Name of Bidder: _____

4. **Project Name:** _____

Owner: _____

Total Contract Amount: _____

Cost of Electrical Work: _____

Construction Time: _____ **Calendar Days**

Owner's Representative: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

5. **Project Name:** _____

Owner: _____

Total Contract Amount: _____

Cost of Electrical Work: _____

Construction Time: _____ **Calendar Days**

Owner's Representative: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

D. SAFETY QUALIFICATION CRITERIA

The following information will be used to determine satisfaction of the minimum safety requirements for this project. To qualify to bid and be awarded the project, the electrical subcontractor's current Workers' Compensation Experience Modification (EMR) must be equal to or less than 1.0 (100%). If the electrical subcontractor's current Workers' Compensation Experience Modification (EMR) is greater than 1.25 (125%), then the bid will be deemed non-responsive, and the bid will be rejected.

However, if the electrical subcontractor's EMR is greater than 1.0 and less than or equal to 1.25, the Bidder will be requested to submit additional information related to the electrical subcontractor's EMR and safety record, including but not limited to OSHA Form 300A "Summary of Work-Related Injuries and Illnesses" for the previous three (3) calendar years. Failure to submit the required information within two (2) working days after the District's request will result in the bid being deemed non-responsive, and the bid will be rejected. Following review of the additional safety information submitted, the District reserves the right to either deem the bid responsive or reject the bid as non-responsive.

Name of Bidder: _____

The Electrical Subcontractor shall list its current Workers' Compensation Experience Modification Rate (available from your insurance carrier).

Year

EMR

To verify the above information, the Owner will contact the electrical subcontractor's Workers' Compensation Insurance carrier. The electrical subcontractor shall authorize its carrier to release this information. Failure to release this information will result in the Bid being deemed non-responsive and/or result in a determination that the electrical subcontractor is not eligible/responsible for purposes of the Project.

Worker's Compensation Insurance Company: _____

Contact Person for Insurance Company: _____

Telephone Number: _____

E. BONDING PROFILE

At the time of submission of the bid the electrical subcontractor shall have an unencumbered bonding capacity equal to at least 100 percent of the electrical subcontract cost for this project.

Current Total Bonding Capacity: _____

Current Unencumbered Bonding Capacity: _____

Electrical Work Subcontract Value: _____

To verify the above information, the Owner will contact the electrical subcontractor's surety. The electrical subcontractor shall authorize its surety to release this information. Failure to release this information will result in the Bid being deemed non-responsive and/or result in determination that the electrical subcontractor is not eligible/responsible for purposes of the Project.

Surety: _____

Contact Person for Insurance Company: _____

Telephone Number: _____

Name of Bidder: _____

F. SIGNATURE

Signed this _____ day of _____, 20 _____.

Name of Electrical Subcontractor/Bidder

Contractor's License No.

Expiration Date

Signature of Electrical Subcontractor/Bidder

Title of Signator

***** END OF SECTION *****

SECTION 00470

ACKNOWLEDGEMENT OF INSURANCE REQUIREMENTS

Included in the Bid Price is full compensation for the requirements set forth in Section 00800-2.0, **LIABILITY AND INSURANCE** of the Contract Documents including:

- a) Commercial General Liability (CGL) Coverage at least as broad as Insurance Services Office (ISO) Form CG 00 01 covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal & advertising injury with limits no less than \$5,000,000 per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (ISO CG 25 03 or 25 04) or the general aggregate limit shall be twice the required occurrence limit. The Owner, its officers, officials, employees, and volunteers are to be covered as additional insureds on the CGL policy
- b) Automobile Liability coverage at least as broad as Insurance Services Office Form CA 0001 covering Code 1 (any auto), with limits no less than \$5,000,000 per accident for bodily injury and property damage.
- c) Workers' Compensation insurance as required by the State of California, with Statutory Limits, and Employers' Liability insurance with a limit of no less than \$1,000,000 per accident for bodily injury or disease.
- d) Builder's Risk (Course of Construction) insurance utilizing an "All Risk" (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions.
- e) Pollution Legal Liability and/or Asbestos Legal Liability and/or Errors and Omissions (if project involves environmental hazards) with limits no less than \$1,000,000 per occurrence or claim, and \$2,000,000 policy aggregate.

Contractor shall waive rights of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss. Contractor shall obtain any endorsement that may be necessary to affect this waiver of subrogation. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the Owner for all work performed by the Contractor, its employees, agents and subcontractors.

Signature of Bidder / Title

Date

END OF ACKNOWLEDGEMENT OF INSURANCE REQUIREMENTS

Name of Bidder: _____

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

CERTIFICATE OF ACKNOWLEDGMENT

State of California }
County of _____ } ss

On _____ before me _____,

a Notary Public, personally appeared _____
Name(s) of Signer(s)

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

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

Signature of Notary

***** END OF SECTION *****

SECTION 00471

ACKNOWLEDGEMENT OF INSURANCE REQUIREMENTS FOR DESIGNATED SUBCONTRACTORS

Included in the Bid Price is full compensation for the requirements set forth in Section 00800-2.0, **LIABILITY AND INSURANCE** of the Contract Documents including:

- a) Commercial General Liability (CGL) Coverage at least as broad as Insurance Services Office (ISO) Form CG 00 01 covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal & advertising injury with limits no less than \$5,000,000 per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (ISO CG 25 03 or 25 04) or the general aggregate limit shall be twice the required occurrence limit. The Owner, its officers, officials, employees, and volunteers are to be covered as additional insureds on the CGL policy.
- b) Automobile Liability coverage at least as broad as Insurance Services Office Form CA 0001 covering Code 1 (any auto), with limits no less than \$5,000,000 per accident for bodily injury and property damage.
- c) Workers' Compensation insurance as required by the State of California, with Statutory Limits, and Employers' Liability insurance with a limit of no less than \$1,000,000 per accident for bodily injury or disease.

Contractor shall waive rights of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss. Contractor shall obtain any endorsement that may be necessary to affect this waiver of subrogation. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the Owner for all work performed by the Contractor, its employees, agents and subcontractors.

Signature of Bidder / Title

Date

END OF ACKNOWLEDGEMENT OF INSURANCE REQUIREMENTS

Name of Bidder: _____

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

CERTIFICATE OF ACKNOWLEDGMENT

State of California }

ss

County of _____ }

On _____ before me _____,

a Notary Public, personally appeared _____

Name(s) of Signer(s)

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

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

Signature of Notary

***** END OF SECTION *****

Name of Bidder: _____

SECTION 00480

BIDDER'S AFFIDAVIT OF NON-COLLUSION SUBMITTED WITH BID

(To Accompany Bid)

_____, (Contractor) hereby declares that:

He or she is _____ (Title/Position) of _____

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

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date

Signature

Public Contract Code Section 7106
Code of Civil Procedure Section 2015.5

Name of Bidder: _____

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

State of California } County of _____ } On _____ before me _____, a Notary Public, personally appeared _____ Name(s) of Signer(s) _____ who proved to me on basis of satisfactory evidence to be the person(s) whose names(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies) and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct. WITNESS my hand and official seal. _____ Signature of Notary	CAPACITY CLAIMED BY SIGNER ☐ INDIVIDUAL(S) ☐ CORPORATE OFFICER(S) _____ Title(s) ☐ PARTNER(S) ☐ ATTORNEY-IN-FACT ☐ TRUSTEE(S) ☐ OTHER _____ Describe ☐ SUBSCRIBING WITNESS (for) _____ _____ _____ SIGNER IS REPRESENTING: _____ _____ _____

*** END OF SECTION ***

Name of Bidder: _____

SECTION 00490

AFFIDAVIT OF SAFETY COMPLIANCE

(To Accompany Bid)

WWTP HVAC Replacements (CIP 22-P010) Project

The Contractor agrees in accordance with the requirements of Section 00700 - 4.7, **Safety**, that for purposes of California Labor Code Section 6400 and related provisions of law the Contractor, the Contractor's privities and any other entities acting pursuant to this Contract will be "employers" responsible for furnishing employment and a place of employment that is safe and healthful for the employees, if any, of such entities acting pursuant to this Contract and that the Owner will not be responsible for having hazards corrected and/or removed at the location where the work under the Contract is to be performed.

The Contractor hereby acknowledges the Contractor's safety obligations at the Project worksite. The Contractor shall conduct its operations to eliminate or reduce hazards and risks associated with Contractor's activities, to prevent accidents and injuries, and to prevent property damage. Therefore, the Contractor is fully responsible for and shall be in compliance with all of the most current safety, health and environmental regulations (federal, state and local). Non-compliance with these regulations may result in suspension or termination of work in progress. The Contractor's Safety Programs must accomplish the foregoing objectives. The Contractor certifies that its Safety Programs comply with and will satisfy these requirements. The Contractor also certifies that each Subcontractor at any tier and other parties engaged in the performance of work on the Project worksite will also comply with and will satisfy these requirements.

Parts A, B, C and D of the attached Contractor Safety Operations Requirements are not required to be completed and submitted with the Bid. The completed forms shall be submitted for the Owner's review with the Contractor's Safety Program prior to commencement of work on the Project as required in Section 00700-4.7.2, Safety Program. The Contractor certifies that it can furnish satisfactory evidence of compliance with the elements identified in the attached Contractor Safety Operations Requirements and the Contractor's Safety Program. The Contractor further acknowledges that its Subcontractors at any tier will provide all Safety Compliance documents to Contractor in accordance with Specification Sections 00490 and 00700-4.7, **Safety**.

Executed On _____, _____

Signature

Name of Bidder

Name (Print)

Title

Attach a Certificate of Acknowledgement for the Notary to the Affidavit.

Name of Bidder: _____

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

CERTIFICATE OF ACKNOWLEDGMENT

State of California }
County of _____ } ss

On _____ before me _____,

a Notary Public, personally appeared _____
Name(s) of Signer(s)

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

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

Signature of Notary

Name of Bidder: _____

CONTRACTOR SAFETY OPERATIONS REQUIREMENTS

(To be submitted with Contractor's Safety Program prior to commencing work)

PART A - Safety Programs

Please indicate below whether your firm has the following written safety programs. If any of the programs listed do not apply to your operations or this project, please make note of this in the "Comments" column. Include any information that you think would be helpful to us in making this assessment. Those programs that are indicated as mandatory must be available for review before commencing work on this project. Other safety programs may be requested if it is later determined that they are applicable to the Project, and as such, must be made available for review upon request, at no additional charge to the Owner.

Program		Do you have a written program?		Program meets Cal/OSHA Criteria		Sub will provide	Have project employees been trained?		Is the training documented?		Comments
		Yes	No	Yes	No		Yes	No	Yes	No	
Mandatory											
YES	Injury and Illness Prevention										
YES	Hazard Communication										
YES	Confined Space Operations										
	Respiratory Protection										
YES	Emergency Response										
YES	Hearing Conservation										
YES	Lockout/Tagout										
YES	New Employee Orientation										
YES	Excavation Safety										
YES	Code of Safe Practices										
YES	Personal Protective Equipment (PPE)										
YES	Drugs/Alcohol										
YES	Traffic Control Safety										
YES	Fall Prevention Plan ⁽¹⁾										

¹ If conventional fall protection measures cannot be used.

00490-3

Name of Bidder: _____

PART B - Safety Equipment - Identify what safety equipment will be available and used for this project.

Type	Description/Comments
☐ Gas detectors	
☐ Ventilation equipment	
☐ Approved harnesses and lanyards	
☐ Mechanical hoists	
☐ Fire extinguishers	
☐ First aid kits	
☐ Respirators	
☐ Hard hats	
☐ Hearing protectors	
☐ Safety goggles	
☐ Steel toed footwear	
☐ Hand protection	
☐ Fall protection	
☐ Confined Space Rescue Equipment	
☐	
☐	
☐	

PART C - Specialized Training and Certification - Identify the areas of specialized training or certification that will have been completed by employees who will be assigned to this project. Be prepared to provide documentation as requested.

☐	CPR/first aid	☐	Confined space operations and rescue	☐	Scaffolding
☐	Fork lift operation	☐	Respirators ☐ Air-Supplying ☐ Air-Purifying	☐	Flagging
☐	Cranes/hoists operation	☐	Trenching and shoring competent person	☐	
☐	Heavy equipment operation	☐	Welding	☐	
☐	Powder-actuated tools use	☐	Asbestos abatement	☐	

PART D - Jobsite Safety Practices

1. Name of person who will have responsibility for jobsite safety?

2. Who will be responsible for conducting and documenting accident investigations?

3. Does your company perform near-miss investigations? _____ *
- * If Yes, please provide sample copy of investigation forms.
4. How often are jobsite safety audits or inspections performed, _____
and by whom? _____
5. Does the person who is responsible for jobsite safety have authority to take immediate action to correct unsafe conditions of work practices? _____
6. Who will be designated the competent person for excavation safety on the project?
_____ *
- *Provide substantiation and/or certificate of current training for the competent person.
7. How often are jobsite tailgate or toolbox safety meetings held? _____
8. Briefly describe how you will ensure that workers comply with safety programs and Cal/OSHA requirements?

9. Please list any Cal/OSHA citations and penalties you have received in the last three years.

10. Have there been any on-the-job fatalities at any job site managed by the Contractor in the last five years?
_____ *
- *If yes, please explain: _____

11. Does your company have a safety incentive program? _____ *
- *If yes, please explain: _____

PART E: Evaluation Worksheet

(FOR USE BY THE OWNER ONLY)

Item	Program is Mandatory	Contractor has Written Program	Contractor States Program meets Cal/OSHA Criteria	Comments
PART A: Safety Programs				
PART B: Safety Equipment				
PART C: Training and Certifications				
PART D: Jobsite Safety Practices				
Responsible Person Named				
Accident Investigations				
Worksite Safety Inspections				
Competent Person				
Safety Meetings				
Compliance With Safety Requirements				
Cal/OSHA Citations/Penalties				
Fatalities				
Safety Incentives				

***** END OF SECTION*****

SECTION 00500

AGREEMENT FOR THE CONSTRUCTION OF

WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT

THIS AGREEMENT, made and concluded, in duplicate, this _____ day of _____, 20____, between the Dublin San Ramon Services District ("District"), Dublin, California, and _____ ("Contractor").

WITNESSETH:

1. That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the District, and under the conditions expressed in the two bonds, bearing even date with these presents, and hereunto annexed, the Contractor agrees with the District, at his/her own proper cost and expense, to do all the work and furnish all the materials necessary to construct and complete in good workmanlike and substantial manner the project entitled: **WWTP HVAC Replacements (CIP 22-P010) Project** in strict conformity with the Contract Documents (collectively defined in Section 01090-2.0), prepared therefor, which said plans and specifications are hereby specially referred to and by said reference made a part hereof.

2. Now, therefore, in consideration of the mutual covenants and agreements of the parties herein contained and to be performed, the Contractor hereby agrees to complete the work in accordance with the terms and conditions stipulated in the Contract Documents for the sum of

(\$ _____) computed in accordance with Contractor's accepted proposal dated _____, 20____, which accepted proposal is incorporated herein by reference thereto as if herein fully set forth. Compensation shall be based upon any lump sum bid items plus the unit prices stated in the Bid Schedule times the actual quantities or units of work and materials performed or furnished. The further terms, conditions, and covenants of this Agreement are set forth in the Contract Documents, each of which is by this reference made a part hereof. Payments are to be made to the Contractor in accordance with the provisions of the Contract Documents in legally executed and regularly issued warrants of the District, drawn on the appropriate fund or funds as required by law and order of the District thereof.

3. The District hereby promises and agrees with the Contractor to employ, and does hereby employ, the Contractor to provide the materials and to do the work according to the terms and conditions herein contained and referred to, for the prices aforesaid, and hereby contracts to pay the same at the time, in the manner and upon the conditions above set forth; and the said parties for themselves, their heirs, executors, administrators, successors and assigns, do hereby agree to the full performance of the covenants herein contained.

4. The Contractor and any subcontractor performing or contracting any work shall comply with all applicable provisions of the California Labor Code for all workers, laborers and mechanics of all crafts, classifications or types, including, but not limited to the following:

(a) The Contractor shall comply with all applicable provisions of Section 1810 to 1815, inclusive, of the California Labor Code relating to working hours. The Contractor shall, as a penalty to the District, forfeit the sum of twenty-five dollars (\$25) for each worker employed in the execution of the Contract by the Contractor or by any subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week, unless such worker receives compensation for all hours worked in excess of eight (8) hours at not less than 1-1/2 times the basic rate of pay.

(b) Pursuant to the provision of California Labor Code, Sections 1770 et. seq., the Contractor and any subcontractor under him shall pay not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations. Pursuant to the provisions of California Labor Code Section 1773.2, the Contractor is hereby advised that copies of the prevailing rate of per diem wages and a general prevailing rate for holidays, Saturdays and Sundays and overtime work in the locality in which the work is to be performed for each craft, classification, or type of worker required to execute the Contract, are on file in the office of the District, which copies shall be made available to any interested party on request. The Contractor shall post a copy of said prevailing rate of per diem wages at each job site.

(c) As required by Section 1773.1 of the California Labor Code, the Contractor shall pay travel and subsistence payments to each worker needed to execute the Work, as such travel and subsistence payments are defined in the applicable collective bargaining agreements filed in accordance with this Section.

(d) To establish such travel and subsistence payments, the representative of any craft, classification, or type of workman needed to execute the contracts shall file with the Department of Industrial Relations fully executed copies of collective bargaining agreements for the particular craft, classification or type of work involved. Such agreements shall be filed within ten (10) days after their execution and thereafter shall establish such travel and subsistence payments whenever filed thirty (30) days prior to the call for bids.

(e) The Contractor shall comply with the provisions of Section 1775 of the California Labor Code and shall, as a penalty to the District, forfeit up to fifty dollars (\$50) for each calendar day, or portion thereof, for each worker paid less than the prevailing rate of per diem wages for each craft, classification, or type of worker needed to execute the Contract. The Contractor shall pay each worker an amount equal to the difference between the prevailing wage rates and the amount paid worker for each calendar day or portion thereof for which a worker was paid less than the prevailing wage rate.

(f) As required under the provisions of Section 1776 of the California Labor Code, Contractor and each subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work classification, and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the public work. Said payroll shall be certified and shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

(1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.

(2) A certified copy of all payroll records enumerated in Paragraph 4(f), herein, shall be made available for inspection or furnished upon request to the District, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.

(3) A certified copy of all payroll records enumerated in Paragraph 4(f), herein, shall be made available upon request by the public for inspection or for copies thereof; provided, however, that a request by the public shall be made through either the District, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to subparagraph 4(f)(2) herein, the requesting party shall, prior to being provided the records, reimburse the costs of preparation by the Contractor, subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal offices of the Contractor.

The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the division.

Each Contractor shall file a certified copy of the records, enumerated in Paragraph 4(f) with the entity that requested the records within ten (10) days after receipt of a written request. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of the Contractor awarded the Contract or performing the Contract shall not be marked or obliterated. The Contractor shall inform the District of the location of the records enumerated under Paragraph 4(f) including the street address, city and county, and shall, within five (5) working days, provide a notice of change of location and address. The Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects the Contractor must comply with this Paragraph 4(f). In the event that the Contractor fails to comply within the 10-day period, he or she shall, as a penalty to the state or the District, forfeit twenty-five dollars (\$25.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due. Responsibility for compliance with Paragraph 4(f) lies with the Contractor.

(g) The Contractor and any subcontractors shall, when they employ any person in any apprenticeable craft or trade, apply to the joint apprenticeship committee administering the apprenticeship standards of the craft or trade in the area of the construction site for a certificate approving the Contractor or subcontractor under the apprenticeship standards for

the employment and training of apprentices in the area or industry affected; and shall comply with all other requirements of Section 1777.5 of the California Labor Code. The responsibility of compliance with California Labor Code Section 1777.5 during the performance of this Contract rests with the Contractor. Pursuant to California Labor Code Section 1777.7, in the event the Contractor willfully fails to comply with the provisions of California Labor Code Section 1777.5, the Contractor shall be denied the right to bid on any public works contract for up to three (3) years from the date noncompliance is determined and be assessed civil penalties.

(h) In accordance with the provisions of Article 5, Chapter 1, Part 7, Division 2 (commencing with Section 1860), and Chapter 4, Part 1, Division 4 (commencing with Section 3700) of the California Labor Code, the Contractor is required to secure the payment of compensation to its employees and for that purpose obtain and keep in effect adequate Workers' Compensation Insurance. If the Contractor, in the sole discretion of the District satisfies the District of the responsibility and capacity under the applicable Workers' Compensation Laws, if any, to act as self-insurer, the Contractor may so act, and in such case, the insurance required by this paragraph need not be provided.

The Contractor is advised of the provisions of Section 3700 of the California Labor Code, which requires every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the provisions of that Code and shall comply with such provisions and have Employer's Liability Limits of \$1,000,000 per accident before commencing the performance of the Work of this Contract.

The Notice to Proceed with the Work under this Contract will not be issued, and the Contractor shall not commence work, until the Contractor submits written evidence that it has obtained full Workers' Compensation Insurance coverage for all persons whom it employs or may employ in carrying out the Work under this Contract. This insurance shall be in accordance with the requirements of the most current and applicable state Workers' Compensation Insurance Laws. In accordance with the provisions of Section 1861 of the California Labor Code, the Contractor in signing this Agreement certifies to the District as true the following statement: "I am aware of the provisions of Section 3700 of the Labor Code which requires every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the provisions of that Code, and I will comply with such provisions before commencing the performance of the Work of this Contract."

A subcontractor is not allowed to commence work on the project until verification of Workers' Compensation Insurance coverage has been obtained and verified by the Contractor and submitted to the Construction Manager for the District's review and records.

(i) In accordance with the provisions of Section 1727 of the California Labor Code, the District, before making payment to the Contractor of money due under a contract for public works, shall withhold and retain therefrom all wages and penalties which have been forfeited pursuant to any stipulation in the Contract, and the terms of Chapter 1, Part 7, Division 2 of the California Labor Code (commencing with Section 1720). But no sum shall be withheld, retained or forfeited, except from the final payment, without a full investigation by either the Division of Labor Standards Enforcement or by the District.

5. It is further expressly agreed by and between the parties hereto that should there be any conflict between the terms of this Agreement and the Bid Proposal of said Contractor, then this Agreement shall control, and nothing herein contained shall be considered as an acceptance of the said terms of said Proposal conflicting herewith.

6. The Contractor agrees to provide and maintain insurance coverage, and to indemnify and save harmless the parties named and in the manner set forth in Section 00800-2.0, **LIABILITY & INSURANCE**.

The duty of Contractor to indemnify and save harmless, as set forth herein, shall include a duty to defend as set forth in Section 2778 of the California Civil Code; provided, however, that nothing herein shall be construed to require Contractor to indemnify against any responsibility or liability in contravention of Section 2782 of the California Civil Code.

7. The Contractor shall diligently prosecute the Work so that it shall be substantially completed within the time specified in Section 00800-1.1, **Time Allowed for Completion**.

8. Except as otherwise may be provided in other provisions of the Contract Documents, Contractor hereby expressly guarantees for one (1) full year from the date of the Substantial Completion of the Work under this Agreement and acceptance thereof by the District, to repair or replace any part of the Work performed hereunder which constitutes a defect resulting from the use of inferior or defective materials, equipment or workmanship. If, within said period, any repairs or replacements in connection with the Work are, in the opinion of the District, rendered necessary as the result of the use of inferior or defective materials, equipment or workmanship, Contractor agrees, upon receipt of notice from District, and without expense to District, to promptly repair or replace such material or workmanship and/or correct any and all defects therein. If Contractor, after such notice, fails to proceed promptly to comply with the terms of this guarantee, District may perform the work necessary to effectuate such correction and recover the cost thereof from the Contractor and/or its sureties.

In special circumstances where a particular item of work or equipment is placed in continuous service before Substantial Completion of the Work, the correction period for that item may start to run from an earlier date. This date shall be agreed upon by the Contractor and District on or before the item is placed in continuous service.

Any and all other special guarantees which may be applicable to definite parts of the Work under this Agreement shall be considered as an additional guarantee and shall not reduce or limit the guarantee as provided by Contractor pursuant to this paragraph during the first year of the life of such guarantee.

9. The Contractor shall provide, on the execution of this Agreement, a good and sufficient corporate surety bond in the penal sum of one hundred percent (100%) of amount bid, which bond shall be on the form provided by the District in Section 00610, **BOND OF FAITHFUL PERFORMANCE**, and be conditioned upon the faithful performance of all work required to be performed by the Contractor under this Agreement. Said bond shall be liable for any and all penalties and obligations which may be incurred by Contractor under this Agreement. The corporate surety bond shall be issued by a corporate surety approved by the District's counsel. The corporate surety shall be authorized to conduct business in California. At its discretion, the District may request that a certified copy of the certificate of authority of the insurer issued by the Insurance Commissioner of the State of California

be submitted by the Surety to the District. At its discretion, the District may also require the insurer to provide copies of its most recent annual statement and quarterly statement filed with the Department of Insurance pursuant to Article 10 (commencing with Section 900) of Chapter 1 of Part 2 of Division 1 of the Insurance Code.

10. In addition to the bond required under Paragraph 9, hereof, Contractor shall furnish a good and sufficient corporate surety bond in the penal sum of one hundred percent (100%) of amount of Bid, which bond shall be on the form provided by the District in Section 00620, **PAYMENT BOND**, and conform strictly with the provisions of Chapter 7, Title 15, Part 4, Division 3, of the Civil Code of the State of California, and all amendments thereto. The corporate surety bond shall be issued by a corporate surety approved by the District's counsel. The corporate Surety shall be authorized to conduct business in California. At its discretion, the District may request that a certified copy of the certificate of authority of the insurer issued by the Insurance Commissioner of the State of California be submitted by the Surety to the District. At its discretion, the District may also require the insurer to provide copies of its most recent annual statement and quarterly statement filed with the Department of Insurance pursuant to Article 10 (commencing with Section 900) of Chapter 1 of Part 2 of Division 1 of the Insurance Code.

11. The Contractor may substitute securities for the amounts retained by the District to ensure performance of the work in accordance with the provisions of Section 22300 of the Public Contract Code.

12. Contractor covenants that Contractor is licensed in accordance with the provisions of the Contractors' License Law of California as provided in Section 00010, **NOTICE INVITING BIDS**.

13. The Contractor shall be provided the time period specified in Section 01340-2.0, **MATERIAL AND EQUIPMENT SUBSTITUTIONS**, for submission of data substantiating a request for a substitution of an "or equal" item.

14. As required by Section 6705 of the California Labor Code and in addition thereto, whenever work under the Contract involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall submit in advance of excavations, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety in Title 8, Subchapter 4, Article 6, California Code of Regulations, the plan shall be prepared by a registered civil or structural engineer employed by the Contractor, and all costs therefore shall be included in the price named in the Contract for completion of the Work as set forth in the Contract Documents. Nothing in this Section shall be deemed to allow the use of a shoring, sloping, or other protective system less effective than that required by the Construction Safety Orders. Nothing in this Section shall be construed to impose tort liability on the District, the Design Consultant, Construction Manager nor any of their agents, consultants, or employees. The District's review of the Contractor's excavation plan is only for general conformance to the California Construction Safety Orders.

Prior to commencing any excavation, the Contractor shall designate in writing to the Construction Manager the "competent person(s)" with the authority and responsibilities designated in the Construction Safety Orders.

15. In accordance with Section 7104 of the Public Contract Code, whenever any work involves digging trenches or other excavations that extend deeper than four (4) feet below the surface, the provisions of Section 00700-7.2, **Differing Site Conditions**, shall apply.

16. In accordance with Section 7103.5 of the Public Contract Code, the Contractor and subcontractors shall conform to the following requirements. In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or subcontractor offers and agrees to assign to the District all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act [Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code], arising from purchases of goods, materials or services pursuant to this Contract or the subcontract. Such assignment shall be made and become effective at the time the District tenders final payment to the Contractor, without further acknowledgment by the parties.

17. In accordance with Section 4552 of the Government Code, the Contractor shall conform to the following requirements. In submitting a Bid to the District, the Contractor offers and agrees that if the Bid is accepted, it will assign to the District all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act [Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code], arising from purchase of goods, materials, or services by the Contractor for sale to the District pursuant to the Bid. Such assignment shall be made and become effective at the time the Authority tenders final payment to the Contractor.

18. Pursuant to Public Contract Code Section 7100, the acceptance by the Contractor of an undisputed payment made under the terms of the Contract shall operate as, and shall be, a release to the District, and their duly authorized agents, from all claim of and/or liability to the Contractor arising by virtue of the contract related to those amounts. Disputed contract claims in stated amounts may be specifically excluded by the Contractor from the operation of the release.

19. In accordance with California Business and Professions Code Section 7030, the Contractor is required by law to be licensed and regulated by the Contractors' State License Board which has jurisdiction to investigate complaints against contractors if a complaint regarding a patent act or omission is filed within four (4) years of the date of the alleged violation. A complaint regarding a latent act or omission pertaining to structural defects must be filed within ten (10) years of the date of the alleged violation. Any questions concerning the Contractor may be referred to the Registrar, Contractors' State License Board, P.O. Box 26000, Sacramento, California 95826.

20. Electronic Signatures. This Agreement may be executed in multiple counterparts, each of which shall, for all purposes, be deemed an original but which together shall constitute one and the same instrument, and the signature pages from any counterpart may be appended to any other counterpart to assemble fully executed documents, and counterparts of this Agreement may also be exchanged via email or other electronic means and any email or other electronic transmission of any party's signature shall be deemed to be an original signature for all purposes.

IN WITNESS WHEREOF, the parties hereto have executed this agreement on the date first set forth above.

CONTRACTOR

By: _____

Title: _____

Dublin San Ramon Services District

By: _____

Jan R. Lee, General Manager

ATTEST:

Nicole Genzale, District Secretary

***** END OF SECTION *****

SECTION 00610

BOND OF FAITHFUL PERFORMANCE

KNOW ALL PERSONS BY THESE PRESENTS: that, WHEREAS, the Board of Directors of the Dublin San Ramon Services District, has awarded to:

hereinafter designated as the "Principal", a Contract for constructing

WWTP HVAC Replacements (CIP 22-P010) Project

WHEREAS, said Principal is required under the terms of said Contract to furnish a bond for the faithful performance of said Contract:

NOW, THEREFORE, we, the Principal and _____, as Surety, are held and firmly bound unto the Dublin San Ramon Services District, California, in the penal sum of (\$ _____), lawful money of the United States, being not less than one hundred (100) percent of the Contract amount, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bounded Principal, it or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and faithfully perform the covenants, conditions, and agreements said Contract and any alterations made as therein provided, on it or their part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the Dublin San Ramon Services District, its officers and agents, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and virtue.

As a condition precedent to the satisfactory completion of the said Contract, the above obligation in the amount of _____ Dollars, (\$ _____), being not less than one hundred (100) percent of the Contract amount, shall hold good for a period of one (1) year after the substantial completion and acceptance of the said work; and through the expiration of Warranty Period; and such additional time thereafter as may be specified in the contract documents. If the above bounded Principal, it or its heirs, executors, administrators, successors or assigns shall fail to make full, complete and satisfactory repair and replacements or totally protect the said Dublin San Ramon Services District from loss or damage made evident during said Warranty Period, and resulting from or caused by defective materials or faulty workmanship in the prosecution of the work done, the above obligation in said sum of _____ Dollars, (\$ _____), shall remain in full force and virtue otherwise the above obligation shall be void.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall any wise affect its obligations on this bond; and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms

of the Contract, or to the work, or to the Specifications.

In the event the Dublin San Ramon Services District, or its successors or assigns, shall be the prevailing party in an action brought upon this bond, then in addition to the penal sum hereinabove specified, we agree to pay to said Dublin San Ramon Services District or its successors or assigns, a reasonable sum on account of attorney's fees in such action, which sum shall be fixed by the court.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their seals this _____ day of _____ 20 __, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Title _____

Name _____

Signature _____

Principal

(SEAL)

By _____

Surety

(SEAL)

By _____

***** END OF SECTION *****

SECTION 00620

PAYMENT BOND

WHEREAS, the Dublin San Ramon Services District, State of California, and _____ (hereinafter designated as "Principal") have entered into an agreement whereby the Principal agrees to install and complete certain designated public improvements, which said agreements, dated _____, 20____, and identified as project _____, is hereby referred to and made a part hereof; and,

WHEREAS, under the terms of said agreement Principal is required before entering upon the performance of the work, to file a good and sufficient payment bond with the Dublin San Ramon Services District, to secure the claims to which reference is made in Title 15 (commencing with Section 3082) of Part 4 of Division 3 of the Civil Code of the State of California.

NOW, THEREFORE, said Principal and the undersigned, duly authorized to transact business under the laws of the State of California, as corporate surety, are held firmly bound unto District, and all contractors, subcontractors, laborers, materialmen and other persons employed in the performance of the aforesaid agreement and referred to in the aforesaid Civil Code of the State of California, in the sum of _____ Dollars (\$_____) for materials furnished or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, that said surety will pay the same in an amount not exceeding the amount hereinabove set forth, and also in case suit is brought upon this bond, will pay, in addition to the face amount thereof, costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by the District in successfully enforcing such obligation, to be awarded and fixed by the Court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies and corporations entitled to file claims under Title 15 (commencing with section 3082) of Part 4 of Division 3 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect.

THE SURETY hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of said agreement or the specifications accompanying the same and stipulates and agrees that no such change, extension of time or alteration or addition shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration or addition.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and surety above named, on _____, 20____.

PRINCIPAL

SURETY

By_____

By_____

Name and Title

Name and Title

Address

City

Phone

NOTE: No substitution or revision to this bond form will be accepted. All bonds submitted must have a certified copy of the bonding agent's power of attorney attached. Also each Surety must be an "Admitted Surety" (i.e., qualified to do business in California), and proof of verification from the California Department of Insurance or a certificate from County Clerk must also be attached.

***** END OF SECTION *****

SECTION 00630

**ESCROW AGREEMENT FOR
SECURITY DEPOSITS IN LIEU OF RETENTION**

WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT

This Escrow Agreement is made and entered into by and between; the Dublin San Ramon Services District, whose address is 7051 Dublin Boulevard, Dublin, California 94568; hereinafter called "Owner", and

whose address is _____

hereinafter called "Contractor", and _____

whose address is _____

hereinafter called "Escrow Agent."

For the consideration hereinafter set forth, the Owner, Contractor, and Escrow Agent agree as follows:

1. Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities which meet the requirements set forth in said Section 22300, with Escrow Agent, as a substitute for retention earnings required to be withheld by Owner pursuant to the Construction Contract entered into between Owner and Contractor for _____ in the amount of _____ dated _____ (hereinafter referred to as the "Contract"). Alternatively, on written request of the Contractor, the Owner shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the Owner within ten (10) days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between the Owner and Contractor. Securities shall be held in the name of Owner, and shall designate the Contractor as the beneficial Owner.

2. Owner shall make progress payments to Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.

3. When the Owner makes payment of retentions earned directly to the Escrow Agent the Escrow Agent shall hold them for the benefit of the Contractor until such time as the escrow created under this Contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the Owner pays the Escrow Agent directly.

4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account, and all expenses incurred by the Owner. The Owner will charge

a one-time set-up fee of **\$49** and a monthly fee of **\$566**. These expenses and payment terms shall be determined by the Owner, Contractor, and Escrow Agent.

5. The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Owner.

6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from Owner to the Escrow Agent that Owner consents to the withdrawal of the amount sought to be withdrawn by Contractor.

7. The Owner shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven (7) days' written notice to the Escrow Agent from the Owner of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the Owner.

8. Upon receipt of written notification from the Owner certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.

9. Escrow Agent shall rely on the written notifications from the Owner and the Contractor pursuant to Sections (5) to (8), inclusive, of this Agreement, and Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

10. The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Owner and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On Behalf of Owner:

Title

Name

Signature

Address

Phone Number

On Behalf of Contractor:

Title

Name

Signature

Address

Phone Number

On Behalf of Escrow Agent:

Title

Name

Signature

Address

Phone Number

At the time the Escrow Account is opened, Owner and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

Owner:

Contractor:

Title

Title

Name

Name

Signature

Signature

***** END OF SECTION *****

SECTION 00650

GENERAL LIABILITY ENDORSEMENT (Form A-1)

DUBLIN SAN RAMON SERVICES DISTRICT ("District")
7051 Dublin Boulevard
Dublin, CA 94568

WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT

A. POLICY INFORMATION.

1. Insurance Company _____ ;
Policy No. _____
2. Policy Term (From) _____ (To) _____ ;
Endorsement Effective Date _____
3. Named Insured _____
4. Address of Named Insured _____
5. Limit of Liability Any One Occurrence/Aggregate
\$ _____
6. Deductible or Self-Insured Retention (Nil unless otherwise specified):
\$ _____

B. POLICY AMENDMENTS.

This endorsement is issued in consideration of the policy premium. Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto it is agreed as follows:

1. **INSURED.** The Dublin San Ramon Services District, the Design Consultant, the Construction Manager, the City of Pleasanton and each of their officers, officials, partners, employees, agents and volunteers are included as additional insured with regard to damages and defense of claims arising from: (a) activities performed by or on behalf of the Named Insured, (b) products and completed operations of the Named Insured, or (c) premises owned, leased or used by the Named Insured. The coverage shall contain no special limitation on the scope of protection afforded the District, Design Consultant, Construction Manager, the City of Pleasanton and each of their officers, officials, partners, employees, agents or volunteers

for liability not arising out of the acts or omissions of the Named Insured.

2. CONTRIBUTION NOT REQUIRED. As respects: (a) work performed by the Named Insured for or on behalf of the Owner; or (b) products sold by the Named Insured to the Owner; or (c) premises leased by the Named Insured from the Owner, the insurance afforded by this policy shall be primary insurance with respect to the District, the Design Consultant, the Construction Manager, the City of Pleasanton and each of their officers, officials, partners, employees, agents and volunteers; or stand in an unbroken chain of coverage excess of the Named Insured's scheduled underlying primary coverage. In either event, any other insurance maintained by the District, the Design Consultant and the Construction Manager, the City of Pleasanton and each of their officers, officials, partners, employees, agents and volunteers shall be excess of this insurance and shall not contribute with it.

3. SCOPE OF COVERAGE. The policy: (1) if primary, affords coverage at least as broad as Insurance Services Office (ISO) Form CG 0001 covering CGL on an "occurrence" basis; or (2) if excess, affords coverage which is at least as broad as the primary insurance forms referenced in the preceding section (1).

4. SEVERABILITY OF INTEREST. The insurance afforded by this policy applies separately to each insured who is seeking coverage or against whom a claim is made or a suit is brought, except with respect to the limits of the insurer's liability.

5. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting provisions of the policy shall not affect coverage provided to the District, the Design Consultant and the Construction Manager, the City of Pleasanton and each of their officers, officials, partners, employees, agents and volunteers.

6. CANCELLATION NOTICE. The insurance afforded by this policy shall not be suspended, voided, canceled, reduced in coverage or in limits except with notice to the District.

C. INCIDENT AND CLAIM REPORTING PROCEDURE.

Incidents and claims are to be reported to the insurer at:

Attn: _____
(Title) (Department)

(Company)

(Street Address)

(Agency) (State) (Zip Code)

(Telephone Number)

D. SIGNATURE OF INSURER OR AUTHORIZED REPRESENTATIVE OF THE INSURER.

I, _____ print/type name), warrant that I have authority to bind the below-listed insurance company and by my signature hereon do so bind this company. By signature below, the surety warrants that if requested by the District, it will furnish a certified copy of the certificate of authority issued by the Insurance Commissioner of the State of California.

Signature of: _____
Authorized Representative
(original signature required on endorsement furnished to the District)

ORGANIZATION: _____ TITLE: _____

ADDRESS: _____ TELEPHONE: _____

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 00651

AUTO LIABILITY ENDORSEMENT (Form B-1)

DUBLIN SAN RAMON SERVICES DISTRICT ("District")
7051 Dublin Boulevard
Dublin, CA 94568

WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT

A. POLICY INFORMATION.

1. Insurance Company _____ ;
Policy No. _____
2. Policy Term (From) _____ (To) _____ ;
Endorsement Effective Date _____
3. Named Insured _____
4. Address of Named Insured _____
5. Limit of Liability Any One Occurrence/Aggregate
\$ _____
6. Deductible or Self-Insured Retention (Nil unless otherwise specified):
\$ _____

B. POLICY AMENDMENTS.

This endorsement is issued in consideration of the policy premium. Notwithstanding any inconsistent statement in the policy to which this endorsement is attached or any other endorsement attached thereto it is agreed as follows:

1. **INSURED.** The Dublin San Ramon Services District, the Design Consultant, the Construction Manager, the City of Pleasanton, and each of their officers, officials, partners, employees, agents and volunteers are included as additional insured with regard to damages and defense of claims arising from ownership, operation, maintenance, use, loading or unloading of any auto owned, leased, hired or borrowed by the Named Insured, regardless of whether liability is attributable to the Named Insured or a combination of the Named Insured and the Dublin San Ramon Services District, the Design Consultant and the Construction Manager, the City of Pleasanton and each of its officers, officials, partners, employees, agents

and volunteers.

2. CONTRIBUTION NOT REQUIRED. As respects work performed by the Named Insured for or on behalf of the Owner, the insurance afforded by this policy shall: (a) be primary insurance with respect to the Dublin San Ramon Services District, the Design Consultant and the Construction Manager, the City of Pleasanton, and each of their officers, officials, partners, employees, agents and volunteers; or (b) stand in an unbroken chain of coverage excess of the Named Insured's primary coverage. In either event, any other insurance maintained by the Dublin San Ramon Services District, the Design Consultant and the Construction Manager, the City of Pleasanton, and each of their officers, officials, partners, employees, agents and volunteers shall be excess of this insurance and shall not contribute with it.

3. SCOPE OF COVERAGE. The policy affords coverage to the Named Insured which is at least as broad as Insurance Services Office Form CA 0001 covering Code 1 (any auto).

4. SEVERABILITY OF INTEREST. The insurance afforded by this policy applies separately to each insured who is seeking coverage or against whom a claim is made or a suit is brought, except with respect to the limits of the insurer's liability.

5. PROVISIONS REGARDING THE INSURED'S DUTIES AFTER ACCIDENT OR LOSS. Any failure to comply with reporting provisions of the policy shall not affect coverage provided to the Dublin San Ramon Services District, the Design Consultant and the Construction Manager, the City of Pleasanton, and each of their officers, partners, employees, and agents.

6. CANCELLATION NOTICE. The insurance afforded by this policy shall not be suspended, voided, canceled, reduced in coverage or in limits except with notice to the District.

C. INCIDENT AND CLAIM REPORTING PROCEDURE.

Incidents and claims are to be reported to the insurer at:

Attn: _____
(Title) (Department)

(Company)

(Street Address)

(Agency) (State) (Zip Code)

(Telephone Number)

D. SIGNATURE OF INSURER OR AUTHORIZED REPRESENTATIVE OF THE INSURER.

I, _____ print/type name), warrant that I have authority to bind the below-listed insurance company and by my signature hereon do so bind this company. By signature below, the surety warrants that if requested by the District, it will furnish a certified copy of the certificate of authority issued by the Insurance Commissioner of the State of California.

Signature of: _____
Authorized Representative
(original signature required on endorsement furnished to the District)

ORGANIZATION: _____ TITLE: _____

ADDRESS: _____ TELEPHONE: _____

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 00700

GENERAL CONDITIONS

1.0 GENERAL

1.1 Contract Agreement

A bidder to whom award is made shall execute a written Contract Agreement and required supplementary documents and submit them to the Owner within ten (10) days after the Notice of Award has been mailed to the bidder at the address given in Section 00300, **BID FORM**. The Agreement shall be made in the form adopted by the Owner and incorporated in the Section 00500, **AGREEMENT**.

If the lowest responsive, responsible bidder to whom award is made fails to enter into the Agreement, as herein provided, the Bidder's Bond will become the property of the Owner, and an award may be made to the next lowest responsive, responsible bidder, and such bidder shall fulfill every stipulation embraced herein as if it were the party to whom the first award was made. A corporation, partnership, or joint venture to which an award is made will be required, before the Agreement is finally executed, to furnish evidence of its corporate existence and evidence that the officer signing the Agreement and bonds for the corporation is duly authorized to do so in the form of a Bid Proposal Certificate as included in Section 00300, **BID FORM**.

In the event the Contractor is a joint venture of two or more contractors, the grants, covenants, provisos and claims, rights, power, privileges and liabilities of the Contract shall be construed and held to be several as well as joint. Any notice, order, direct request or any communication required to be or that may be given by the Owner or the Construction Manager to the Contractor under this Contract, shall be well and sufficiently given to all persons being the Contractor if given to any one or more of such persons. Any notice, request or other communication given by any one of such persons to the Owner or the Construction Manager under this Contract shall be deemed to have been given by and shall bind all persons being the Contractor.

If any part of the work to be done under this Contract is subcontracted, the subcontract shall be in writing and shall provide that all work to be performed thereunder shall be performed in accordance with the terms of the Contract Documents. The subcontracting of any or all of the work to be done will in no way relieve the Contractor of any part of its responsibility under the Contract. Certified copies of subcontract agreements will be provided by the Contractor to the Owner upon request.

The Contractor shall not assign, transfer, convey, or otherwise dispose of the Contract in whole or in part, or its right, title, or interest therein, or its power to execute such Contract, to any other person, firm, or corporation without previous consent in writing of the Owner. Any proposed assignment, transfer, convey and or other disposition without such written consent of this owner will be void.

Equipment supplied under this Contract shall be furnished in accordance with a written agreement, and such agreement shall provide that any equipment supply shall be performed in accordance with the terms of the Contract Documents. Certified copies of agreements for equipment supply will be provided by the Contractor to the Owner upon request.

1.2 **Written Notice and Service Thereof**

Any notice to any party relative to any part of this Contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted, by certified or registered mail, to said party at its last given address, or delivered in person to the said party or its authorized representative of the work. This includes notice of change of address.

1.3 **Rights of Action**

No right of action shall accrue upon or by reason of this Agreement to or for the use or benefit of anyone other than the parties to this Agreement. The parties to this Agreement are the Contractor and the Owner.

1.4 **Plans and Specifications**

The Contract Documents are complementary; what is called for by one is as binding as if called for by all. It is the intent of the Drawings and Specifications to describe a functionally complete and operable Project (and all parts thereof) to be constructed in accordance with the requirements of the Contract Documents. Any work, materials or equipment that may reasonably be inferred from the requirements of the Contract Documents or from prevailing custom or trade usage as being required to produce this intended result will be furnished and performed whether or not specifically called for. When words or phrases that have a well-known technical or construction industry or trade meaning are used to describe Work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. The intent of the Drawings specifically includes the intent to depict construction that complies with all applicable laws, codes and standards. Subject to applicable law, including but not limited to California Public Contract Code Section 4100 et seq., and the terms of this Contract governing subcontracting, the Divisions and Sections of the Specifications and 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.

Reasonably implied parts of the Work shall be performed as “incidental work” even though absent from the Drawings and Specifications. “Incidental” work shall be performed by Contractor without extra cost to Owner. Incidental work includes any work not shown on Drawings nor described in Specifications, but which is necessary or normally or customarily required as a part of the Work shown on the Drawings or described in the Specifications, or is necessary or required to make each installation satisfactory, legally operable, functional, consistent with the intent of the Drawings and Specifications or the requirements of the Contract Documents. Incidental work shall be treated as if fully described in Specifications and shown on Drawings, and expense thereof shall be included in price bid. Incidental work includes, but is not limited to, tasks required to be performed under Division 1 **GENERAL REQUIREMENTS** of Specifications.

The Contractor may obtain from the Owner, free of charge, ten (10) copies of the conformed Plans (half-size) and Specifications. The Contractor may also obtain from the Owner, free of charge, five (5) sets of full-size prints of the Plans and Specifications. Both the Plans and Specifications will be conformed by incorporating all addenda, which may have been issued during the bid period to the original bid documents. The Owner will endeavor to provide those conformed “Issued for Construction” documents no later than the date of the Notice to Proceed. The conformed “Issued for Construction” documents will be produced for the convenience and efficiency of all parties involved

with construction. In the event of a discrepancy or failure to include a specific item of any addendum, the addendum as issued during the bid period shall take precedence over the conformed documents. Additional sets of the plans and specifications may be procured at the cost of printing and binding. The Owner will also provide one electronic copy of the conformed plans and specifications upon receipt of an executed release from the Contractor. The Owner will furnish the release form at the Contractor's request.

The Contractor shall keep on the Project site a copy of the Specifications and Drawings and shall at all times give the Construction Manager access thereto. Any Drawings included in the Specifications shall be regarded as part thereof and of the Contract. Anything mentioned in these Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in these Specifications, shall be of like effect as though shown or mentioned in both. The Construction Manager will furnish from time to time such drawings, plans, profiles, and information, as it may consider appropriate for the Contractor's guidance. Unless otherwise provided in the Contract Documents, it shall be the duty of the Contractor to see that all provisions are complied with in detail irrespective of the inspections of the Work during its progress by the authorized official or its representatives. Any failure on the part of the Contractor to observe the Contract Documents will be sufficient cause for the rejection of the Work at any time before its acceptance.

Wherever reference specifications are referred to in these Specifications without designation of year, the reference is to the current or revised specification effective at the time of the Owner receiving bids, unless otherwise referenced in Section 01060, **REGULATORY REQUIREMENTS AND PERMITS**.

1.5 Applicability of all Paragraphs of Specifications

The technical specifications are presented in paragraphs for convenience. However, this presentation does not necessarily delineate trades or limits of responsibility. All paragraphs of the Specifications and Plans are interdependent and applicable to the Project as a whole.

The Specifications and all notes on the Drawings are directed to the Contractor and all work shall be performed by the Contractor even though phrases such as "the Contractor shall" or "shall be done by the Contractor" are omitted. Where terms such as "approved," "acceptable," "favorably reviewed," "review," "selected," "directed," "equivalent," "equal," or "satisfactory" are used, it shall mean by or to the Construction Manager and/or Design Consultant.

1.6 Contract Interpretation by the Construction Manager

Notwithstanding any omission from these Specification or the Drawings it shall be the duty of the Contractor to call the Construction Manager's attention to apparent errors or omissions and request instructions before proceeding with the work. The Construction Manager may, by appropriate instructions correct errors and supply omitted information, which instructions shall be as binding upon the Contractor as though contained in the original Specifications or Drawings.

Any discrepancies found between the Contract Documents and Project site conditions or any inconsistencies or ambiguities in the Contract Documents shall be immediately reported, in writing, to the Construction Manager. Questions regarding the meaning and intent of the Contract Documents shall be referred in writing by the Contractor to the Construction Manager with a Request for Information. The Construction Manager shall respond to the Contractor in writing with a decision

within fifteen (15) days of receipt of the request, or if it is necessary to extend this period, the Construction Manager shall notify the Contractor in writing as to when a decision will be provided.

Work done by the Contractor after its discovery of such discrepancies, inconsistencies or ambiguities without such notice and prior to response from the Construction Manager shall be done at the Contractor's risk.

1.7 **Order of Precedence**

In resolving inconsistencies among two or more sections of the Contract Documents, precedence shall be given in the following order:

1. Addenda, Supplemental Agreements and Change Orders, the one dated later having precedence over another dated earlier.
2. Agreement (Section 00500)
3. Permits
4. General Requirements (Sections 01000-01999)
5. Supplementary General Conditions (Section 00800)
6. General Conditions (Section 00700)
7. Instructions to Bidders (Section 00100)
8. Project Plans
9. Technical Specifications (Section 02000 and all others following)
10. Typical Details
11. Reference/Standard Specifications
12. Reference/Standard Plans

Figure dimensions on Drawings shall govern over scaled dimensions, and detailed Drawings shall govern over general or standard Drawings.

1.8 **Bonds**

The successful bidder shall, at the time of signing the Contract, furnish surety bonds executed by a surety admitted to conduct business in California using the bond forms included in the bid package.

The payment bond shall be in amount equal to one hundred percent (100%) of the Contract Amount and shall be for payment of just claims for materials, equipment, labor and subcontractors employed by the Contractor thereon.

The faithful performance bond shall be in an amount equal to one hundred percent (100%) of the Contract Amount and shall be for the faithful performance of the Contract, and for the fulfillment of such other requirements as may be provided by Law. The performance bond shall remain in effect to guarantee the repair and replacement of defective equipment, materials, and workmanship, and payment of damages sustained by the Owner on account of such defects, discovered within one (1) year after final acceptance by the Owner, for the work performed under the Contract, which shall remain in effect for a period of one (1) year, to guarantee the repair and replacement, and payments for damages.

Attorneys-in-fact, who sign bid bonds or contract bonds, must file with each bond a notarized and effectively dated copy of their power of attorney as required on bond forms supplied by the Owner for Contractor use in Section 00610, **FAITHFUL PERFORMANCE BOND** and 00620, **PAYMENT BOND**.

The surety company shall familiarize itself with all of the conditions and provisions of this Contract, and it waives the right of special notification of any change or modification of this Contract or of extension of time, or of decreased or increased work, or of the cancellation of the Contract, or of any other act or acts by the Owner or its authorized agents under the terms of this Contract; and failure to so notify the aforesaid surety companies of changes shall not relieve the surety companies of their obligations under this Contract.

1.9 **Penalty for Collusion**

If, at any time, it is found that the person, firm, or corporation to whom the Contract has been awarded has, in presenting any bid or bids, colluded with any other party or parties, then the Contract shall be null and void, and the Contractor and its sureties shall be liable for loss or damage which the Owner may suffer thereby, and the Owner may advertise for new bids.

1.10 **Rights and Remedies**

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to, and not a limitation of, any duties, obligations, rights, and remedies otherwise imposed or available by law.

No action or failure to act by the Owner, the Design Consultant, or the Construction Manager shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

2.0 **CONTRACT ADMINISTRATION**

2.1 **Administration of the Contract**

The Owner's Representative, the Construction Manager, and the Design Consultant will provide administration of the Contract as hereinafter described. These parties are designated in Section 00800-1.4, **Contract Administration**. If the status of any of the above parties should change, the Owner will provide written notice to the Contractor of such change.

In case of the termination of the employment of the Design Consultant or the Construction Manager, the Owner shall appoint a Design Consultant or a Construction Manager whose status under the Contract Documents shall be that of the former Design Consultant or Construction Manager, respectively.

2.2 **Owner's Representative**

2.2.1 **General** - The Owner's Representative has the authority to act on behalf of the Owner on change orders, field orders, progress payments, Contract decisions, acceptability of the Contractor's work, and early possession.

2.2.2 **Change Orders/Field Orders** - The Owner's Representative has the authority to accept or reject change orders, field orders and cost proposals submitted by the Contractor or as recommended by the Construction Manager.

2.2.3 Progress Payments - The Owner's Representative has the authority to accept or reject requests for progress payments, which have been submitted by the Contractor and recommended by the Construction Manager.

2.2.4 Contract Decisions - Should the Contractor disagree with the Construction Manager's decision with respect to the Contract, the Contractor may appeal to the Owner's Representative in accordance with the provisions of the Contract.

2.2.5 Acceptability of Work - The Owner's Representative has the authority to make the final determination of the acceptability of the Work. The Owner's Representative also has the authority to accept or reject the Design Consultant's recommendations regarding retention of defective work as provided.

2.3 Construction Manager

2.3.1 General - The Construction Manager is a representative of the Owner employed to act as advisor and consultant to the Owner in construction matters related to the Contract. The term Construction Manager may include more than one individual to perform contract administration and construction observation. Hereinafter, the term Construction Manager includes any and all representatives working under the direction of the Construction Manager.

All instructions to the Contractor and all communications from the Contractor to the Owner or the Design Consultant shall be forwarded through the Construction Manager. The Construction Manager will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents. The Owner has delegated its authority to the Construction Manager to make initial decisions regarding questions, which may arise as to the quality or acceptability of materials furnished and work performed, and as to the manner of performance and rate of progress of the work under the Contract. The Construction Manager shall interpret the intent and meaning of the Contract and shall make initial decisions with respect to the Contractor's fulfillment of the Contract and the Contractor's entitlement to compensation. The Contractor shall look initially to the Construction Manager in matters relating to the Contract.

The Construction Manager's authority to act under Paragraph 00700-2.1, Administration of the Contract, and any decision made by it in good faith either to exercise or not to exercise such authority, shall not be interpreted or construed as control or responsibility of any of the work performed under this Contract.

2.3.2 Owner Representative - The Construction Manager will observe the progress, quality, and quantity of the Work to determine, in general, if the Work is proceeding in accordance with the provisions of the Contract Documents. The Construction Manager shall not be responsible for construction means, methods, appliances techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work.

In accordance with the provisions detailed elsewhere in these General Conditions, the Construction Manager will make decisions relative to all matters of interpretation or execution of the Contract Documents.

2.3.3 Observation and Inspections of Construction - The Construction Manager shall observe the construction and shall have the authority to reject work and materials, which do not conform to the Contract Documents, and to require special inspection or testing.

Observation and inspection by an inspector is not an authorization to revoke, alter, or waive any requirements of the Specifications. Observation and inspection is the authorization to call the attention of the Contractor to any failure of the Work, materials or workmanship to conform to the Contract Documents. The inspector shall have this authority including the ability to reject materials or, in any emergency, suspend the Work. The Contractor may appeal any such issue, which it disagrees with to the Construction Manager for decision. If the decision of the Construction Manager is not satisfactory to the Contractor, the Contractor may appeal such decision to the Owner's Representative.

2.3.4 Acceptability of the Work - The Construction Manager has the authority to make a recommendation as to the acceptability of the Work.

2.3.5 Change Orders - The Construction Manager has the authority to initiate change orders; to reject change orders proposed by the Contractor or Design Consultant; to negotiate and recommend acceptance of change orders; or to order minor changes in the Work at no cost to the Owner.

2.3.6 Construction Schedule - The Construction Manager has the authority to review and recommend acceptance of the progress schedule submitted by the Contractor at the start of the Work and subsequent significant revisions for conformance to the specified sequence of work and logic.

2.3.7 Progress Payments - The Construction Manager has the authority to recommend acceptance or rejection of requests for progress payments, which have been submitted by the Contractor.

2.3.8 Final Payment - The Construction Manager, with the assistance of the Design Consultant, will conduct inspections to determine the dates of substantial completion of the Work and final completion of the Work, and will receive and forward to the Owner, for the Owner's review, written warranties, and related documents required by the Contract and assembled by the Contractor.

2.4 Design Consultant

2.4.1 General - The Design Consultant will have the authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

2.4.2 Interpretations - The Design Consultant has the authority to be the initial interpreter of the technical requirements of the Contract Documents. Either party to the Contract may make written request to the Construction Manager for interpretations necessary for the proper execution or progress of the Work. The Construction Manager shall refer such written requests to the Design Consultant, who will render such interpretations. Where the Contractor has requested an interpretation from the Construction Manager, or been notified by the Construction Manager that such interpretation has been requested by the Owner, any work done before receipt of such interpretations, if not in accordance with same, shall be removed and replaced or adjusted as directed by the Construction Manager without additional expense to Owner. Written request shall be handled in accordance with Section 01345, **REQUESTS FOR INFORMATION AND CLARIFICATIONS**.

2.4.3 Acceptability of the Work - The Design Consultant has the authority to make a recommendation as to the acceptability of the Work. The Design Consultant has the authority to recommend acceptance regarding the retention of defective work.

2.4.4 Submittal - The Design Consultant shall receive, through the Construction Manager, shop drawings, product data and samples for review in accordance with Section 01340, **SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**.

The Design Consultant has the authority to review and take other appropriate action upon the Contractor's submittal such as shop drawings, product data and samples, but only for conformance with the design concept of the Work and the information given in the Contract Documents.

3.0 OWNER

3.1 General

The Owner, acting through the Owner's Representative or the Construction Manager, shall have the authority to act as the sole judge of the Work and materials with respect to both quantity and quality as set forth in the Contract.

3.2 Attention to Work

The Owner's Construction Manager's and Design Consultant's representatives are designated in Section 00800-1.4, **Contract Administration**. The Construction Manager's designated representative will normally be available at the Project site of the Work. An alternate representative will be designated when the designated Construction Manager's representative is not available at the Project site of the Work. The Design Consultant may assign a representative to be available at the Project Site of the Work.

3.3 Observation and Inspection

In addition to the Construction Manager's designated representative, the Owner may provide one or more inspectors to the Construction Manager to observe the work and with the same authority as provided for in Section 00700-2.3.3, **Observation and Inspections of Construction**.

Separate and independent from the observations and inspections above, the project may be inspected by Building Officials or Fire Officials for code compliance. Such inspectors shall have the authority provided to them by local jurisdiction.

3.4 Owner's Right to Use or Occupy

The Owner reserves the right, prior to Substantial Completion, to occupy, or use, any completed part or parts of the Work, providing these areas have been approved for occupancy by the Owner. Subject to applicable laws, the exercise of this right shall in no way constitute an acceptance of such parts, or any part of the Work, nor shall it in anyway affect the dates and times when progress payments shall become due from the Owner to the Contractor or in any way prejudice the Owner's rights in the Contract, or any bonds guaranteeing the same. The Contract shall be deemed completed only when all the Work contracted has been duly and properly performed and accepted by the Owner.

Prior to such occupancy or use, the Owner and Contractor shall agree in writing regarding the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents.

In exercising the right to occupy or use completed parts of the Work prior to the Substantial Completion thereof, the Owner shall not make any use which will materially increase the cost to the Contractor, without increasing the Contract Amount, nor materially delay the completion of the Contract, without extending the time for completion.

3.5 Owner's Right to Carry Out the Work

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of the Contract, and fails within five (5) days after receipt of written notice from the Owner to commence and continue correction of such neglect or deficiency with diligence and promptness, the Owner may, and without prejudice to any other remedy, make good such default, neglect or failure.

The Owner also reserves the right to perform any portion of the work due to an emergency threatening the safety of the Work, public, Owner, and any property or equipment.

In either case, a Change Order shall be issued unilaterally deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies and/or for performing such work, including compensation for the Design Consultant's, the Construction Manager's, and Owner's additional services made necessary by such default, neglect, failure or emergency.

3.6 Owner's Right to Perform Work and to Award Separate Contracts

The Owner reserves the right to perform work related to the Project with the Owner's own forces, and to award separate contracts in connection with the Project or other work on the Project site. If the Contractor claims that delay, damage, or additional cost is involved because of such action by the Owner, the Contractor shall make such claim as provided elsewhere in the Contract Documents.

When separate contracts are awarded for different portions of the Project or other work on the Project site, the term "Contractor" in the Contract Documents in each case shall mean the contractor who executes each separate Agreement.

The Owner will provide for the coordination of the work of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate therewith as provided in Section 00700-4.10, **Cooperation with Other Contractors**.

3.7 Responsibility of the Owner

The Owner shall not be held responsible for the care or protection of any material or parts of the work prior to the final acceptance, except as expressly provided in these Specifications.

4.0 CONTRACTOR

4.1 Status of Contractor and Subcontractors

4.1.1 It is stipulated and agreed that the Contractor shall be an independent contractor in the performance of this Contract and shall have complete charge of persons engaged in performance of the Work. The Contractor shall perform the Work in accordance with its own means, methods, and appliances subject to compliance with the requirements of the Contract.

4.1.2 Subcontractors will not have or be recognized as having a direct relationship with the Owner. The persons engaged in the work, including employees of subcontractors and suppliers, will be considered employees of the Contractor and their work shall be subject to the provisions of the Contract. References in the Contract Documents to actions required of subcontractors, manufacturers, suppliers, or any person other than the Contractor, the Owner or the Construction Manager shall be interpreted as requiring that the Contractor shall require such subcontractor, manufacturer, supplier or person to perform the specified action.

The Contractor shall not employ any subcontractors that are not properly licensed in accordance with State law. Prior to commencement of any work by a subcontractor, the Contractor shall submit verification to the Construction Manager that the subcontractor is properly licensed for the work it will perform.

Contractor shall be fully responsible to Owner for the performance, acts and omissions of its subcontractors, and of persons directly or indirectly employed by them. Each subcontract shall expressly incorporate by reference the terms of this Agreement, including the following provisions:

- Each subcontractor shall carry insurance as required by this Agreement, and provide evidence of such insurance, as provided in Section 00800-2.0, Indemnity & Insurance.
- Each subcontractor shall be obligated to defend, indemnify, and hold the Owner harmless from all claims arising from the subcontractor's portion of the Work in the same manner as Contractor.
- Each subcontractor shall grant Owner a license to use its drawings and design materials as provided in the Agreement.
- Each subcontract shall acknowledge the Owner's right to suspend or terminate the Agreement, and waive any right to anticipate profits in the event of such termination.

The removal and/or substitution of any subcontractor listed in Section 00430, **DESIGNATION OF SUBCONTRACTORS**, shall be made by the Contractor and Owner as provided for in Public Contract Code Section 4100 et. seq.

4.2 Contractor's Representative

The Contractor shall designate in writing, before starting work, an authorized representative who shall have complete authority to represent and to act for the Contractor. Said authorized representative, or designated alternate, who has the authority to act in matters relating to the Contract, shall be personally present at the Project site at all times while work is actually in progress on the Contract. During periods when the Work is suspended, arrangements acceptable to the Construction Manager shall be made for any emergency work that may be required. The Contractor's authorized representative, or designated alternate(s), shall be fluent and proficient in the English language in

order to understand, receive, and carry out oral and written communications or instructions relating to all job functions and responsibilities.

When the Contractor consists of two or more persons, firms, partnerships, or corporations functioning on a joint venture basis, said Contractor shall designate in writing to the Construction Manager, the name of their authorized representative who shall have supreme authority to direct the work and to whom orders will be given by the Construction Manager, to be received and obeyed by the Contractor.

Information shall include the representative's name, street address, town, and telephone number, cell phone number and the mailing address if different from the street address.

The Contractor's authorized representative shall give its personal attention to and shall supervise the Work to the end that it shall at all reasonable times be prosecuted faithfully; and when the authorized representative or designated alternate is not personally present on the Work, the representative shall at all reasonable times be represented by a competent superintendent or foreman who shall receive and obey all instructions or orders given under this Contract, and who shall have full authority to supply materials, tools, and labor without delay, and who shall be the legally appointed representative of the Contractor. The Contractor shall be liable for the faithful observation of any instructions delivered to the Contractor or to its authorized representative.

4.3 Use and Protection of Owner's Site and Adjacent Property

4.3.1 With the approval of the Construction Manager, the Contractor may use portions of the Owner's site for storage of construction equipment, materials and field offices. The Owner will not accept any responsibility for damage to or loss of the Contractor's equipment or materials stored on any Project related site caused by vandalism, nature, or otherwise, suffered by the Contractor. Protection of all construction equipment, stores, and supplies shall be the sole responsibility of the Contractor. Where additional workspace is desired by the Contractor or where the Owner cannot provide the space to the Contractor, it shall be the Contractor's sole responsibility and expense to obtain such a space for its use.

4.3.2 All workers or representatives of the Contractor, subcontractors or suppliers are admitted to the Site only for the proper execution of the Work in accordance with the Contract Documents. Furthermore, no persons may occupy property owned by the Owner outside the limit of the Work, as indicated on the drawings, without the express written permission of the Owner.

4.3.3 The Contractor shall enforce any instructions from the Owner or Construction Manager regarding combustible materials, placement of signs, danger signals, barricades, radios, noise, dust, and smoking. Upon completion of the Work, the Contractor shall remove all temporary barricades, signs and related materials.

4.3.4 The Contractor shall determine safe loading capacities and shall not overload any structure, building, pipe or other existing facility beyond its safe capacity during construction. In addition to any requirements imposed by law, the Contractor shall shore up, brace, underpin and protect as may be necessary all foundations and other parts of all existing structures, facilities and improvements on the Site or adjacent to the Site which are in any way affected by the Contractor's excavations or other operations connected with the Work. Prior to commencing any work which in any way affects adjoining or adjacent land or buildings thereon, or public utilities, the Contractor shall notify the

Construction Manager to discuss responsibilities for properly notifying the owners/occupants of adjacent land and the protective measures taken by the Contractor. Upon request of the Construction Manager, the Contractor shall meet with the recipient of any notice or attend local public meetings as proper public outreach on local impacts caused by completion of the Work.

4.3.5 The Contractor shall take all necessary precautions to protect existing facilities against the effects of all weather and environmental elements and Contractor shall be strictly liable for failure to protect any facility.

4.3.6 All existing improvements and facilities shall be protected from any damage resulting from the operations, equipment or workers of the Contractor during the entire Contract Time.

4.3.7 The Contractor shall take all steps necessary to protect all structures, buildings, land and other facilities from fires and sparks originating from the Work. The Contractor shall comply with all laws and regulations regarding fire protection and shall comply with all instructions given by the fire department with jurisdiction.

4.3.8 Any damage to existing conditions, or to any other improvement or property above or below the ground surface, whether public or private, arising from the Contractor's operations or performance of the Work shall be repaired within forty-eight (48) hours by the Contractor without expense to the Owner, unless disruption of the Owner's operations or creation of a safety hazard has occurred, in which case damage will be repaired immediately. The forty-eight (48) hour non-emergency repair response time may be extended only if agreed to in writing by the Owner and/or private property owner. Any delays to the project completion times caused by such repairs shall be considered non-compensable and no further extension of the Contract Time will be granted therefor. Should the Contractor fail to timely repair damage caused by its operations or performance in accordance with this section, the Owner may take steps to protect property and life, in its sole discretion, and deduct entire cost of such work from amounts due or that may become due the Contractor. No prior notice to the Contractor shall be necessary for the Owner to take such action.

4.4 **Fees and Permits**

The requirements for fees and permits are specified in Section 01060-2.0, **FEES AND PERMITS**.

4.5 **Compliance with Laws**

The Owner is a public agency in the State of California and is subject to the provisions of law relating to public contracts. It is agreed that all provisions of law applicable to public contracts are a part of these Contract Documents to the same extent as though set forth herein and will be complied with by Contractor.

The Contractor, shall at its own cost and expense, observe and keep itself and its subcontractors fully informed of all existing and future legislated State and Federal Laws and City and County ordinances and regulations which in any manner affect those engaged or employed in the Work, or the materials and equipment used in the Work, or which in any way affect the conduct of the Work, and all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the Drawings, Specifications, or in any other part of this Contract, in relation to any such law, ordinance, regulation, order or decree, the Contractor shall

immediately report the same to the Construction Manager in writing. The Contractor shall at all times observe and comply with all such existing and future laws, ordinances, regulations, orders and decrees; and shall protect, indemnify, defend and hold harmless the Owner, the Construction Manager, the Cities of Dublin, San Ramon and Pleasanton, the Design Consultant, and all of their officers, officials, partners, employees, agents, volunteers, and servants against any claim or liability arising from or based upon the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor itself, its employees, subcontractors, suppliers or others acting on the Contractor's behalf.

The following regulations and requirements that are included in the Contract Documents do not relieve the Contractor of the burden of ascertaining legal requirements that must be satisfied in accordance with this section and applicable law.

4.5.1 Eight Hour Day Limitation – In accordance with the provisions of Division 2, Part 7, Chapter 1, Article 3 of the Labor Code, State of California, and in particular Sections 1810 to 1815 inclusive, thereof, eight (8) hours labor shall constitute a days' work and no laborer, worker, or mechanic in the employ of said Contractor, or any subcontractor doing or contracting to do any part of the Work contemplated by this Contract, shall be required or permitted to work more than eight (8) hours in any one calendar day, and forty (40) hours in any one calendar week unless compensated at not less than time and a half as set forth in California Labor Code Section 1815. However, if the prevailing wage determination requires a higher rate of pay for overtime than is required under said Section 1815, then the overtime rate must be paid, as specified in California Code of Regulation Title 8, Group 3, Section 16200(a)(3)(F). The Contractor and each subcontractor shall also keep an accurate record showing the names and actual hours worked of all workers employed by them in connection with the work contemplated by this Contract, which record shall be open at all reasonable hours for the inspection of the Owner or its officers or agents and by the Division of Labor Standards Enforcement of the Department of Industrial Relations, their deputies or agents; and it is hereby further agreed that said Contractor shall forfeit as a penalty to the Owner, the sum of Twenty-five Dollars (\$25.00) for each laborer, worker or mechanic employed in the execution of this Contract by the Contractor or by any subcontractor for each calendar day during which such laborer, worker or mechanic is required or permitted to labor more than eight (8) hours in any one calendar day and forty (40) hours in one calendar week in violation of these provisions.

4.5.2 Apprentices – Authority shall, within five (5) days of the Award of Contract, send a copy of the Award to the Division of Apprenticeship Standards. Authority shall within five (5) days of a finding of any discrepancy regarding the ratio of apprentices to journeymen pursuant to the certificated fixed number of apprentices to journeyman, notify the Division of Apprenticeship Standards.

In accordance with the provision of California Labor Code Section 1777.7, if Contractor willfully fails to comply with the provisions of Section 1777.5 of said Code, Contractor shall be denied the right to bid on any public works Contract for a period of up to one (1) year for the first violation and up to three (3) years for each subsequent violation from the date the determination of non-compliance is made by the Administrator of Apprenticeship; and forfeit as a civil penalty the sum of fifty dollars (\$50.00) for each calendar day of non-compliance. Notwithstanding the provisions of Section 1727 of the California Labor Code, upon receipt of a determination that a civil penalty has been imposed, Authority shall withhold from Contract progress payments then due or to become due the amount of such penalty. Any funds withheld by Authority pursuant to Section 1777.7 shall be deposited in the general funds of Authority.

4.5.3 Receipt of Workers' Wages, Fee for Registering or Placing Persons In Public Works – Attention is directed to the provisions of sections 1778 and 1779 of the California Labor Code, which read as follows:

"Section 1778. Every person, who individually or as a representative of an awarding or public body or officer, or as a contractor or subcontractor doing public work, or agent or officer thereof, who takes, receives or conspires with another to take or receive, for its own use or the use of any other person any portion of the wages of any workman or working subcontractor, in connection with services rendered upon any public work is guilty of a felony."

"Section 1779. Any person or agent or officer thereof who charges, collects, or attempts to charge or collect, directly or indirectly, a fee or valuable consideration for registering any person for public work, or for giving information as to where such employment may be procured, or for placing, assisting in placing, or attempting to place, any person in public work, whether the person is to work directly for the state, or any political subdivision or for a contractor or subcontractor doing public work is guilty of a misdemeanor."

4.5.4 Labor Discrimination. Attention is directed to Section 1735 of the Labor Code, which reads as follows:

"A contractor shall not discriminate in the employment of persons upon public works on any basis listed in subdivision (a) of Section 12940 of the Government Code, as those bases are defined in Sections 12926 and 12926.1 of the Government Code, except as otherwise provided in Section 12940 of the Government Code. Every contractor for public works who violates this section is subject to all the penalties imposed for a violation of this chapter."

4.5.5 Workers' Compensation Insurance – Attention is directed to the provisions of Section 00800-2.1.2, Workers' Compensation Insurance, and the requirements of California Labor Code Section 3700.

4.5.6 Certified Electricians – Workers performing work for an electrical contractor installing, constructing, or maintaining any electrical system covered by the National Electrical Code shall be certified as a General Electrician per California Labor Code Section 3099.

4.5.7 Lateral and Subjacent Supports – Attention is directed to Section 832 of the Civil Code of the State of California relating to lateral and subjacent supports, and wherever structures or improvements adjacent to the excavation may be damaged by such excavation, the Contractor shall comply with this law. As provided in Labor Code Section 6707, a separate bid item is provided for costs of shoring and bracing of excavations five (5) feet or more in depth.

4.5.8 Safety Standards – The Contractor shall comply with all applicable provisions of the Safety and Health Regulations of Construction, promulgated by the Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act (40 USC 327 et. seq.) as set forth in Title 29, C.F.R., CAL/OSHA, and the regulations issued thereunder. Compliance shall be the Contractor's sole responsibility, and neither the Owner, the Construction Manager nor the Design Consultant shall have any liability for non-compliance. See Section 00700-4.7, **Safety**, for additional safety requirements.

4.5.9 Asbestos Related Work – All work involving asbestos containing material must be performed in accordance with California Labor Code, Sections 6501.5 through 6510, inclusive, and California Administrative Code, Title 8, Section 5208 and all other pertinent laws, rules, regulations, codes, ordinances, decrees and orders.

4.5.10 Public Records Act – Except as otherwise provided herein, all records, documents, drawings, plans, specifications, and all other information relating to the conduct of Owner's business, including information submitted by the Contractor ("Records"), shall become the exclusive property of Owner and shall be deemed public records. Said Records are subject to the provisions of the California Public Records Act (Government Code § 6250 et. seq.). The Owner's use and disclosure of its records are governed by this Act. The Owner will use its best efforts to inform the Contractor of any request for any financial records or documents marked "Trade Secret", "Confidential" or "Proprietary" provided by the Contractor to Owner.

Contractor, at its sole expense and risk, shall be fully responsible for any and all fees for prosecuting or defending any action brought or instituted by Contractor opposing disclosure of Record and shall indemnify and hold Owner harmless from all costs and expenses including attorney's fees and costs of litigation in connection with any such action.

Owner will have no liability to Contractor or Contractor's privity concerning disclosure of records in accordance with the California Public Records Act or other applicable law or in accordance with the direction of any competent authority, and Contractor, on behalf of itself, and its privities waives, releases and fully discharges such liability.

4.5.11 Audit and Examination of Records – The Owner may examine and audit at its own cost and expense all books, estimates, records, contracts, documents, bid documents, bid cost data, subcontract job cost reports and other Work related data of the Contractor, subcontractors engaged in performance of the Work, and suppliers providing supplies, equipment and other materials required for the Work, including computations and projections related to bidding, negotiating, pricing or performing the Work or Contract modifications and other materials concerning the Work, including, but not limited to, Contractor daily logs, in order to evaluate the accuracy, completeness, and currency of cost, pricing, scheduling and any other Work related data. The Contractor will make available all such Work related data at all reasonable times for examination, audit, or reproduction at the Contractor's business office at or near the Work site, and at any other location where such Work related data may be kept until three years after final payment under the Contract. Pursuant to California Government Code Section 8546.7, if the amount of public funds to be expended is in excess of \$10,000, this Contract will be subject to the examination and audit of the State Auditor, at the request of the Owner, or as part of any audit of the Owner, for a period of three (3) years after final payment under the Contract.

4.5.12 Labor Compliance Monitoring and Enforcement. This project is subject to labor compliance monitoring and enforcement by the California Department of Industrial Relations.

The Contractor and each subcontractor shall keep or cause to be kept an accurate record showing the names and occupants of all laborers, workers and mechanics employed by it in connection with the execution of this Agreement or any subcontract thereunder, and showing also the actual per diem wage paid to each of such workers. Contractor must provide certified payroll records to the District or District's Representative on a weekly basis. Each payroll record shall be on forms

provided by the Division of Labor Standards Enforcement or may consist of printouts of payroll data that are maintained as computer records, if the printouts contain the same information as the forms provided by the division and the printouts are certified or verified as described below.

The District or District Representative will request detailed information from the Contractor and each subcontractor reflecting the required Department of Industrial Relations Classification, Craft, Base/Straight Rate, OT Rate, and Benefit Breakdown and other pertinent information to be determined by the District, in addition to the breakdown of the same information to be paid by the Contractor and each subcontractor.

The General Contractor shall be responsible for the submittal of payroll records of all its subcontractors. The payroll records shall be certified or verified by a written declaration that it is made under penalty of perjury, stating both of the following:

- (1) The information contained in the payroll record is true and correct.
- (2) The employer has complied with the requirements of Sections 1722.1, 1725.5, 1771, 1811, and 1815 of the Labor Code for any work performed by his or her employees on the public works project.

Payroll records shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

- A. A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or its authorized representative on request.
- B. A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of the District, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.
- C. A certified copy of all payroll records shall be made available upon request by the public in accordance with Section 1776 of the Labor Code.

In addition to the submissions described above, if the Labor Commissioner directs the contractors or subcontractors on the project to furnish records directly to it, each Contractor and subcontractor shall furnish the records specified in Labor Code Section 1776 each month directly to the Labor Commissioner, in the format prescribed by the Labor Commissioner.

The Contractor is responsible for its and its subcontractors' compliance with the provisions of Section 1776 of the Labor Code.

4.6 **Compliance with Environmental Laws**

During construction, the Contractor shall comply with all pertinent requirements of Federal, State, and local environmental laws and regulations, including, but not limited to, the Federal Clean Air Act, State and local air pollution and noise ordinances, construction site erosion control regulations. Specific requirements are further specified in Section 01060, **REGULATORY REQUIREMENTS AND PERMITS**, and Section 01560, **TEMPORARY CONTROLS**.

4.7 Safety

4.7.1 Contractor's Safety Responsibility – The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the Work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to U.S. Department of Labor (OSHA), the California Occupational Safety and Health Act (CalOSHA), and all other applicable Federal, State, County, and local laws, ordinances, codes, including but not limited to the requirements set forth below, and any regulations that may be detailed in other parts of these Contract Documents. In the event of conflicting requirements, the most stringent requirement as it pertains to the Contractor's safety responsibility, shall be followed by the Contractor.

No provision of the Contract Documents shall act to make the Owner, the Construction Manager, Design Consultant or any other party than the Contractor responsible for safety. The Contractor agrees that for purposes of California Labor Code Section 6400 and related provisions of law the Contractor, the Contractor's privities and any other entities acting pursuant to this contract will be "employers" responsible for furnishing employment and a place of employment that is safe and healthful for the employees, if any, of such entities acting pursuant to this contract and that neither the Owner nor the Construction Manager, the City of Pleasanton, the Design Consultant or their respective officers, officials, partners, employees, agents or volunteers or other authorized representatives will be responsible for having hazards corrected and /or removed at the location(s) where the work is to be performed. The Contractor agrees that neither the Owner nor the Construction Manager, the City of Pleasanton, the Design Consultant or their respective officers, officials, partners, employees, agents or volunteers or other authorized representatives will be responsible for taking steps to protect the Contractor's employees from such hazards, or for instructing the Contractor's employees to recognize such hazards or to avoid the associated dangers. The Contractor agrees that with respect to the work to be performed under this contract and the location(s) where such work is to be performed, the Contractor will be responsible for not creating hazards, and for having hazards corrected and/or removed. The Contractor agrees that through the safety obligations contained in this contract and the Contractor's own inspection of the site(s) where the contract work is to be performed, the Contractor is aware and has been notified of the hazards to which the Contractor's employees may be exposed in the performance of contract work. The Contractor has taken and/or will take appropriate, feasible steps to protect the Contractor's employees from such hazards, and has instructed and/or will instruct its employees to recognize such hazards and how to avoid the associated dangers. The Contractor agrees that neither the Owner nor the Construction Manager, the City of Pleasanton, the Design Consultant or their respective officers, officials, partners, employees, agents or volunteers or other authorized representatives will be "employers" pursuant to California Labor Code Section 6400 and related provisions of law with respect to the Contractor, the Contractor's privities or other entities acting pursuant to this contract.

The Contractor shall indemnify, defend and hold Owner and Construction Manager, the City of Pleasanton, the Design Consultant and their respective officers, officials, partners, employees, agents and volunteers or other authorized representatives harmless to the full extent permitted by law concerning liability related to the Contractor's safety obligations in accordance with Section 00800-2.1.8, Indemnification.

If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Construction Manager and the Owner. In addition, the

Contractor shall furnish the Construction Manager with a copy of the Employer's Report of Injury immediately following any incident requiring the filing of said report during the prosecution of the Work under this Contract. The Contractor shall also furnish the Construction Manager with a copy of the Employer's Report of Injury involving any subcontractors on this Project. The Contractor shall make all reports as are, or may be, required by any authority having jurisdiction, and permit all safety inspections of the Work being performed under this Contract.

If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Construction Manager, giving full details of the claim.

4.7.2 Safety Program – Contractor shall establish, implement, and maintain a written Injury and Illness Prevention Program as required by Cal/OSHA Title 8, Section 1509. Before beginning the Work Contractor shall prepare and submit to the Construction Manager a Contractor Safety Program that provides for the implementation of all of Contractor's safety responsibilities in connection with the Work at the site and the coordination of that program and its associated procedures and precautions with safety programs, precautions and procedures of each of its subcontractors and other prime Contractors performing work at the site. Contractor shall be solely responsible for initiating, maintaining, monitoring, coordinating, and supervising all safety programs, precautions, and procedures in connection with the Work and for coordinating its programs, precautions, and procedures of the other prime contractors and subcontractors performing the Work at the site. The Safety Program should contain all the necessary elements for Contractor to administer its program on site. At a minimum, this written Safety Program shall address the elements required by Cal/OSHA Title 8, Section 1509.

The Contractor shall maintain a Drug-Free workplace policy within the Project site for the safety of its employees, the District's, Construction Manager's, and Design Consultant's employees and the public. At the time of execution of an Agreement with the Owner, the Contractor shall provide the Owner with certification, as provided in Section 00458, **CERTIFICATION OF DRUG-FREE WORKPLACE REQUIREMENTS**, that the Contractor maintains, and will maintain for the duration of the Agreement, a Drug-Free workplace policy at the Construction site. The Drug-Free workplace policy shall be substantially the same as the Owner's policy and a copy of the policy shall be posted on the Construction site. The Contractor shall notify the Construction Manager of any criminal drug statute violation occurring on the site not later than five (5) days after the Contractor becomes aware of such violation.

The Contractor's compliance with requirements for safety and/or the Construction Manager's review of the Contractor's Safety Program shall not relieve or decrease the liability of the Contractor for safety. The Construction Manager's review of the Contractor's Safety Program is only to determine if the above listed elements are included in the program.

4.7.3 Safety Supervisor – The Contractor shall appoint an employee as safety supervisor who is qualified and authorized to supervise and enforce compliance with the Safety Program. The Contractor shall notify the Construction Manager in writing prior to the commencement of work of the name of the person who will act as the Contractor's Safety Supervisor and furnish the safety supervisor's resume to the Construction Manager.

The Contractor will, through and with its Safety Supervisor, ensure that all of its employees and its subcontractors of any tier fully comply with the Project Safety Policies. The Safety Supervisor shall be a full-time employee of the Contractor whose responsibility shall be for supervising compliance with applicable safety requirements on the Project site and for developing and implementing safety training classes for all job personnel. The Owner shall have the authority to require removal of the Contractor's Safety Supervisor if the representative is judged to be improperly or inadequately performing the duties; however, this authority shall not in any way affect the Contractor's sole responsibility for performing this work safely, nor shall it impose any obligation upon the Owner to ensure the Contractor performs its work safely.

4.7.4 Safety and Protection – The Contractor shall take all necessary precautions to prevent damage, injury, and loss to:

- All employees on the Project, employees of all subcontractors, and other persons and organizations who may be affected thereby;
- All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
- Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, wetlands, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation, or replacement in the course of construction.

The Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and of underground facilities and utility districts when prosecution of the Work may affect them and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any subcontractor, supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the Contractor.

4.7.5 Excavation Safety – In accordance with the provisions of Section 6705 of the Labor Code, the Contractor shall submit, in advance of excavation of any trench or trenches five feet or more in depth, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plans vary from the shoring system standards set forth in the Construction Safety Orders of the Division of Industrial Safety in Title 8, Subchapter 4, Article 6, California Code of Regulations, the plans shall be prepared and signed by a registered civil or structural engineer employed by the Contractor, and all costs therefor shall be included in the price named in the Contract for completion of the work as set forth in the Contract Documents. Nothing in this section shall be deemed to allow the use of a shoring, bracing, sloping, or other protective system less effective than that required by the Construction Safety Orders. Nothing in this section shall be construed to impose a tort liability on the Owner, the Construction Manager, the Cities of Dublin, San Ramon and Pleasanton, the Design Consultant, nor any of their officers, officials, partners, employees, agents, consultants or volunteers. The Owner's review of the Contractor's excavation plan is only for general conformance to the Construction Safety Orders.

Prior to commencing any excavation, the Contractor shall designate in writing to the Construction Manager the "competent person(s)" with the authority and responsibilities designated in the Construction Safety Orders.

4.7.6 Safety Emergencies - In emergencies affecting the safety or protection of persons or the Work or property at the Project site or adjacent thereto, the Contractor, without special instruction or authorization from the Construction Manager, is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Construction Manager prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby.

4.7.7 Safety Violations – Should the Contractor fail to correct an unsafe condition, the Owner shall have the right to notify the Contractor through the Construction Manager that an unsafe condition may exist and must be corrected or the work in question can be stopped in accordance with Section 00700-6.6, **Suspension of Work** until the condition is corrected to the satisfaction of the Owner. No extension of time or additional compensation will be granted as a result of any stop order so issued. The notification and suspension of such work or the failure to provide such notification and suspension by the Owner shall not relieve the Contractor of its sole responsibility and liability for safety and the correction of any unsafe conditions.

The Owner shall have the authority to require the removal from the project of any worker and the foreman and/or superintendent in responsible charge of the work where safety violations occur.

4.7.8 Equipment Safety Provisions – The completed Work shall include all necessary permanent safety devices, such as machinery guards and similar safety items, required by the State and Federal (OSHA) industrial authorities and applicable local and national codes. Further, any features of the Work, including Owner-selected equipment, subject to such safety regulations shall be fabricated, furnished, and installed in compliance with these requirements. All equipment furnished shall be grounded and provided guards and protection as required by safety codes. Where vapor-tight or explosion-proof electrical installation is required by safety codes, this shall be provided. Contractors and manufacturers of equipment shall be held responsible for compliance with the requirements included herein. The Contractor shall notify all equipment suppliers and subcontractors of the provisions of this paragraph.

4.7.9 Confined Spaces – The Project requires work in confined spaces and requires compliance with CAL/OSHA and Federal OSHA requirements. Confined spaces for the purposes of this section shall be as defined by the Division of Industrial Safety. Notwithstanding any classifications relative to the Tunnel Safety Orders, work within confined spaces of this project is subject to the definitions and applicable provisions of Section 5156 et. seq., Title 8, Division 1, Chapter 4, Subchapter 7, Group 16, Article 108 of California Code of Regulations.

Entry into existing "permit" confined spaces as defined by OSHA shall be allowed only in compliance with a confined space entry permit program by the Contractor that meets the requirements of CAL/OSHA Section 5157. While the Owner has identified certain existing facilities as confined spaces other confined spaces may exist on the Project. It shall be the responsibility of the Contractor to identify and classify these confined spaces.

In addition, the Owner classifies the following as confined space: the interior of sewers, vaults, manholes, reservoirs and any other such structure of space which is similarly surrounded by confining surfaces as to permit the accumulation of dangerous gases or vapors. The confined spaces are "permit" confined spaces as defined by OSHA and therefore entry is allowed only through compliance with a confined space entry permit program by the Contractor that meets the requirements of CAL/OSHA Section 5157. While the above-mentioned locations have been identified as permit confined spaces, other permit-confined spaces may exist. It shall be the responsibility of the Contractor to identify and classify these confined spaces. Sources of ignition, including smoking, shall be prohibited in any confined space.

It is anticipated that the Contractor may encounter hazardous conditions within these confined spaces, which include, but are not limited to the following:

- A. Exposure to hydrogen sulfide, methane, carbon dioxide and other gases and vapors commonly found in municipal sewers which could have or has the potential of having Immediate Danger to Life or Health Conditions (IDLH).
- B. Exposure to atmosphere containing insufficient oxygen to support human life.
- C. Exposure to combustible, flammable and/or explosive atmosphere.
- D. Exposure to sewage, which may contain bacteriological, chemical and other constituents harmful to humans.
- E. Work in conditions where engulfment or entrapment may occur.
- F. Work in environments, which may be slippery and/or have uneven work surfaces.
- G. Work in structures, which have limited and/or restricted access and egress.
- H. Work in structures where workers may trip, slip and/or fall several feet.

4.7.10 Construction Activity Permits – The Contractor must submit a copy of its respective current DOSH permit before beginning work on any the following construction activities:

- A. Construction of trenches or excavations which are five feet or deeper and into which a person is required to descend.
- B. Construction of any building, structure, scaffolding or falsework more than three stories high or the equivalent height (36 feet).
- C. Demolition of any building or structure, or dismantling of scaffolding or falsework more than three stories high or the equivalent height (36 feet).
- D. Erection or dismantling of vertical shoring systems more than three stories high, or the equivalent height (36 feet).

4.7.11 Public Safety and Convenience – The Contractor shall conduct his work so as to ensure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the Work and to ensure the protection of persons and property. No road or street shall be closed to the public except with the permission of the Construction Manager and the proper governmental authority. Fire hydrants on or adjacent to the Work shall be accessible to fire fighting equipment. Temporary provisions shall be made by the Contractor to ensure the use of sidewalks, private and public driveways and proper functioning of gutters, sewer inlets, drainage ditches and culverts, irrigation ditches and natural water courses. To the maximum extent permitted by law, Contractor shall indemnify, hold harmless and defend Owner from any and all liability, including attorneys' fees and costs of litigation, arising from any failure to comply with this section by Contractor or its privities.

4.8 Provisions for Handling Emergencies

It is possible that emergencies may arise during the progress of the Work, which may require special treatment or make advisable extra shifts of labor forces to continue the Work for twenty-four (24) hours per day. These emergencies may be caused by damage or possible damage to nearby existing structures or property by reason of the work under construction, or by storm, accidents, or leakage. The Contractor shall be prepared in case of such emergencies to make all necessary repairs and shall promptly execute such work when required by the Construction Manager. The determinations made by the Construction Manager for handling emergencies shall be final and conclusive upon the parties.

Upon start of the Work, Contractor shall provide means for immediate emergency notification of Contractor's designated representative and designated emergency alternates.

4.9 Nonstandard Working Hours

The Contractor may be required to prosecute the Work at night or outside of the normal working hours defined in Section 01560-7.0, **WORKING HOURS**. Such work may be required due to project and/or operational constraints as defined in Section 01010, **SUMMARY OF WORK**, or if emergencies arise as provided for in Section 00700-4.8, Provisions for Handling Emergencies. When required, ordered, or permitted to work at night, the Contractor shall provide sufficient and satisfactory lighting and other facilities therefor. Subject to applicable law, for work outside of the normal working hours, the Contractor shall receive no extra payment, but compensation shall be considered as having been included in the price stipulated for the Work, except for authorized work performed outside of the Contract requirements.

4.10 Cooperation with Other Contractors

This Paragraph shall serve as notice to the Contractor that the Owner may let other contracts for other work at or near the site of this work. The Contractor shall afford other contractors reasonable opportunity for the delivery and storage of their materials and the execution of their work, and shall properly connect and coordinate its work with theirs.

Should construction be under way by other forces or by other contractors within or adjacent to the limits of the work or in the vicinity of the work to be done under this Contract, the Contractor shall so conduct its operations as to interfere to the least possible extent with the work of such other forces or contractors.

Any difference or conflicts, which may arise between the Contractor and any other forces or contractors, creating delays or hindrance to each other, shall be adjusted as determined by the Construction Manager.

Section 01010, **SUMMARY OF WORK**, indicates anticipated other potential construction activities within or adjacent to work to be performed in this Contract.

5.0 CONTROL OF WORK AND MATERIAL

5.1 Means, Methods and Appliances

The means, methods and appliances adopted by the Contractor shall be planned and executed to produce the highest grade quality of work and will enable the Contractor to complete the Work in the time agreed upon. The Owner and Construction Manager shall not supervise, direct, or have control over, or be responsible for, Contractor's means, methods and appliances of construction or for the safety precautions and programs incident thereto, or for any failure of Contractor to comply with laws and regulations applicable to the furnishing or performance of Work. However, if at any time the means, methods and appliances appear inadequate or of inferior quality, the Construction Manager may order the Contractor to improve their character or efficiency, and the Contractor shall conform to such order; failure of the Construction Manager to order such improvement of methods of efficiency will not relieve the Contractor from its obligation to perform satisfactory work and to finish the Work in the time agreed upon.

Subject to the Contract Times specified in the Contract Documents, the Contractor is solely responsible for planning and scheduling the means, methods, and appliances to address weather conditions that may occur during the course of the Work. The Contractor is solely responsible for all costs to address such means, methods and appliances and for the direct and indirect costs resulting from weather conditions.

5.2 Character of Workers

None but competent superintendents, forepersons and workers shall be employed on the Work. The Contractor shall remove from the Work any person who commits trespass, possesses firearms or other weaponry, is under the influence or is in the possession of alcohol or other illegal drugs/controlled substance, or is, in the opinion of the Contractor or Construction Manager, disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable. Such discharge shall not be the basis of any claim for compensation or damages against the Owner, its officers, officials, employees, agents, and volunteers, the Design Consultant, the Construction Manager, and their partners, officers, employees, agents or any of its officers or representatives.

5.3 Supply of Sufficient Workers

The Contractor shall at all times employ qualified workers sufficient to prosecute the Work at a rate and in a sequence and manner necessary to complete the Work within the Contract Time(s). This obligation shall remain in full force and effect notwithstanding disputes or claims of any type.

5.4 Materials and Workmanship

Unless otherwise indicated in these Specifications, or favorably reviewed by the Design Consultant, materials and equipment for the construction work shall be the best grade in quality of a manufacturer regularly engaged in the production of such materials and equipment or materials and equipment of comparable character. All materials must be of the specified quality and equal to approved samples, if samples have been submitted. All work shall be done and completed in the best workmanlike manner, obtainable in the local market. All permanent materials and equipment shall be new unless otherwise specified.

Notwithstanding any omission from these Contract Documents it shall be the duty of the Contractor to call the Construction Manager's attention to apparent errors or omissions and request instructions before proceeding with the Work. The Construction Manager may, by appropriate instructions correct errors and supply omitted information. Such instructions shall be as binding upon the Contractor as though contained in the original Contract Documents.

All defective work or materials shall be promptly removed from the premises by the Contractor, whether in place or not, and shall be replaced or renewed in such manner as the Construction Manager may direct. All materials and workmanship of whatever description shall be subjected to the inspection of, and rejection by, the Construction Manager if not in conformance with the Contract Documents.

Any defective material or workmanship, or any unsatisfactory or imperfect work, which may be discovered before the final acceptance of the work or within one (1) year thereafter, shall be corrected immediately upon the receipt of notice from the Construction Manager, without extra charge, notwithstanding that it may have been overlooked in previous inspections and estimates. Failure to inspect work shall not relieve the Contractor from any obligation to perform sound and reliable work as herein described.

5.5 **Existing Utilities**

5.5.1 **General** – The location of known existing utilities and pipelines are shown on the Plans in their approximate locations. However, nothing herein shall be deemed to require the Owner to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the site of the project can be inferred from the presence of other visible facilities, such as buildings, cleanouts, meter and junction boxes, on or adjacent to the site of the Project.

The Owner will assume the responsibility for the timely removal, relocation, or protection of existing main or trunk line utility facilities located on the Project site if such utilities are not identified by the Owner in the Contract Documents or which can reasonably be inferred from the presence of other visible facilities.

5.5.2 **Utility Location** – It shall be the Contractor's responsibility to determine the exact location and depth of all utilities, including service connections, which have been marked by the respective utility owners and which the Contractor believes may affect or be affected by the Contractor's operations. The Contractor shall not be entitled to additional compensation nor time extensions for work necessary to avoid interferences nor for repair to damaged utilities if the Contractor does not expose all such existing utilities as required by this section.

The locating of utilities shall be in conformance with Government Code Section 4216 except for the Owner's utilities located on the Owner's property and not on public right-of-way.

A "High Priority Subsurface Installation" is defined in Section 4216 (e) as "high-pressure natural gas pipelines with normal operating pressures greater than 415kPA gauge (60psig) or greater than six inches nominal pipe diameter, petroleum pipelines, pressurized sewage pipelines, high-voltage electric supply lines, conductors, or cables that have a potential to ground of greater than or equal to 60kv, or hazardous materials pipelines that are potentially hazardous to workers or the public if damaged."

A "Subsurface Installation" is defined in Section 4216 (I) as "any underground pipeline, conduit, duct, wire, or other structure, except nonpressurized sewer lines, nonpressurized storm drains, or other nonpressurized drain lines."

Pursuant to Government Code Section 4216.2 the Contractor shall contact the appropriate regional notification center at least two (2) working days but not more than 14 calendar days before performing any excavation. The Contractor shall request that the utility owners conduct a utility survey and mark or otherwise indicate the location of their service. The Contractor shall furnish to the Construction Manager written documentation of its contact(s) with the regional notification center prior to commencing excavation at such locations.

After the utility survey is completed, the Contractor shall commence "potholing" or hand digging to determine the actual location of the pipe, duct, or conduit. The Construction Manager shall be given notice prior to commencing potholing operations. The Contractor shall uncover all piping and conduits, to a point one (1) foot below the pipe, where crossings, interferences, or connections are shown on the Drawings, prior to trenching or excavating for any pipe or structures, to determine actual elevations. New pipelines shall be laid to such grade as to clear all existing facilities, which are to remain in service for any period subsequent to the construction of the run of pipe involved.

The Contractor's attention is directed to the requirements of Government Code Section 4216.2 (a)(2) which provides: "When the excavation is proposed within 10 feet of a high priority subsurface installation, the operator of the high priority subsurface installation shall notify the excavator of the existence of the high priority subsurface installation prior to the legal excavation start date and time, as such date and time are authorized pursuant to paragraph (1) of subdivision (a) of 4216.2. The excavator and the operator or its representative shall conduct an onsite meeting at a mutually-agreed-on time to determine actions or activities required to verify the location of the high priority subsurface installation prior to start time." The Contractor shall notify the Construction Manager in advance of this meeting.

5.5.3 Utility Relocation and Repair – If interferences occur at locations other than those indicated in the Contract Documents with reasonable accuracy, the Contractor shall notify the Construction Manager in writing. The Construction Manager will supply a method for correcting said interferences in accordance with the responsibilities of this section and Government Code Section 4215.

Care shall be exercised by the Contractor to prevent damage to adjacent existing facilities and public or private works; where equipment will pass over these obstructions, suitable planking shall be placed. If high priority subsurface installations are damaged and the operator cannot be contacted, the Contractor shall call 911 emergency services.

The Owner will compensate the Contractor for the costs of locating and repairing damage not due to the failure of the Contractor to exercise reasonable care, and for removing or relocating such main or trunk line utility facilities not indicated in the Contract Documents with reasonable accuracy, and for the cost of equipment on the Project necessarily idled during such work. The payment for such costs will be made as provided in Section 00700-7.1, **Change Orders**. The Contractor shall not be assessed liquidated damages for delay in completion of the Project, when such delay is caused by the failure of the Owner or utility company to provide for removal or relocation of such utility facilities. Requests for extensions of time arising out of utility relocation or repair delays shall be filed in accordance with Section 01310-6.0, **TIME IMPACT ANALYSES**.

The public utility, where they are the owner of the effected utility, shall have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation work at a reasonable price. The right is reserved to the Owner and the owners of utilities or their authorized agents to enter upon the Work area for the purpose of making such changes as are necessary for the rearrangement of their facilities or for making necessary connections or repairs to their properties. The Contractor shall cooperate with forces engaged in such work and shall conduct its operations in such a manner as to avoid any unnecessary delay or hindrance to the work being performed by such forces and shall allow the respective utilities time to relocate their facility.

When the Contract Documents indicate that a utility is to be relocated, altered or constructed by others, the Owner will conduct all negotiations with the utility company and the work will be done at no cost to the Contractor, unless otherwise stipulated in the Agreement.

Temporary or permanent relocation or alteration of utilities desired by the Contractor for its own convenience shall be the Contractor's responsibility and it shall make arrangements and bear all costs for such work.

6.0 PROGRESS OF THE WORK

6.1 Commencement of Work

Within thirty (30) calendar days after receipt of the required bonds and evidences of insurance and the executed Agreement from the Contractor, written Notice to Proceed will be given by the Owner to Contractor. Notwithstanding other provisions of the Contract, the Contractor shall not be obligated to perform work, and the Owner shall not be obligated to accept or pay for work performed by the Contractor, prior to Notice to Proceed. The Contractor shall provide the required Contract bonds and evidences of insurance prior to Notice to Proceed and commencing work at the site.

The Contractor shall commence the work covered by this Contract within ten (10) days after the date established in the Notice to Proceed for the commencement of Contract Time.

The Contractor shall give the Construction Manager written notice not less than two (2) working days in advance of the actual date on which the work will be started. The Contractor shall be entirely responsible for any delay in the work, which may be caused by its failure to give such notice.

6.2 Contract Time

Time shall be of the essence of the Contract. The Contractor shall prosecute the work so that the various portions of the project shall be complete and ready for use within the time specified in Section 00800-1.1, **Time Allowed for Completion**. It is expressly understood and agreed by and between the Contractor and the Owner that the Contract Time for completion of the work described herein is a reasonable time taking into consideration the general climatic and economic conditions and other factors prevailing in the locality and the nature of the work. The Contractor is hereby advised that the Contractor's bid is to be based on the entire Contract Time and the Contractor shall include its field and home office overhead costs in the bid for the entire Contract Time.

6.3 Delays

6.3.1 Notice of Delays - When the Contractor foresees a delay in the prosecution of the Work and, in any event, immediately upon the occurrence of a delay, the Contractor shall notify the Construction Manager in writing of the probability of the occurrence of the delay, and its cause. The Contractor shall provide this notice no later than one (1) working day after the occurrence of such delay, including weather delays as specified herein. The Contractor shall take immediate steps to prevent, if possible the occurrence or continuance of the delay. The Contractor agrees that no claim shall be made for delays, which are not called to the attention of the Construction Manager at the time of their occurrence.

6.3.2 Non-Excusable Delays - Non-excusable delays in the prosecution of the Work shall include delays, which could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its subcontractors, at any tier level, or suppliers. The Contractor shall receive no compensation or time extension for such delay.

6.3.3 Excusable Delays - Excusable delays in the prosecution or completion of the Work shall include delays which result from causes beyond the control of the Contractor and Owner and which could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its subcontractors, at any tier level, or suppliers. The Contractor shall receive no compensation for such delay.

- A. Abnormal Delays - Delays caused by fire, unusual storms, floods, tidal waves, earthquakes, strikes, labor disputes, freight embargoes, and shortages of materials shall be considered as excusable delays insofar as they prevent the Contractor from proceeding with the Work for at least five (5) hours per day toward completion of the current critical activity item(s) on the latest favorably reviewed progress schedule.
- B. Weather Delays - Should inclement weather conditions or the conditions resulting from weather prevent Contractor from proceeding with seventy-five (75) percent of the normal labor and equipment force engaged in the current critical activity item for a period of at least five (5) hours per day toward completion of such operation or operations, and the crew is dismissed as a result thereof, it shall be a weather delay day. Contractor may be granted a time extension pursuant to Section 00700-6.4.2.C, Weather Delays.
- C. Material Shortages - Upon the submission of satisfactory proof to the Construction Manager by the Contractor, shortages of material may be acceptable as grounds for granting a time extension. In order that such proof may be satisfactory and acceptable to the Construction Manager, it must be demonstrated by the Contractor that the Contractor has made every effort to obtain such materials from all known sources within reasonable reach of the proposed Work. Only the physical shortage of material, caused by unusual circumstances, will be considered under these provisions as a cause for extension of time, and no consideration will be given to any claim that material could not be obtained at a reasonable, practical, or economical cost or price, unless it is shown to the satisfaction of the Construction Manager that such material could have been obtained only at exorbitant prices entirely out of line with current rates, taking into account the quantities involved and usual practices in obtaining such quantities. A time extension for shortage of material will not be considered for material

ordered or delivered late or whose availability is affected by virtue of the mishandling of procurement. The above provisions apply equally to equipment to be installed in the work.

6.3.4 Compensable Delays – Compensable delays in the prosecution or completion of the Work shall include delays that occur through no fault of the Contractor or its subcontractors and prevent the Contractor from proceeding with the Work for at least five (5) hours per day toward completion of the current critical activity item(s) on the latest favorably reviewed progress schedule due to the following cause(s):

- A. Delays due solely to the actions and/or inactions of the Owner.
- B. Delays due to differing site conditions as defined in Section 00700-7.2, Differing Site Conditions.
- C. Delays due to other Contractors employed by the Owner who interfere with the Contractor's prosecution of the Work as defined above.

6.3.5 Concurrent Delays – Concurrent delays are those delay periods when the prosecution of the Work is delayed during the same period of time due to causes from a combination of the delays defined in Sections 00700-6.3.2, Non-Excusable Delays, 00700-6.3.3, Excusable Delays, or 00700-6.3.4, Compensable Delays. During such concurrent delay periods, time extensions will be granted in accordance with Section 00700-6.4, Time Extensions; however, the Contractor will be granted a non-compensable time extension, and the Owner shall not assess its actual costs as defined in Section 00700-6.4.1, Non-Excusable Delays.

6.3.6 Critical Activity – The definition and application of the term “critical activity” and “critical path” as used in Section 6.3, Delays, and 6.4, Time Extensions, is specified in Section 01310-3.3.2,B, Critical Path.

6.4 Time Extensions

6.4.1 Non-Excusable Delays – The Owner, at its sole option, may grant an extension to milestone or completion dates for non-excusable delays. If the Owner grants an extension of time for non-excusable delays, the Contractor agrees to pay the Owner's actual costs, arising from the delay, including charges for engineering, inspection and administration incurred during the extension.

6.4.2 Excusable or Compensable Delays - If the Contractor is delayed in the performance of its work as defined in Sections 00700-6.3.3, Excusable Delays, or 00700-6.3.4, Compensable Delays, then milestone and Contract completion dates may be extended by the Owner for such time that, in the Owner's and Construction Manager's determination, the Contractor's completion dates will be delayed, provided that the Contractor strictly fulfills the following:

- A. The Contractor shall provide notification, in accordance with Paragraph 00700-6.3.1, Notice of Delays, and submit in writing a request for an extension of time to the Construction Manager stating at a minimum the probable cause of the delay and the number of days being requested. The time extension request shall be submitted in accordance with the requirements of Section 01310-6.0, **TIME IMPACT ANALYSES**.
- B. If requested by the Construction Manager, the Contractor shall promptly provide sufficient information to the Construction Manager to assess the cause or effect of the alleged delay, or to determine if other concurrent delays affected the Work.

- C. Weather Delays. The Contractor will be granted a non-compensable time extension for weather caused delays, pursuant to Section 00700-6.3.3.B, Weather Delays, over and above an allowance as provided for in Section 00800-1.3, **Weather Days**. No time extensions for weather delays will be granted until the total number of weather days exceeds this allowance. The provisions of articles A and B above also apply to Weather Delays. Both the use of the Weather Day allowance and the granting of additional days to the Contract due to weather require an actual impact to the critical path as defined below and in Section 01310, **PROGRESS SCHEDULES AND REPORTS**.

Should the Contractor fail to fulfill any of the foregoing, which are conditions precedent to the right to receive a time extension, the Contractor waives the right to receive a time extension.

During such extension of time, neither extra costs incurred by the Owner for engineering, inspection and administration nor damages for delay will be charged to the Contractor. It is understood and agreed by the Contractor and Owner that time extensions due to excusable or compensable delays will be granted only if such delays involve an impact to the critical path that would prevent completion of the whole Work within the specified Contract time. Attention is directed to Section 01310-3.3.2.G, Float, regarding the use of float in the Project schedule as related to time extensions.

Should the Contractor fail to complete the Work within the time specified in the Contract, as extended in accordance with this section if applicable, the Contractor shall forfeit and the Owner may recover liquidated damages in accordance with Section 00700-6.5, **Liquidated Damages**.

6.4.3 **Indirect Overhead**

The Contractor shall be reimbursed for indirect overhead expenses for periods of time when the Work is delayed as defined in Section 00700-6.3.4, **Compensable Delays**, only when such delay involves an impact to the critical path that would prevent completion of the whole Work within the specified Contract Time. However, no reimbursement for indirect overhead shall be made for compensable delays, which occur during a concurrent delay as defined in Section 00700-6.3.5, **Concurrent Delays**. If it is mutually agreed that the allowable markups provided for in Section 01035, **MODIFICATION PROCEDURES**, do not provide equitable compensation for the Contractor's indirect overhead expenses then the adjustments provided for under this section shall be applied and the change order markups in Section 01035, **MODIFICATION PROCEDURES**, reduced to reflect the compensation provided by this section. As a condition precedent to any reimbursement, the Contractor must fulfill all conditions as provided in Section 00700-6.4.2 **Excusable or Compensable Delays**. No additional markup for overhead or profit shall be provided for such indirect overhead expenses.

Payment to the Contractor for indirect overhead expenses will be made only if the extended Contract period granted for the compensable delay(s) is required to complete the work following the depletion of the original Contract period and any time extensions granted other than compensable time extensions.

6.4.3.1 **Indirect Field Overhead** – For those allowable delay periods as defined in Section 00700-6.4.3, **Indirect Overhead**, the Contractor shall be reimbursed for its indirect field overhead based on:

- A. Actual invoice costs for on-site field offices and temporary utilities as described in Sections 01510, **TEMPORARY UTILITIES** and 01560, **TEMPORARY CONTROLS**.
- B. Actual labor costs, as determined consistent with Section 01035-3.0, **FORCE ACCOUNT PAYMENT**, for field office staff.

- C. Fair rental values acceptable to the Construction Manager as described in Section 01035-3.0, **FORCE ACCOUNT PAYMENT**, for construction equipment idled due to the delay.

6.4.3.2 Indirect Home Office Overhead – For those allowable delay periods as defined in Section 00700-6.4.3, **Indirect Overhead**, the Contractor shall be reimbursed for the total of its home office overhead and all of its subcontractor's home office overhead based on the following formula:

Contract Bid Price (\$)

_____ x 0.03 = Total Daily Home Office Overhead (\$/Day of Delay)

Contract Period (Days)

As it is impractical to determine the actual home office overhead, such reimbursement shall encompass full payment for any and all home office overhead expenses for such periods of time for the Contractor and all subcontractors. Distribution of the markup amount among the Contractor and all subcontractors and suppliers is the responsibility of the Contractor.

6.5 Liquidated Damages

- A. Owner and the Contractor recognize that time is of the essence of this Agreement and that the Owner will suffer financial loss if the Work is not completed within the time specified in Section 00800-1.1, **Time Allowed for Completion**, and required milestone work in Section 00800-1.2, **Damages for Delays** herein, plus any extensions thereof allowed in accordance with Section 00700-6.4, **Time Extensions** of the General Conditions. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage which the Owner will sustain in the event of and by reason of the Contractor's failure to fully perform the Work or to fully perform all of its contract obligations that have accrued by the time for completion as specified in Section 00800-1.1, **Time Allowed for Completion** herein and/or as specified for completion of any scheduled operations or works described in Section 00800-1.2, **Damages for Delays**. It is, therefore, agreed in accordance with California Government Code Section 53069.85 that the Contractor will forfeit and pay to the Owner liquidated damages in the amount set forth in Section 00800-1.2, **Damages for Delays**, per day for each and every calendar day that expires after the time for completion specified in 00800-1.1, **Time Allowed for Completion** herein and/or as specified for completion of any scheduled operations or works described in Section 00800-1.2, **Damages for Delays** except as otherwise provided by extension of time pursuant to Section 00700-6.4, **Time Extensions** of the General Conditions. It is further understood and agreed in accordance with California Government Code Section 53069.85 that the liquidated damages sum specified in this provision is not manifestly unreasonable under the circumstances existing at the time this Contract was made, and that the Owner may deduct liquidated damages sums in accordance with this provision from any payments due or that may become due the Contractor.
- B. Liquidated damages will continue to accrue at the stated rate until substantial completion of the Work. Accrued liquidated damages may be deducted by the Owner from amounts due or that become due to the Contractor for performance of the Work. Liquidated damages may not be waived or reduced by the Owner unless expressly waived or reduced in writing by the Construction Manager.

6.6 Suspension of Work

6.6.1 If the Contractor fails to correct defective work as required by Sections 00700-5.3, **Supply of Sufficient Workers**, and 00700-5.4 **Materials and** Workmanship or fails to carry out the Work in accordance with the Contract Documents or any other applicable rules and regulations, the Owner, by a written order of the Owner's representative or signed personally by an agent specifically so empowered by the Owner, in writing, may order the Contractor to stop the work, in its entirety or any portion thereof. In the event of a suspension of only a portion of the work, the Contractor is obligated to perform the portion of the work not suspended. The Suspension of Work shall remain in effect until the condition or cause for such order has been eliminated. The Owner's concurrence that the condition or cause has been eliminated will be provided to the Contractor in writing. This right of the Owner to stop and suspend the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. All delays in the Work occasioned by such stoppage shall not relieve the Contractor of any duty to perform the Work or serve to extend the time for its completion. Any and all necessary corrective work done in order to comply with the Contract Documents shall be performed at no cost to the Owner.

6.6.2 In the event that a suspension of Work is ordered, as provided in this paragraph, the Contractor, at its expense, shall perform all work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public, pedestrian, and vehicular traffic, during the period of such use by suspension. Should the Contractor fail to perform the Work as specified, the Owner may perform such work and the cost thereof may be deducted from partial payments and/or final payment due the Contractor under the Contract.

6.6.3 The Owner shall also have authority to suspend the Work wholly or in part, for such period, as the Owner may deem necessary, due to unsuitable weather, or to such other conditions as are considered unfavorable for the suitable prosecution of the Work. Such temporary suspension of the Work will be considered justification for time extensions to the Contract in an amount equal to the period of such suspension if such suspended work includes the current critical activity on the latest favorably reviewed progress schedule. The Contractor as directed by the Owner shall comply with the provisions in Section 00700-6.6.2, **Suspension of Work**, above. Such additional work shall be compensated as provided for in Section 00700-7.0, **CHANGES IN THE WORK**.

6.7 **Right to Terminate Contract**

If at any time the Contractor is determined to be in material breach of the Contract, notice thereof in writing will be served upon the Contractor and its sureties, and should the Contractor neglect or refuse to propose and effect a means for a satisfactory compliance with the Contract, as directed by the Construction Manager, within the time specified in such notice, the Owner or the Owner's Representative in such case shall have the authority to terminate the operation of the Contract.

Upon such termination, the Contractor shall discontinue the Work, or such parts of it as the Owner may designate. Upon such termination, the Contractor's control shall terminate and thereupon the Owner or its fully authorized representative may take possession of all or any part of the Contractor's materials, tools, equipment, and appliances upon the premises and use the same for the purposes of completing the Work and hire such force and buy or rent such additional machinery, tools, appliances, and equipment, and buy such additional materials and supplies at the Contractor's expense as may be necessary for the proper conduct of the Work and for the completion thereof; or the Owner may

employ other parties to carry the Contract to completion, employ the necessary workers, substitute other machinery or materials and purchase the materials contracted for, in such manner as the Owner may deem proper; or the Owner may annul and cancel the Contract and release the Work or any part thereof. Any excess of cost arising therefrom over and above the Contract Price will be charged against the Contractor and its sureties, who will be liable therefor.

In the event of such termination, all monies due the Contractor or retained under the terms of this Contract shall be held by the Owner; however, such holdings will not release the Contractor or its sureties from liability for failure to fulfill the Contract. Any excess cost over and above the Contract Amount incurred by the Owner arising from the termination of the operations of the Contract and the completion of the Work by the Owner as above provided shall be paid for by the Contractor. The Contractor shall be entitled to credit against such excess costs and contract funds held by the Owner. Any contract funds remaining after all valid claims for completion of the Work have been paid, shall be paid to the Contractor sixty (60) days after completion of the Work.

If at any time before completion of the work under the Contract, it shall be determined by the Owner that reasons beyond the control of the parties hereto render it impossible, impractical, undesirable, or otherwise against the interests of the Owner to complete the work, or if the work shall be stopped by an injunction of a court of competent jurisdiction or by order of any competent authority, the Owner may, upon ten (10) days written notice to the Contractor, discontinue the work and terminate the Contract for its convenience. Upon service of such notice of termination, the Contractor shall discontinue the work in such manner, sequence, and at such times as the Construction Manager may direct. The Contractor shall have no claim for damages for such discontinuance or termination, nor any claim for anticipated profits on the work thus dispensed with, nor any other claim except for the work actually performed in accordance with the Contract Documents up to the time of discontinuance, including any extra work ordered by the Construction Manager to be done.

7.0 CHANGES IN THE WORK

7.1 Change Orders

7.1.1 Without invalidating the Contract and without notice to sureties or insurers, the Owner through the Construction Manager, may at any time or from time to time, order additions, deletions, or revisions in the Work; these will be authorized by Field Directive, Field Order, or Change Order. A Change Order will not be issued for a Field Directive unless the Construction Manager concurs with an appeal by the Contractor that such Field Directive is a change in the scope of the Contract. The Contractor shall comply promptly with the requirements for all Change Orders, Field Orders, or Field Directives. The work involved in Change Orders shall be executed under the applicable conditions and requirements of the Contract Documents. If any Field Order causes an increase or decrease in the Contract Amount or an extension or shortening of the Contract Time, an equitable adjustment will be made by issuing a Change Order using the Change Order form indicated in Section 01035, **MODIFICATION PROCEDURES**. By the acceptance of a Change Order, the Contractor waives any claim for additional time, not included in the Change Order, for the work covered by that Change Order. Additional or extra work performed by the Contractor without written authorization of a Field Order or Change Order will not entitle the Contractor to an increase in the Contract Amount or an extension of the Contract Time.

7.1.2 Compensable extra work shall be that work required for the completed project, but not shown, detailed or specified in the Contract Documents and not constituting "incidental work " as defined in Section 00700-1.4, **Plans and Specifications**. Such work shall be governed by all applicable provisions of the Contract Documents. In giving instructions, the Construction Manager shall have authority to make minor changes in the Work, not involving extra cost, and not inconsistent with the purposes of the Work; but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the Owner through the Construction Manager, and no claim for an addition to the Contract Amount and/or Contract Time shall be valid unless so ordered.

7.1.3 In case any change increases or decreases the work shown, the Contractor shall be paid for the work actually done at a mutually agreed upon adjustment to the Contract Price, based upon the provisions of Section 01035, **MODIFICATION PROCEDURES**.

7.1.4 If the Contractor refuses to accept a Change Order, the Owner may issue it unilaterally. The Contractor shall comply with the requirements of the Change Order. The Owner shall provide for an equitable adjustment to the Contract Price and/or Contract Time, and compensate the Contractor accordingly. If the Contractor does not agree that the adjustment is equitable, it may submit a claim in accordance with Section 00700-7.3, **Resolution of Disputes**.

7.2 **Differing Site Conditions**

Pursuant to Public Contract Code Section 7104, the Contractor shall promptly, and before such conditions are disturbed, notify the Construction Manager in writing, of any:

- a. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.
- b. Subsurface or latent physical conditions at the site differing from those indicated in the Contract Documents.
- c. Unknown physical conditions at the site of any unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

The Owner shall promptly investigate the conditions, and if it finds that the conditions do materially differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work the Owner shall cause to be issued a change order under the procedures provided in Section 00700-7.1, **Change Orders**.

In the event that a dispute arises between the Owner and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the work the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law, which pertain to the resolution of disputes and protests between the contracting parties, Section 00700-7.3, **Resolution of Disputes**.

No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required herein and in accordance with Section 00700-6.3.1, **Notice of Delays**.

7.3 **Resolution of Disputes**

It is the intent of this Contract that disputes regarding the Contract be resolved promptly and fairly between the Construction Manager and Contractor. However, it is recognized that some disputes will require detailed investigation and review by one or both parties before a determination and resolution can be reached. For the protection of the rights of both the Contractor and Owner the following provisions apply to the resolution of disputes, which cannot be resolved by the Contractor and Construction Manager.

7.3.1 **Pre-Claims procedures**

- a. **Notice** – Either party shall provide verbal or written notice of disputed or potentially disputed work to the other parties' attention prior to the commencement of and sufficiently in advance of performing the disputed work to allow both parties joint initial review of the disputed work. If there is disagreement subsequent to the initial review, the Contractor shall formally request a Contract Interpretation by the Construction Manager in accordance with Section 00700-1.6, **Contract Interpretation by the Construction Manager**. If the Contractor disagrees with the Construction Manager's decision in Section 00700-1.6, **Contract Interpretation by the Construction Manager**, or in any case where the Contractor deems additional compensation or a time extension to the Contract Time is due the Contractor for work or materials not covered in the Contract or which the Construction Manager has not recognized as extra work, the Contractor shall notify the Construction Manager, in writing, of its intention to make claim. Notice pertaining to decisions provided in Section 00700-1.6, **Contract Interpretation by the Construction Manager**, or such other determinations by the Construction Manager shall be filed in writing to the Construction Manager within ten (10) days of receipt of such decision and prior to the commencement of such work. All other notices for extra work shall be filed in writing to the Construction Manager prior to the commencement of such work. Written notice shall use the words "Notice of Potential Claim". Such Notice of Potential Claim shall state the circumstances and the reasons for the claim, but need not state the amount.

Additionally, no Claim for additional compensation or extension of time for a delay will be considered unless the provisions of Sections 00700-6.3, **Delays**, and 6.4, **Time Extensions**, are complied with. No claim filed after the date of final payment will be considered.

Unless notice is properly given, the Contractor shall not recover costs incurred by it as a result of the alleged extra work, changed work or other situation which had required notice been given, would have given rise to a right for additional compensation. Timely notice of potential claim is of great importance to the Construction Manager and Owner, and is not merely a formality. Such notice allows the Owner to consider preventative action, to monitor the Contractor's increased costs resulting from the situation, to marshal facts, and to plan its affairs. Such notice by the Contractor, and the fact that the Construction Manager has kept account of the work in question, shall not in any way be construed, in itself, as proving the validity of the claim.

- b. **Response by Construction Manager** – The Construction Manager shall review the "Notice of Potential Claim" and within ten (10) days of receipt of the notice shall respond to the Contractor in writing with its determination, or if it is necessary to extend this period, the

Construction Manager shall notify the Contractor in writing as to when a decision will be provided.

- c. Appeals to the Owner's Representative – In the event the Contractor disagrees with any determination of the Construction Manager provided in accordance with Section 00700-7.3.1.b, Response by Construction Manager, the Contractor may, within ten (10) days of receipt of such determination, appeal the determination to the Owner's Representative for review. The Owner's Representative shall review the appeal and transmit the decision in writing to the Contractor within 30 days from the date of receipt of the appeal. Failure of the Contractor to appeal the determination of the Construction Manager within said ten (10) day period shall constitute a waiver of the Contractor's right to thereafter assert claim resulting from such determination or decision.

In the event the Contractor disagrees with the determination of the Owner's Representative, the Contractor shall notify the Construction Manager, in writing within ten (10) days of receipt of such determination, of its intention to make Claim in accordance with Paragraphs 00700-7.3.2 through 00700-7.3..

7.3.2 Upon receipt of a Claim sent by registered mail or certified mail with return receipt requested, the Owner shall conduct a reasonable review of the Claim and, within a period not to exceed 45 days, shall provide the Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed. Upon receipt of a Claim, the Owner and the Contractor may, by mutual agreement, extend the time period provided in the preceding sentence.

The Contractor shall furnish reasonable documentation to support the Claim. Unless otherwise agreed, such documentation will consist of accurate records of all costs, including a summary of the hours and classification of equipment and labor utilized on the disputed work, as well as a summary of any materials or any specialized services, which are used. Unless otherwise agreed in writing, such information shall be submitted to the Construction Manager on a daily basis, receipt of which shall not be construed as an authorization for or acceptance of the disputed work.

Within 30 days after the last cost of work for which the Contractor contends it is due additional compensation is incurred, but if costs are incurred over a span of more than 30 days, then within 15 days after the thirtieth day and every month thereafter, the Contractor shall submit to the Construction Manager reasonable documentation to support the Claim, including, as best the Contractor is able, its costs incurred for the claimed matter. The Construction Manager shall have the right as provided in Section 01035-7.0, **COST PRICING DATA AND ACCESS TO RECORDS**, to review the Contractor's records pertaining to a submitted claim. In case the claim is found to be just, it shall be allowed and paid for as provided in Section 01035, **MODIFICATION PROCEDURES**.

If the Owner needs approval from its governing body to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the Claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a Claim sent by registered mail or certified mail, return receipt requested, the Owner shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the Contractor a written statement identifying the disputed portion and the undisputed portion.

Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the Owner issues its written statement. If the Owner fails to issue a written statement, Paragraph 00700-7.3.3 shall apply.

7.3.3 If the Contractor disputes the Owner's written response, or if the Owner fails to respond to a Claim issued pursuant to this Paragraph 00700-7.3 within the time prescribed, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the Owner shall schedule a meet and confer conference within 30 days for settlement of the dispute.

Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the Owner shall provide the Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the Owner issues its written statement. Any disputed portion of the Claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the Owner and the Contractor sharing the associated costs equally. The Owner and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the Claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the Claim remaining in dispute shall be subject to applicable procedures outside this Paragraph 00700-7.3.

For purposes of this Paragraph 00700-7.3.3, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this Paragraph 00700-7.3.3.

Unless otherwise agreed to by the Owner and the Contractor in writing, the mediation conducted pursuant to this Paragraph 00700-7.3.3 shall excuse any further obligation under Public Contract Code Section 20104.4 to mediate after litigation has been commenced.

7.3.4 Failure by the Owner to respond to a Claim from a Contractor within the time periods described in this Paragraph 00700-7.3 or to otherwise meet the time requirements of this Paragraph 00700-7.3 shall result in the Claim being deemed rejected in its entirety. A Claim that is denied by reason of the Owner's failure to have responded to a Claim, or its failure to otherwise meet the time requirements of this Paragraph 00700-7.3., shall not constitute an adverse finding with regard to the merits of the Claim or the responsibility or qualifications of the Contractor.

7.3.5 Amounts not paid in a timely manner as required by this Paragraph 00700-7.3 shall bear interest at 7 percent per annum.

7.3.6 If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against the Owner because privity of contract does not exist, the Contractor may present to the Owner a Claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the Contractor present a Claim for work which was performed by the subcontractor or by a lower tier subcontractor

on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the Owner shall furnish reasonable documentation to support the Claim. Within 45 days of receipt of this written request, the Contractor shall notify the subcontractor in writing as to whether the Contractor presented the Claim to the Owner and, if the original Contractor did not present the Claim, provide the subcontractor with a statement of the reasons for not having done so.

7.3.7 Resolution of Claims Not Exceeding \$375,000 – Claims pertaining to this Agreement for three hundred and seventy-five thousand dollars (\$375,000) or less which cannot be resolved between the parties shall be resolved pursuant to the provisions of Public Contract Code commencing at Section 20104, except that the mediation conducted pursuant to this Paragraph 00700-7.3 shall excuse any further obligation under Public Contract Code Section 20104.4 to mediate after litigation has been commenced unless otherwise agreed. The arbitration proceedings established in Public Contract Code Section 20104.4(b) shall only apply if both the Owner and Contractor mutually agree to arbitration.

7.3.8 Civil Action Proceedings – If a civil action is filed to resolve the Claim, the case must be submitted to judicial arbitration pursuant to procedures set forth in the Code of Civil Procedure commencing at Section 1141.10. Discovery is permitted consistent with the rules pertaining to judicial arbitration.

Arbitrators shall be experienced in construction law.

A party who elects to have a trial de novo following an arbitration award and does not obtain a more favorable judgment shall pay the attorney's fees incurred by the other party from and after the filing of the request for trial de novo. The Owner must pay interest at the legal rate on any arbitration award or judgement, commencing on the date when suit was filed.

Should either party to this Contract bring legal action against the other, the case shall be handled by the Superior Court of the State of California in the County of Contra Costa. The Agreement shall be construed and its performance enforced under California Law without regard to the conflict of law provisions thereof.

8.0 PAYMENT

8.1 Basis of Payment

8.1.1 General - The Contractor shall accept the compensation, as herein provided, as full payment for furnishing all labor, materials, tools, equipment, and incidentals necessary to the completed Work and for performing all work contemplated and embraced under the Contract; also for loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work, also for all expenses incurred in consequence of the suspension or discontinuance of the Work as herein specified; and for completing the Work according to the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

No compensation will be made in case of loss of anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as provided in such agreements.

Full compensation for conforming to all of the provisions of the Contract Documents shall be considered as included in the prices paid for the various Contract items of work and no additional compensation will be allowed therefor.

8.1.2 Payment for Patents and Patent Infringement - All fees or claims for any patented invention, article, or arrangement that may be used upon, or in, any manner connected with the performance of the Work or any part thereof shall be included in the price bid for doing the work, and the Contractor and its sureties shall defend, protect, and hold the Owner, the Construction Manager, the Cities of Dublin, San Ramon and Pleasanton, the Design Consultants, together with all their officials, officers, partners, volunteers, agents, and employees harmless from and any and all suits and claims including claims for attorneys fees, expert's fees and costs brought or made by the holder of any invention or patent, or on account of any patented or unpatented invention, process, article, or appliance manufactured for or used in the performance of the Contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract. Before final payment is made on the Contract, the Contractor shall furnish an affidavit to the Owner regarding patent rights for the Project. The affidavit shall state that all fees and payments due as a result of the work incorporated into the Project or methods utilized during construction have been paid in full. The Contractor shall certify in the affidavit that no other fees or claims exist for work in this Project.

8.1.3 Payment of Taxes - The Contractor shall pay and shall assume exclusive liability for all taxes levied or assessed on or in connection with its performance of this Contract, whether before or after acceptance of the work, including, but not limited to, State and local sales and use taxes, Federal and State payroll taxes or assessments, and excise taxes, including any taxes or assessments levied or increased during the performance period of the work. No separate allowance will be made therefor, and all costs in connection therewith shall be included in the total amount of the Contract price.

8.2 Partial Payments

8.2.1 General - In consideration of the faithful performance of the Work prosecuted in accordance with the Contract Documents, the Owner will pay the Contractor for all such work installed on the basis of unit prices and/or percentage completion of lump sum Bid Items. Amounts earned for lump sum work will be based on accepted Cost Breakdown (Section 01025, **MEASUREMENT AND PAYMENT**).

Payments will be made by the Owner to the Contractor on estimates duly certified and approved by the Construction Manager, based on the Lump Sum or unit price value of equipment installed and tested, labor and materials incorporated into said permanent work by the Contractor during the preceding month, and acceptable materials and equipment on hand (materials and equipment furnished and delivered to the site by the Contractor and not yet incorporated into the work accompanied by an approved invoice). Payments will not be made for temporary construction unless specifically provided for in the Contract Documents.

Partial payments will be made monthly based on work accomplished as of a day mutually agreed to by the Owner and the Contractor.

The Contractor shall submit a completed and signed progress payment request form with its estimate of the work completed during the prior month and the work completed to date in a format corresponding to the unit price schedule and accepted cost breakdown. Additionally, the Contractor

shall submit a detailed statement of the Contractor's request for payment of acceptable materials and equipment on hand in compliance with Section 00700-8.2.2, Partial Payments - Inclusion of Materials on Hand. Each payment request shall list each Change Order executed prior to date of submission, including the Change Order Number.

Upon receipt of Contractor's requests for payment, the Owner shall act in accordance with the following:

- (a) The Construction Manager shall review the submitted estimates, as soon as practicable after receipt for the purpose of determining that the estimates are a proper request for payment, and shall prepare a certified estimate of the total amount of work done and acceptable materials and equipment on hand.
- (b) Any request for payment determined not to be a proper payment request suitable for payment shall be returned to the Contractor as soon as practicable, but not later than seven (7) days after receipt. A request for payment returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the request for payment is not proper.
- (c) The number of days available to the Owner to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the Owner exceeds the seven (7) day return requirement set forth in subdivision (b) above.

If requested, the Contractor shall provide such additional data as may be reasonably required to support the partial payment request. The Construction Manager will be available to meet and discuss the partial payment request prior to its resubmittal(s). When the Contractor's estimate of amount earned conforms with the Construction Manager's evaluation, the Contractor shall submit to the Construction Manager a properly completed and signed progress payment request. The Construction Manager will submit the recommended progress payment request for the Owner's approval and processing. Payment will be made by the Owner to the Contractor in accordance with Owner's normal accounts payable procedures; the Owner shall retain amounts in accordance with Section 00700-8.3, **Right to Withhold Amounts**.

No such estimate or payment shall be required to be made, when in the judgement of the Construction Manager, the Work is not proceeding in accordance with the provisions of the Contract, or when in the Construction Manager's judgement the total value of the Work done since the last estimate amounts to less than One Thousand Dollars (\$1,000).

Subject to the provisions of this section, the Owner shall pay the Contractor within thirty (30) days after receipt of undisputed and properly submitted requests for payment from the Contractor. In accordance with Public Contract Code Section 20104.50, if the Owner fails to pay an undisputed request for payment within the allotted thirty (30) days, the Owner shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

Each progress payment request and the final payment request shall be deemed "proper" only if it is submitted on the form approved by the Owner, with all of the requested information completely and accurately provided by the Contractor and such completed progress payment request form or final payment request form is accompanied by: (i) certified payrolls of the Contractor and all Subcontractors, of any tier, for laborers performing any portion of the Work for which a progress payment or final payment is requested; (ii) duly completed and executed Conditional Waiver and

Release Upon Progress Payment or Final Payment forms in accordance with California Civil Code §3262 for all Subcontractors of any tier, and Material Suppliers covering the progress payment or final payment requested; (iii) duly completed and executed Unconditional Waiver and Release Upon Progress Payment forms in accordance with California Civil Code §3262 for all Subcontractors of any tier, and Material Suppliers covering the Progress Payment received by the Contractor under the prior progress payment request.

8.2.2 Partial Payments - Inclusion of Materials on Hand - Materials, as used herein, shall be considered to be those items, which are fabricated and manufactured material and equipment. Only those materials for which the Contractor can transfer clear title to the Owner will be qualified for partial payment. The Contractor may request payment of seventy-five (75) percent of the actual net cost of these materials. The request for partial payment will be subject to retention as provided elsewhere in the Contract Documents.

To receive partial payment for materials and equipment not incorporated in the Work, it shall be necessary for the Contractor to submit to the Construction Manager a list of such materials, at least seven (7) days prior to submitting the monthly estimate of amount earned for work completed. At the Construction Manager's sole discretion, it will approve items for which partial payment is to be made subject to the following:

- a. Equipment and materials will only be eligible if given conditional or final acceptance by the Design Consultant and are in apparent compliance with favorably reviewed shop drawings.
- b. Only equipment or materials which have received favorable review of shop drawings will qualify. The Operation and Maintenance Manuals for equipment must be submitted in accordance with Section 01730, **OPERATION AND MAINTENANCE DATA**, prior to payment for stored materials.
- c. Eligible equipment or materials must be delivered and properly stored, protected, and maintained in a manner favorably reviewed by the Construction Manager, at the job site.
- d. The Contractor's actual net cost for the materials must be supported by paid invoices of suppliers, or other documentation requested by the Construction Manager.
- e. Materials or equipment delivered to the Site less than thirty (30) days prior to their scheduled incorporation in the Work shall not qualify.
- f. Final payment shall be made only for materials actually incorporated in the Work and, upon acceptance of the Work, all materials remaining for which advance payments had been made shall revert to the Contractor, unless otherwise agreed, and partial payments made for these items shall be deducted from the final payment for the Work.
- g. Partial payments for materials and equipment on hand shall not be deemed to be final payment for the material nor relieve the Contractor of its obligations under the Contract.
- h. Partial payments for materials and equipment on hand shall not be construed or considered as acceptance of any portion of the Work.
- i. Partial payments for materials and equipment on hand shall be subject to retention in accordance with Section 00700-8.3, **Right to Withhold Amounts**.

8.2.3 Effect of Payment – Payment will be made by Owner based on the Construction Manager's observations at the site and the data comprising the progress payment request. Payment will not be a representation that the Owner has:

- (a) made exhaustive or continuous on-site inspections to check the quality or quantity of Work;
- (b) reviewed construction means, methods, techniques, sequences or procedures;

- (c) reviewed copies of requisitions received from subcontractors and material suppliers and other data requested by Owner to substantiate Contractor's right to payment;
- (d) made examination to ascertain how or for what purpose Contractor has used money previously paid on account of the Contract Sum; or
- (e) accepted all or part of the Work.

8.2.4 Cash Flow Projection – A cash flow projection covering the entire construction period shall be included with the monthly contract earnings estimate report. The time increment shall be monthly and shall be revised monthly to show actual earnings and changes to projected cash flows. If there is a difference in the percent complete of the Work as measured by the CPM schedule and the percent complete of the Work as measured by the monthly contract earnings estimate, the Contractor shall explain the reason for the difference.

8.3 Right to Withhold Amounts

8.3.1 Retention - The Owner will deduct from the partial payment and retain as part security, five (5) percent of the amount earned until the final payment in accordance with Public Contract Code Section 7201.

8.3.2 Other Withholds - In addition to the amount which the Owner may otherwise retain under the Contract, the Owner may withhold a sufficient amount or amounts of any payment or payments otherwise due the Contractor, as in its judgment may be necessary to cover:

- a. Defective work not remedied.
- b. A reasonable doubt that the Contract can be completed for the balance then unpaid.
- c. Damage to another contractor or third party, or to property.
- d. Failure of the Contractor to maintain Record Documents current as required in Section 01720, **PROJECT RECORD DOCUMENTS**.
- e. Cost of insurance arranged by the Owner due to cancellation or reduction of the Contractor's insurance.
- f. Failure to submit, revise, resubmit or otherwise conform to the requirements herein for preparing and maintaining a construction schedule as required in Section 01310, **PROGRESS SCHEDULES AND REPORTS**.
- g. Failure to make proper submissions, as specified herein.
- h. Payments due the Owner from the Contractor.
- i. The Contractor's neglect or unsatisfactory prosecution of the Work including additional engineering and administrative costs related to construction and/or shop drawing errors and the failure to clean up.
- j. Provisions of law that enable or require the Owner to withhold such payments in whole or in part.
- k. Stop Notice claims filed by Contractor's subcontractors, of any tier, or its material suppliers.
- L. Failure of Contractor to submit Operation and Maintenance Manuals as required in Section 01730, **OPERATION AND MAINTENANCE DATA**.
- m. Failure to comply with environmental or other regulatory requirements.

When the above reasons for withhold amounts are removed, payment will be made to the Contractor for amount withheld because of them.

8.4 **Security Substitution for Withholds**

For any retention of amount earned by the Contractor under Sections 00700-8.2, **Partial Payments**, or 00700-8.7, **Final Inspection and Payment**, the Contractor may substitute securities as provided in Section 22300 of the Public Contract Code, as amended, which state in part as follows:

"Provisions shall be included in any invitation for bid and in any contract documents to permit the substitution of securities for any moneys withheld by a public agency to ensure performance under a contract, provided that substitution of securities provisions shall not be required where federal regulations or policies, or both, do not allow the substitution of securities. At the request and expense of the contractor, securities equivalent to the amount withheld shall be deposited with the public agency, or with a state or federally chartered bank as the escrow agent, who shall then pay those monies to the contractor. Upon satisfactory completion of the contract, the securities shall be returned to the contractor."

Alternatively, the contractor may request and the Owner shall make payment of retentions earned directly to the escrow agent at the expense of the contractor. At the expense of the contractor, the contractor may direct the investment of the payments into securities and the contractor shall receive the interest earned on the investments upon the same terms provided for in this section for securities deposited by the contractor. Upon satisfactory completion of the contract, the contractor shall receive from the escrow agent all securities, interest and payments received by the escrow agent from the Owner, pursuant to the terms of this section. The contractor shall pay to each subcontractor, not later than 20 days of receipt of the payment, the respective amount of interest earned, net of costs attributed to retention withheld from each subcontractor, on the amount of retention withheld to insure the performance of the contractor.

The contractor shall be the beneficial owner of any securities substituted for money withheld and shall receive any interest thereon.

Securities eligible for investment under Section 22300 of the Public Contract Code shall be limited to those listed in Section 16430 of the Government Code and to bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the Owner.

The escrow agreement used hereunder shall be null, void, and unenforceable unless it is substantially similar to the form in Section 00630, **ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION**.

8.5 **Warranty of Title**

No material, supplies, or equipment for the Work under this Contract shall be purchased subject to any chattel mortgage, security agreement, or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by the seller or supplier. The Contractor warrants good title to all material, supplies, and equipment installed or incorporated in the work and agrees upon completion of all work to deliver the premises, together with all improvements and appurtenances constructed or placed thereon by the Contractor, to the Owner free from any claims, liens, security interests, or charges. The Contractor further agrees that neither the Contractor nor any person, firm, or corporation furnishing any materials or labor for any work covered by this Contract

shall have any right to a lien upon the premises or any improvement or appurtenances thereon, provided that this shall not preclude the Contractor from installing metering devices and other equipment of utility companies or of municipalities, the title of which is commonly retained by the utility company or the municipality. In the event of the installation of any such metering device or equipment, the Contractor shall advise the Owner as to the legal Owner thereof.

Nothing contained in this paragraph, however, shall defeat or impair the right of such persons furnishing materials or labor under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this Paragraph shall be inserted in all subcontracts and material contracts, and notice of its provisions shall be given to all persons furnishing materials for the work when no formal Contract is entered into for such materials.

8.6 Substantial Completion

When the Contractor considers that the Work or portion of the Work as defined in Section 01010-3.0, **EARLY OCCUPANCY OF PORTIONS OF WORK**, is substantially complete, the Contractor shall notify the Construction Manager in writing. Upon receipt of the notification, the Construction Manager, the Owner, the Design Consultant and/or their authorized representatives will make inspection, to determine if the Work and administrative requirements are sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. If items are found which prevent such use or occupancy, the Construction Manager shall notify the Contractor in writing of such items by issuing a Corrective Work Item List.

Upon the completion of such corrective work, the Contractor shall so notify the Construction Manager in writing. The Construction Manager, the Owner and/or the Design Consultant shall inspect the Work to determine its acceptability for Substantial Completion and for determination of other items, which do not meet the terms of the Contract. Upon verification that the Work is substantially complete the Construction Manager shall prepare a Certificate of Substantial Completion and the Punch List. The Certificate shall establish the date of Substantial Completion and the responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, commencement of warranties required by the Contract Documents, and shall fix the time, not to exceed 60 days, within which the Contractor shall finish all items on the Punch List or remaining work or administrative requirements accompanying the Certificate. When the preceding provisions have been approved by both the Owner and the Contractor, they shall sign the Certificate to acknowledge their written acceptance of the responsibilities assigned to them in such Certificate. By such acknowledgment, the Owner has the right to retain, in accordance with applicable law, withheld monies due the Contractor to pay the Owner's actual costs including, but not limited to, charges for engineering, inspection and administration incurred due to the failure to complete the Punch List within the time period provided in the Certificate of Substantial Completion, which costs the Owner may deduct from amounts due or that may become due the Contractor under the Contract.

8.7 Final Inspection and Payment

Upon completion of the Work, including all items on the Punch List, and upon completion of final cleaning, the Contractor shall so notify the Construction Manager in writing. Upon receipt of the notification, the Construction Manager, the Owner and/or their authorized representatives will make the final inspection, to determine the actual status of the Work in accordance with the terms of the

Contract. If materials, equipment, workmanship or administrative requirements are found which do not meet the terms of the Contract, the Construction Manager shall prepare a Final Inspection List of such items and submit it to the Contractor. Following completion of the work to correct all items in the Final Inspection List the Contractor shall notify the Construction Manager. The Construction Manager shall, in turn, notify the Owner that the Work has been completed in accordance with the Contract. Final determination of the acceptability of the Work shall be made by the Owner. After completion of the work, but prior to its acceptance by the Owner, the last partial payment will be made to the Contractor in accordance with Section 00700-8.2, **Partial Payments**.

After receipt of the last partial payment, but prior to acceptance of the Work by the Owner, the Contractor shall send a letter to the Construction Manager. The letter, pursuant to California Public Contract Code Section 7100, shall state that acceptance of the final payment described below shall operate as and shall be, a release to the Owner, the Construction Manager, the Design Consultant, and their duly authorized agents, from all claim of and/or liability to the Contract arising by virtue of the Contract related to undisputed contract amounts. Disputed Contract claims in stated amounts previously filed as provided in Section 00700-7.3, **Resolution of Disputes**, may be specifically excluded by the Contractor from the operation of the release.

Following receipt of all required submittals and the Construction Manager's written statement that construction is complete and recommendation that the Owner accept the project, the Owner will take formal action on acceptance.

Within ten (10) days of the acceptance by the Owner of the completed work embraced in the Contract, the Owner will cause to be recorded in the office of the County Recorder a Notice of Completion.

Sixty (60) days after recording the Notice of Completion of the Work involved in the Contract, the Owner will pay the Contractor in lawful money such sums of money as may be due the Contractor and are undisputed including all sums retained but excluding such sums as have previously been paid the Contractor. This payment will constitute the final payment to the Contractor under this Contract. Upon receipt of such payment, the Contractor shall send Owner an "unconditional waiver and release upon final payment" properly executed in accordance with California Civil Code Section 3262.

The Owner will pay the Contractor in lawful money such sums of money as may be due the Contractor including all sums retained but excluding such sums as have previously been paid the Contractor and as may be needed to cover outstanding stop notices. This payment will constitute the final payment to the Contractor under this Contract.

In the event of a dispute between the Owner and the Contractor, the Owner may in accordance with Public Contract Code Section 7107 withhold from the final payment an amount of 150 percent of the disputed amount.

***** END OF SECTION *****

SECTION 00800

SUPPLEMENTARY GENERAL CONDITIONS

1.0 MODIFICATIONS TO THE GENERAL CONDITIONS

1.1 Time Allowed for Completion

In accordance with the provisions of Section 00700-6.2, **Contract Time**, substantial completion of this Project shall be completed within **280** consecutive days from the date established in the Notice to Proceed for the commencement of Contract Time.

Milestone A: All equipment lead times greater than 6 weeks (Air handling units, chiller, etc.), shall be ordered no later than 90 days from the Notice to Proceed.

Milestone B: New chiller (owner furnished) for Building T shall be installed and functional no later than 60 days from the Notice to Proceed or delivery of chiller, Whichever is latest.

1.2 Damages for Delays

In accordance with the provisions of Section 00700-6.5, **Liquidated Damages**, for the period of time that any portion of the work remains unfinished after the time fixed for an interim milestone and/or Substantial Completion in Section 00800-1.1, **Time Allowed for Completion**, as modified by extensions of time granted by the Owner, it is understood and agreed by the Contractor and the Owner that the Contractor shall pay the Owner the damages listed below.

	Dollars Per Day Liquidated Damages (Amount in Dollars)
1. Substantial Completion	<u>\$500</u>
2. Milestone A	<u>\$500</u>
3. Milestone B	<u>\$500</u>
4. Final Completion	<u>\$500</u>

1.3 Weather Days

In accordance with the provisions of Paragraph 00700-6.4.2.C, Weather Delays, the following allowance(s) for weather caused delay have been included in the time allowed for completion.

	Weather Day Allowance (Working Days)
1. Substantial Completion	<u>10</u>
2. Milestone A	<u>0</u>
3. Milestone B	<u>0</u>
4. Final Completion	<u>5</u>

This allowance represents the Owner's assessment of potential lost working days. This allowance includes both weather days due to inclement weather conditions and the conditions resulting from weather in accordance with Paragraph 00700-6.3.3.2, Weather Delays. These weather days shall be included in the Contractor's schedule as specified in Section 01324-4.0, **WEATHER CONDITIONS**. This allowance is not a warranty as to the extent that weather may or may not impact the Work. The Contractor shall make its own independent assessment of potential impacts to the Work due to weather based on the Project location, the Work required, the Contract Period, the schedule, and the Contractor's planned means, methods and appliances, and the Contractor shall take such factors into consideration in its Bid and planning of the Work. The Contractor is responsible for determining the means, methods and appliances for prosecuting the Work as defined in Section 00700-5.1, **Means, Methods and Appliances**.

1.4 **Contract Administration**

The following project representatives are hereby designated by the Owner:

- A. Owner Representative: **Ryan Yamamoto, Project Manager**
- B. Design Consultant: **Carl Crizer, PE, Salas O'Brien Engineers, Inc.**
- C. Construction Manager: **Abbas Daeenabi, Roebbelen Management Inc.**

All communications to and from the Contractor shall be routed through the Construction Manager. Wherever the Contract Documents indicate that the Contractor shall contact or notify the Engineer, Architect, Soils Engineer, Structural Engineer, etc., the Contractor shall route such communication through the Construction Manager except when otherwise explicitly approved by the Construction Manager.

1.5 **Alternative Dispute Resolution of Claims—Not Used**

2.0 **LIABILITY AND INSURANCE**

2.1 **General Requirements**

The Contractor shall take out, pay for, and maintain throughout the duration of this Contract and for such additional periods as more specifically required herein the following insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, the Contractor's agents, representatives, employees or subcontractors.

Within ten (10) days after notice of award of the Contract, the Contractor shall promptly obtain at its own expense, all the insurance required by Section 00800-2.0, **LIABILITY AND INSURANCE** and as specified in Section 00470, **ACKNOWLEDGEMENT OF INSURANCE REQUIREMENTS**. The Contractor shall submit coverage verification for review and approval by the Owner prior to the Owner's execution of the Contract.

The Notice to Proceed with the Work under this Contract will not be issued, and the Contractor shall not commence work, until such insurance has been approved by the Owner. Such insurance shall remain in full force and effect at all times during the prosecution of the Work and until the final completion and acceptance thereof. The Notice to Proceed does not relieve the Contractor of the duty to obtain such insurance as required herein.

Contractor shall include all costs for insurance in its bids.

Each insurance policy required by this contract shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except with notice to the Owner.

Nothing contained in these insurance requirements is to be construed as limiting the extent of the Contractor's responsibility for payment of damages resulting from its operations under this Contract. For any claims related to this project, the Contractor's insurance coverage shall be primary insurance as respects the Owner, the Construction Manager, the City of Pleasanton, the Design Consult, and their officers, officials, partners, employees, agents and volunteers. Any insurance or self-insurance maintained by the Owner, its officers, officials, employees, agents or volunteers shall be in excess of the Contractor's insurance and shall not contribute with it.

Any failure of the Contractor to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the Owner, the Design Consultant and the Construction Manager, the City of Pleasanton, and their officers, officials, partners, employees, agents or volunteers.

Companies writing the insurance under this article shall be licensed to do business in the State of California or be permitted to do business under the Surplus Line Law of the State of California. Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A: VII.

Owner reserves the right to modify these requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other circumstances.

2.2 Subcontractors

Before any subcontractor commences work, Contractor shall require and verify that all subcontractors maintain insurance meeting all the requirements stated herein, and Contractor shall ensure that the Owner is an additional insured on insurance required from subcontractors.

Each designated subcontractor shall promptly obtain at its own expense, all the insurance required by Section 00800-2.0, **LIABILITY AND INSURANCE** and as specified in Section 00471, **ACKNOWLEDGEMENT OF INSURANCE REQUIREMENTS FOR DESIGNATED SUBCONTRACTORS**. Subcontractors shall furnish original certificates and required endorsements as verification of insurance coverage to the Contractor. The Contractor shall make such documents available for the Construction Manager's and/or Owner's review upon such request. The insurance liability limits specified in Section 00800-2.0, **LIABILITY AND INSURANCE**, shall apply for all subcontractors listed in Section 00430, **DESIGNATION OF SUBCONTRACTORS**. The Contractor is responsible for confirming that the proper insurance is provided in accordance with Section 00471, **ACKNOWLEDGEMENT OF INSURANCE REQUIREMENTS FOR DESIGNATED SUBCONTRACTORS**. For Commercial General Liability coverage subcontractors shall provide coverage with a format least as broad as CG 20 38 04 13.

2.3 Coverage Requirements

Coverage shall be as broad as required herein. If the contractor or subcontractor maintains higher limits than the minimums shown above, the Owner requires and shall be entitled to coverage for the higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the Owner.

2.3.1 Commercial General Liability

Commercial General Liability (CGL) Coverage shall be at least as broad as Insurance Services Office (ISO) Form CG 00 01 covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal & advertising injury with limits no less than \$5,000,000 per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (ISO CG 25 03 or 25 04) or the general aggregate limit shall be twice the required occurrence limit.

2.3.2 Automobile Liability

Automobile Liability coverage shall be at least as broad as Insurance Services Office Form CA 0001 covering Code 1 (any auto), with limits no less than \$5,000,000 per accident for bodily injury and property damage.

2.3.3 Worker's Compensation

Workers' Compensation insurance shall be as required by the State of California, with Statutory Limits, and Employers' Liability insurance with a limit of no less than \$1,000,000 per accident for bodily injury or disease.

2.3.4 Builder's Risk

Builder's Risk (Course of Construction) insurance utilizing an "All Risk" (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions.

Contractor may submit evidence of Builder's Risk insurance in the form of Course of Construction coverage. Such coverage shall name the Owner as a loss payee as their interest may appear.

If the project does not involve new or major reconstruction, at the option of the Owner, an Installation Floater may be acceptable. For such projects, a Property Installation Floater shall be obtained that provides for the improvement, remodel, modification, alteration, conversion or adjustment to existing buildings, structures, processes, machinery and equipment. The Property Installation Floater shall provide property damage coverage for any building, structure, machinery or equipment damaged, impaired, broken, or destroyed during the performance of the Work, including during transit, installation, and testing at the Owner's site.

2.3.5 Pollution Legal Liability, Asbestos legal Liability, Errors and Omissions

Contractors' Pollution Legal Liability and/or Asbestos Legal Liability and/or Errors and Omissions (if project involves environmental hazards) shall have limits no less than \$1,000,000 per occurrence or claim, and \$2,000,000 policy aggregate.

2.3.6 Professional Liability—Not Used

2.4 Deductibles and Self-Insured Retentions

Any deductibles or self-insured retentions must be declared to and approved by the Owner. At the option of the Owner, either: the Contractor shall cause the insurer to reduce or eliminate such self-insured retentions as respects the Owner, its officers, officials, employees, and volunteers; or the Contractor shall provide a financial guarantee satisfactory to the Owner guaranteeing payment of losses and related investigations, claim administration, and defense expenses. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or Owner.

2.5 Additional Insureds

The Owner, its officers, officials, employees, and volunteers are to be covered as additional insureds on the CGL policy with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts, or equipment furnished in connection with such work or operations and automobiles owned, leased, hired, or borrowed by or on behalf of the Contractor. General liability coverage can be provided in the form of an endorsement to the Contractor's insurance (at least as broad as ISO Form CG 20 10, CG 11 85 or both CG 20 10, CG 20 26, CG 20 33, or CG 20 38; and CG 20 37 forms if later revisions used).

2.6 Primary Coverage

For any claims related to this project, the Contractor's insurance coverage shall be primary insurance at least as broad as ISO CG 20 01 04 13 as respects the Owner, its officers, officials, employees, and volunteers. Any insurance or self-insurance maintained by the Owner, its officers, officials, employees, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.

2.7 Claims Made Policies

If any coverage required is written on a claims-made coverage form:

- A. The retroactive date must be shown, and this date must be before the execution date of the contract or the beginning of contract work.
- B. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of contract work.
- C. If coverage is canceled or non-renewed, and not replaced with another claims-made policy form with a retroactive date prior to the contract effective, or start of work date, the Contractor must purchase extended reporting period coverage for a minimum of five (5) years after completion of contract work.
- D. A copy of the claims reporting requirements must be submitted to the Owner for review.

- E. If the services involve lead-based paint or asbestos identification/remediation, the Contractors Pollution Liability policy shall not contain lead-based paint or asbestos exclusions. If the services involve mold identification/remediation, the Contractors Pollution Liability policy shall not contain a mold exclusion, and the definition of Pollution shall include microbial matter, including mold.

2.8 Waiver of Subrogation

Contractor hereby agrees to waive rights of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss. Contractor agrees to obtain any endorsement that may be necessary to affect this waiver of subrogation. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the Owner for all work performed by the Contractor, its employees, agents and subcontractors.

2.9 Verification of Coverage

Contractor shall furnish the Owner with original Certificates of Insurance including all required and amendatory endorsements (or copies of the applicable policy language effecting coverage required by this contract and a copy of the Declarations and Endorsement Page of the CGL policy listing all policy endorsements to Owner before work begins. However, failure to obtain the required documents prior to the work beginning shall not waive the Contractor's obligation to provide them. The Owner reserves the right to require complete, certified copies of all required insurance policies, including endorsements, required by these specifications, at any time.

2.10 Insurance During Guarantee Period

For all work the Contractor or its subcontractors perform during the guarantee period, worker's compensation, and commercial general liability insurance and insurance in the amounts and format required herein, shall remain in force and be maintained for five (5) years after final completion.

3.0 INDEMNIFICATION

Contractor shall indemnify, defend with counsel acceptable to Owner and hold harmless to the full extent permitted by law, Owner, the City of Pleasanton, the Design Consultant and the Construction Manager, their consultants, subconsultants, and their officers, officials, partners, employees, agents and volunteers, (collectively "the Indemnified Parties"), from and against any and all liability, loss, damage, claims, expenses and costs (including, without limitation, attorney fees and costs and fees of litigation) (collectively, "Liability") of every nature arising out of or in connection with Contractor's performance of the Work or its failure to comply with any of its obligations contained in this Agreement. Such indemnification by the Contractor shall include, but not be limited to, the following:

- a. Liability or claims resulting directly or indirectly from the negligence or carelessness of the Contractor, its subcontractors, employees, or agents in the performance of the Work, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the Contractor, its employees, or agents;
- b. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the Contractor's, or Supplier's own employees, or agents engaged in the Work resulting in actions brought against the Indemnified Parties;

- c. Liability or claims arising directly or indirectly from or based on the violation of any Laws or Regulations, whether by the Contractor, its subcontractors, employees, or agents;
- d. Liability or claims arising directly or indirectly from the use or manufacture by the Contractor, its subcontractors, employees, or agents in the performance of this Agreement of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article, or appliance, unless otherwise specified stipulated in this Agreement.
- e. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the Owner or any other parties by the Contractor, its subcontractors, employees, or agents;
- f. Liability or claims arising directly or indirectly from the willful misconduct of the Contractor, its subcontractors, employees, or agents;
- g. Liability or claims arising directly or indirectly from any breach of the obligations assumed in this Agreement by the Contractor;
- h. Liability or claims arising directly or indirectly from, relating to, or resulting from a hazardous condition created by the Contractor, Subcontractors, Suppliers, or any of their employees or agents, and;
- i. Liability or claims arising directly, or indirectly, or consequentially out of any action, legal or equitable, brought against the Indemnified Parties, their consultants, subconsultants, and the officers, directors, employees, agents and volunteers of each or any of them, to the extent caused by the Contractor's use of any premises acquired by permits, rights of way, or easements, the Site, or any land or area contiguous hereto or its performance of the Work thereon.
- j. Liability arising directly or indirectly from exposure to hazards in violation of the California Labor Code that may be asserted by any person or Owner, including, but not limited to, the Contractor, arising out of or in connection with the negligent activities of the Contractor, its agents, employees or privities pursuant to this Contract, whether or not there is concurrent negligence on the part of the Indemnified Parties.

The Contractor shall reimburse the Indemnified Parties for all costs and expenses, (including but not limited to fees and charges of engineers, architects, attorneys, and other professionals and court costs of appeal) incurred by said Indemnified Parties in enforcing the provisions of this Paragraph.

The indemnification obligation under this Section 00800-**3.0 INDEMNIFICATION** shall not be limited in any way by any limitation on the amount or type of insurance carried by Contractor or by the amount or type of damages, compensation, or benefits payable by or for the Contractor or any Subcontractor or other person or organization under workers' compensation acts, disability benefit acts, or other employee benefit acts.

Pursuant to California Public Contract Code Section 9201, Owner shall timely notify Contractor of receipt of any third-party claim relating to this Agreement.

The Contractor's obligations pursuant to this provision will survive the expiration or earlier termination of this Contract.

4.0 INJURY OR ILLNESS REPORTS

The Contractor shall furnish the Construction Manager with a copy of the Employer's Report of Injury immediately following any incident requiring the listing of said report on the OSHA Log during the

prosecution of the work under this Contract. The Contractor shall also furnish the Construction Manager with a copy of the Employer's Report of injury involving any subcontractor on this project.

5.0 STATE REVOLVING FUND LOAN PROGRAM—NOT USED

6.0 WAGE RATE REQUIREMENTS

6.1 PREVAILING WAGES

Pursuant to the statutes of the State of California, the Director of Industrial Relations has ascertained and determined the general prevailing rate of per diem wages, and rates for overtime and legal holidays, in the locality in which this work is to be performed for each craft or type of worker or mechanic needed to execute the Contract. The prevailing rates so determined are available for inspection at the Authority office and form a part of the Contract Documents. It shall be the duty of the Contractor to post a copy of such prevailing wages at the job site as required by regulation.

This project is subject to labor Compliance monitoring and enforcement by the California Department of Industrial Relations.

6.1.1 Davis Bacon Act—Not Used

6.2 TRAVEL AND SUBSISTENCE

As required by Section 1773.1 of the California Labor Code, the Contractor shall pay travel and subsistence payments to each worker needed to execute the Work, as such travel and subsistence payments are defined in the applicable collective bargaining agreements filed in accordance with that Section.

6.3 PENALTY

Unless a greater amount is specified within the Contract Documents, the Contractor shall forfeit as penalty to the Authority twenty-five dollars (\$25) for each calendar day, or portion thereof, for each worker paid less than the stipulated prevailing rates for any Work done under the Contract by the Contractor or by any subcontractor under the Contractor, in violation of the provisions of the Labor Code and, in particular, Section 1770 to Section 1871 thereof, inclusive

7.0 PARTNERING—NOT USED

8.0 RECORD DRAWINGS AND ADDITIONAL INFORMATION

The following drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) have been used by Design Consultant in preparing the Contract Documents. Drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) are available for review at the Owner's office at 7051 Dublin Boulevard, Dublin, CA, upon 48 hours notice to Owner. The following record

information is available for review by the Contractor at the Owner's office. The Owner makes no warranty as to the accuracy of this information.

- a. **Laboratory Expansion Drawings dated February 1, 1994.**

9.0 SUBSTANTIAL COMPLETION

Substantial completion of the Project as required by Section 00700-8.6, **Substantial Completion**, requires that the following portions of the Work must be completed in accordance with the requirements of the Contract Documents:

- Completion of the work as required by the Contract Documents to allow the Owner to occupy and utilize the Project for its intended purpose.
- Completion of the Corrective Work Item List as described in Section 00700-8.6, **Substantial Completion**
- Training has been completed for all electrical, mechanical and instrumentation systems.
- All testing required by the Contract and Specification Section 01660, **TESTING AND TRAINING**, has been successfully completed.
- All process equipment shall be installed and operational.
- All instrumentation and control systems shall be installed and operational to allow automatic operation.
- All alarms are fully functional, tested and demonstrated to properly associate locally, remotely and in the SCADA system.
- All items related to health and safety of Owner operations and maintenance staff, including warning signs, guardrails, and safety equipment shall be complete.
- All record drawings have been submitted, updated, reviewed and approved.

Portions of the Work not essential to the system operation, which can be completed without interruption of system operations, may be completed after the Work is substantially complete, and may include the following items:

- Final Site Clean-Up
- Completion of the Final Punch List prepared by the Construction Manager in accordance with Section 00700-8.6, **Substantial Completion**.

9.1 RETENTION RELEASE—NOT USED

10.0 PROJECT LIAISON—NOT USED

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

DIVISION 1 – GENERAL REQUIREMENTS

THIS PAGE LEFT INTENTIONALLY BLANK

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

1.0 WORK COVERED BY CONTRACT DOCUMENTS

Overview:

1. Building A

- a. Replacement and modification of rooftop HVAC equipment serving all of the 2nd floor laboratory and office spaces. Rooftop equipment to be demolished shall include existing EFs 1 thru 9, general exhaust fan, GE-1, AHU-1, air cooled chiller CH-1, associated pumps P-1, 2, and all CHW & HHW piping and appurtenances associated with AHU-1 and CH-1 on rooftop. Demolish rectangular supply air ductwork from AHU-1 on roof down to where the ductwork transitions to round duct branches serving the 2nd floor spaces. Demolish the existing absorption chiller and associated pumps, piping and accessories on grade. Chilled water piping from the absorption chiller shall be demolished to point of disconnect on lower roof as shown on drawings. Heating hot water piping from the absorption chiller shall be demolished and capped as shown on drawings.
- b. Provide new major HVAC equipment including: AHU-1, CH-1 & 2 & associated inline primary CHW pumps, secondary CHW pumps, strobic exhaust fan system. AHU-1 shall be provided with new double wall supply air duct down to point of connection to existing round supply air duct above the 2nd floor ceiling. New Chillers, CH-1 & 2 and all associated pumps and accessories, shall be provided in place of the demolished absorption chiller on grade. Strobic exhaust fan, EF-1, shall be provided on roof with a single fan within the fan plenum. The plenum shall be large enough to house a back-up fan and have all required provisions for connecting and powering the back-up fan, should a back-up be desired to be installed in the future.
- c. All existing Phoenix valves serving the 2nd floor shall be retain valve bodies but shall be retrofitted to remove the <E> pneumatic controls and be provided with new electronic Siemens controls and integrated into the existing building A Siemens controls system.
- d. New Siemens exhaust valves shall be provided to serve the 2nd floor rooms and/or hoods & equipment that currently do not have an exhaust valve installed within the exhaust ductwork. New valves shall be installed per the drawings and shall be integrated into the building's Siemens controls system.
- e. 1st Floor Titus VAV Boxes: Existing 1st floor VAV boxes shall remain. The extent of the work done to the VAV boxes is limited to disconnecting the existing pneumatic tubing and controls and upgrading the controls to a DDC control system. This upgrade would include replacing only the hydronic hot water control valve actuators, but retaining the HHW valves, coils and VAV boxes. The pneumatic controls would be capped and retired in place. Additionally, new room thermostats and leaving air temperature sensors at VAV box discharge shall be provided.

2. Building T:

- a. The existing absorption chiller and associated CHW and HHW pumps shall be demolished and a new equivalent capacity absorption chiller and pumps will be provided in their

place. The existing concrete housekeeping pad shall be extended such that the installation of the new chiller can allow adequate spacing for piping connections and routing between the new chiller and the exterior wall of building T. The new absorption chiller will be provided by the owner without the manufacturer's sheet metal casing. The absorption chiller shall be installed with an outdoor overhang similar to the adjacent one currently protecting the existing pumps and piping.

3. Building C:
 - a. Existing rooftop package unit shall be demolished and replaced with a like-for-like replacement in the same location as the existing unit.
4. Building H:
 - a. Existing AHU-2210 and associated heating hot water piping shall be demolished. A new equivalently sized air handler shall be provided in it's place and connected to the existing ductwork. The heating hot water will not be reconnected and shall be capped as shown on drawings.
 - b. Existing EF within influent pump room shall be demolished and a new section of duct will be installed to replace the demolished EF.

2.0 WORK SEQUENCE AND CONSTRAINTS

2.1 Continuity of Operations – General

Construction under this Contract involves expansion and/or modification of facilities at the existing operating treatment facilities, pump stations, reservoirs and/or pipelines which must continue to meet requirements of State and Federal regulating agencies.

These existing facilities are currently and continuously in operation and those functions shall not be interrupted except as specified herein. The Contractor shall coordinate the work to avoid any interference with normal operation of equipment and processes.

In addition to the requirements specified elsewhere in these Contract Documents, the Contractor is advised of the following constraints to the work sequence and schedule.

The Contractor shall note that not all valves and gates that may be used to isolate lines and facilities will completely seal. The Contractor shall allow for leakage in planning its work and may, with the Owner's concurrence, test certain valves and gates before work involving isolation is begun. The Contractor shall provide adequate temporary pumping and piping facilities to clear the work areas as necessary of water, sewage and sludge. The Contractor shall clean the work areas as required to perform work.

Shutdown of existing facilities will be performed by Owner personnel or by the Contractor only under Owner personnel's supervision and with prior approval.

The work under this Contract shall be conducted in a manner that will minimize shutdowns, roadway closures, or traffic obstructions caused by construction. Shutdowns causing damage to adjacent public and private property shall not be permitted and any damage resulting shall be the sole responsibility of the Contractor.

The Contractor shall note that only certain structures, tie-ins and constraints are addressed in this section. All work, whether or not addressed here, shall be governed by applicable parts of this section, and schedules and procedures further submitted for approval.

Changes to existing utilities or any new connection thereto must be coordinated to provide the least possible interference with plant operations. Prior to any shutdown or flow diversion all materials, fittings, supports, equipment and tools shall be on the site and all necessary labor scheduled prior to starting any connection work.

The Contractor shall include all work described in this section in the construction schedule. The sequence and constraints identified in this section shall be followed in the construction of the work. However, alternatives to these sequences and constraints may be submitted by the Contractor for review by the Construction Manager.

Disruptions to wastewater operations shall be permitted during dry weather periods (April 1 to October 31) and only when flow conditions are below peak levels. To minimize impact on the Owner's staff, all outages shall be limited to 8-hour periods, whenever possible. Planned utility service shutdowns to any service area or process unit of the Project shall be accomplished during periods of minimum use. In some cases this will require night or weekend work, which shall be at no additional cost to the Owner. The Contractor shall program work so that service will be restored in the minimum possible time and shall cooperate with the Owner in reducing shutdowns of the utility to a minimum.

No utility shall be disconnected without prior written approval from the utility owner and Construction Manager. When it is necessary to disconnect a utility, the Contractor shall give at least two weeks notice to the utility owner and to the Construction Manager for approval of the proposed schedule.

The Contractor shall provide staff following shutdowns to monitor and ensure the proper operation of systems.

The Contractor is advised that any shutdown of facilities will place a considerable burden on the Owner's staff before, during and after the shutdown. If through inadequate planning, lack of preparedness, faulty or inefficient workmanship or other causes controllable by the Contractor, delays, excessive time, or additional shutdowns are required that cause the Owner to incur extra cost, said extra cost will be assessed against the Contractor.

Contractor shall submit a preliminary construction schedule and a detailed Methods of Procedure document listing anticipated safety and isolation areas of the 2nd floor laboratories and the first floor office areas required to conform to the District's needs to utilize these areas as much as possible during the construction contract execution. This may include work in hours other than standard daytime hours and will require coordination with the District's Representative to assure that portions of 2nd floor labs remain functional during daytime hours.

2.2 Bypassing—Not Used

2.3 System Outage Request

Modifications to existing facilities, the construction of new facilities, and the connection of new to existing facilities may require the temporary outage or bypass of processes or facilities. In addition to the Construction Schedule, the Contractor shall submit a detailed outage plan and time schedule for all construction activities related to all outages or bypasses.

The outage plans shall be submitted to the Construction Manager for the Owner's review and acceptance a minimum of two weeks in advance of the time that such outages are required.

A System Outage Request (SOR) form located at the end of this section shall accompany each outage plan. The outage plans shall be coordinated with the construction schedule and shall meet the Contractor's planned method; the length of time required to complete said operation; and necessary temporary power, controls, instrumentation or alarms required to maintain control, monitoring and alarms; and the manpower, plant and equipment which the Contractor shall provide in order to ensure proper operation of affected facilities. In addition, the outage plan shall describe the Contractor's contingency plan that shall be initiated in the event that its temporary facilities fail or it becomes apparent that the time constraints described in the approved SOR cannot be met. The contingency plan shall conform to all specified outage requirements. All costs for preparing and implementing both the outage and contingency plans shall be borne by the Contractor.

The Construction Manager shall be notified in writing at least one week in advance of the required outage if the schedule for performing the work has changed or if revisions to the outage plan are required. Any changes must be approved by the Construction Manager and the Owner prior to the outage.

The Contractor shall attend a meeting with the Construction Manager and Owner one week before the scheduled outage to review the SOR.

The Contractor is advised that any shutdown of facilities will place a considerable burden on the Owner's staff before, during, and after the shutdown. If through inadequate planning, lack of preparedness, faulty or inefficient workmanship or other causes controllable by the Contractor, delays, excessive time, or additional shutdowns are required that cause the Owner to incur extra cost, said extra cost will be paid by the Contractor.

Building A Sequence of Construction:

1. Isolate the existing on grade absorption chiller and pumps – valve off and remove. Remove the existing CHW piping from the absorption chiller and the piping extending to the air-cooled chiller on the roof of building A.
2. Construct new platform on roof of "A." Install AHU-1. Repair roof.
3. Provide new concrete housekeeping pads for new equipment, install new chillers and support equipment where absorption chillers were. Test and run.
4. Install new CHWS and CHWR lines from the chilled water plant to the POC with the existing 2" lines feeding AHU-2 and then run 3" CHWS and CHWR lines up from the lower roof of building A up to the upper roof of "A" building. Mount these new CHW and HHW lines on the existing screen wall inside of the mechanical area and run to location of new AHU-1, test and run.

5. Connect new hydronic lines, ductwork and drains to AHU-1, test and run.
6. Remove and replace with new hydronic chilled water control valve and install new differential pressure sensors and transmitter at AHU-2.
7. Run as much of the new EA ductwork as possible without disturbing the existing exhaust from the hoods. Provide temp exhaust fan and temporarily connect to the new exhaust duct.
8. Disconnect hood exhaust ductwork from existing roof mounted exhaust fans, remove fans and patch roof. Install new air valves, convert controls to electric with DDC sensors. Connect to temporary exhaust duct fan on roof.
9. Demolish existing general exhaust fan on roof of building A, reconfigure structure and roof curbing to support new exhaust fan. Install new exhaust fan and controls for fan operations.
10. Disconnect existing AHU-1 from SA drop on roof of building A. Start and run new AHU-1.
11. Disconnect existing piping and controls from existing AHU-1 and shut down existing air cooled chiller on roof of building A. Remove AHU-1 and existing chiller from roof. Repair roof as required.
12. Connect exhaust ductwork to new exhaust fan plenum. Test and run new exhaust fan.
13. Remove temporary exhaust fan from roof of building A.
14. Set-up controls for labs on 2nd floor of building A. Air balance shall be done to mimic “at rest” and operational conditions. Individual hoods shall be tested with sash at operational levels and at wide open sash conditions.
15. Set lab airflow differential to allow large main lab to maintain a slightly negative pressure relative to the outer corridor. Where other smaller labs require pressure differential test and set up controls.
16. Upgrade existing VAV boxes with hydronic control coils. Demolish existing pneumatic controls from ceiling of 1st floor of building A. Install new DDC controls and room temperature sensors, test and run. Air balance AHU-2.

The Contractor shall note that only certain structures, tie-ins and constraints are addressed in this section. All work, whether or not addressed here, shall be governed by applicable parts of this section and schedules and procedures further submitted for approval.

The Contractor shall include all work described in this section in the construction schedule. The sequence and constraints identified in this section shall be followed in the construction of the work. However, alternatives to these sequences and constraints may be submitted by the Contractor for review by the Construction Manager.

2.5 Facility Access

Continuous access to the Owner’s facilities shall be provided at all times during the Project. Such access shall be suitable for large vehicles, e.g. chemical delivery and sludge hauling trucks. Access routes shall be provided as detailed on the Contract Plans unless alternative plans are submitted by the Contractor and approved by the Owner. The Contractor will be responsible for providing any temporary signage and controls to notify of this traffic routing.

2.6 Sewer Flow Control—Not Used

3.0 **EARLY OCCUPANCY OF PORTIONS OF WORK—NOT USED**

4.0 OWNER FURNISHED MATERIALS

The new chiller for Building T will be furnished by the Owner, and shall be installed by the Contractor in accordance with the Contract Documents.

5.0 TRENCH EXCAVATION—NOT USED

6.0 WORK UNDER OTHER CONTRACTS

6.1 Owner, utilities, and others may perform activities within Project area while the Work is in progress. Schedule the Work with Owner, utilities, and others to minimize mutual interference.

6.2 Activities by others which may affect performance of work include:

None.

7.0 WORK PERCENTAGES

The Contractor shall perform at least 15 (15%) percent of the Contract bid amount. This portion of work shall encompass the performance of work by the Contractor's forces and equipment, the procurement of materials and equipment by the Contractor and field related general conditions required to support and supervise the construction effort.

The Contractor shall provide a detailed breakdown of the planned distribution of work, by dollar amount specifically indicating the aforementioned Contractor's work percentage, prior to the Notice to proceed.

Failure to comply with the aforementioned percentage may result in monetary penalties and/or contract termination.

Subcontractors shall not be responsible for the performance of any work or procurement of materials and equipment within the above Contractor's work percentage allotment.

8.0 UNDERGROUND FACILITIES

The Contractor shall exercise care in all excavations to avoid damage to existing underground facilities. This shall include potholing and hand digging in those areas where underground facilities are known to exist until they have been sufficiently located to avoid damage to the facilities.

Prior to fabrication of any materials, the Contractor shall verify the locations and elevations of existing underground facilities to ensure proper connection and/or clearance.

The Contractor shall exercise care in maintaining those pipes and facilities to be abandoned and/or removed which are required for the continuing operation of the existing facilities until such time as they can be abandoned. The Contractor shall exercise extreme caution in working in any area adjacent to existing facilities. It is essential that the existing facilities be maintained in service until the new work is ready for full time operation and is placed in service.

No additional compensation shall be provided the Contractor for compliance with the provisions of this section for the damage and repair of such facilities due to the lack of care, and the Contractor shall be responsible for the direct and indirect costs resulting from the damage and repair of such facilities.

For work at the Owner's facilities the Contractor is responsible for coordinating all existing project documentation, including but not necessarily limited to, the Contract Documents and existing record drawings for the determination of the location of all underground facilities. If the Contractor determines that existing facilities interfere with the new Work and such facilities were not shown or were incorrectly shown in the Contract Documents, the Contractor shall notify the Construction Manager in accordance with Section 00700-1.6, **Contract Interpretation by the Construction Manager.**

9.0 PROJECT SIGN—NOT USED

10.0 ACCESS FOR OPERATING PERSONNEL

The Contractor's attention is drawn to the fact that during the course of the work of this Contract, adjacent existing facilities will be used and maintained by Owner personnel. The Contractor shall coordinate its work in such a way as to interfere as little as possible with the routine work of existing facilities except in direct pursuit of the work of this Contract and as favorably reviewed by the Construction Manager. The Contractor shall provide safe access at all times to all existing facilities for operating personnel and equipment.

**DSRSD
SYSTEM OUTAGE REQUEST
(For DSRSD Use)**

SOR No. _____

Date:

Project:

To:

Requested By:

Construction Manager

Name:

1. A Shutdown is requested on the following system:

2. Proposed date of Shutdown:

3. Estimated duration: _____ Hrs. Beginning at _____ A.M. P.M.

4. Reason for Shutdown:

5. Operations staff assistance required: _____ Yes _____ No
Describe:

6. Method of Approach/Sequence of Events:

7. Equipment to be used during Shutdown:

8. Contingency Plan:

01010-8

DSRSD
WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT
SOR REVIEW- For DSRSD Use

SOR No. _____

Item: _____

Construction Manager Comments:

Construction Manager Signature: _____ Date: _____

Date Transmitted to DSRSD: _____

DSRSD Comments:

DSRSD Engineering: _____ Date: _____

DSRSD Operations: _____ Date: _____

DSRSD Maintenance: _____ Date: _____

Date Transmitted to Construction Manager: _____

SOR Acceptable with Comments Noted: _____

SOR Not Acceptable/Resubmit: _____

Date Construction Manager Transmits to Contractor: _____

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01025

MEASUREMENT AND PAYMENT

1.0 MEASUREMENT AND PAYMENT

1.1. General

Measurements of the completed work shall be in accordance with, and by instruments and devices calibrated to United States Standard Measures and the units of measurement for payment, and the limits thereof, shall be made as shown on the Plans, Specifications, General Requirements, and Supplementary Conditions.

1.2 Units of Measurement

Measurements shall be in accordance with U.S. Standard Measures. A pound is an avoirdupois pound. A ton is 2,000 pounds avoirdupois. The unit of liquid measure is the U.S. gallon.

1.3 Certified Weights

When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales, or when approved by the Construction Manager, on a completely automated weighing and recording system. The Contractor shall furnish the Construction Manager with duplicate licensed weighmaster's certificates showing the actual net weights. The Owner will accept the certificates as evidence of the weights delivered.

1.4 Methods of Measurement

Materials and items of work which are to be paid for on the basis of measurement shall be measured in accordance with the method stipulated in the particular sections involved. In determining quantities, all measurements shall be made in a horizontal plane unless otherwise specified.

Material not used from a transporting vehicle shall be determined by the Construction Manager and deducted from the certified tag.

When material is to be measured and paid for on a volume basis and it would be impractical to determine the volume, or when requested by the Contractor in writing and approved by the Construction Manager in writing, the material will be weighed and converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Construction Manager and shall be agreed to by the Contractor before such method of measurement of pay quantities will be adopted.

Full compensation for all expense involved in conforming to the above requirements for measuring and weighing materials shall be considered as included in the unit prices paid for the materials being measured or weighed and no additional allowances will be made therefor.

Quantities of material wasted or disposed of in a manner not called for under the Contract; or rejected loads of material, including material rejected after it has been placed by reason of failure of the Contractor to conform to the provisions of the Contract; or material not unloaded from the transporting vehicle; or material placed outside the lines indicated on the plans or given by the Construction Manager; or material remaining on hand after completion of the Contract, will not be paid for and such quantities will be deducted from the final total quantities. No compensation will be allowed for hauling rejected material.

2.0 BID ITEMS

The Bid Amounts for each Bid Item will be used for comparative bid analysis. The Bid amounts will also form the basis of monthly progress payments. Each Lump Sum bid amount will undergo further breakdown as described later in this section. Unit prices for any unit price bid items will be the basis for monthly progress payment determinations and for any changes related to that Work item. Bid items are not intended to be exclusive descriptions of work categories and the Contractor shall determine and include in its pricing all materials, labor, and equipment necessary to complete each Bid Item (work phase) as shown and specified.

BID ITEM 1: Mobilization/Demobilization – Lump Sum

Bid Item 1 includes all costs for mobilization of construction plant and equipment and payment of bonds and insurance. This bid item is limited to a maximum amount of five (5) percent of the Bid Price. Payment for this item shall be made eighty (80) percent on first progress payment and twenty (20) percent on the final progress payment.

BID ITEM 2: Building A – Lump Sum

Bid Item 2 includes payment for all work required under the Contract applicable to Building A. This work shall include all disciplines (MEPS), procurement of all equipment and required materials, contractor labor, etc. Refer to the Building A breakdown of required bid items applicable for Building A. This item shall constitute full compensation for all such work as required per the Contract Documents.

- a. Rooftop HVAC Replacements
- b. Chiller Yard Remodel
- c. 2nd floor Laboratory Remodel
- d. 1st floor VAVs Controls Upgrade
- e. Building-wide Controls integration of all new and existing equipment under this Contract.

BID ITEM 3: Building C – Lump Sum

Bid Item 3 includes payment for all work required under the Contract applicable to Building C. This work shall include all disciplines (M&E), procurement of all equipment and required materials, contractor labor, etc. This item shall constitute full compensation for all such work as required per the Contract Documents.

BID ITEM 4: Building H – Lump Sum

Bid Item 4 includes payment for all work required under the Contract applicable to Building H. This work shall include all disciplines (MEPS), procurement of all equipment and required materials, contractor labor, etc. This item shall constitute full compensation for all such work as required per the Contract Documents.

BID ITEM 5: Building T – Lump Sum

Bid Item 5 includes payment for all work required under the Contract applicable to Building T. This work shall include all disciplines (MEPS), procurement of all equipment (excluding owner-furnished new replacement chiller) and required materials, contractor labor, etc. This item shall constitute full compensation for all such work as required per the Contract Documents.

BID ITEM 6: Fees and Permits – Lump Sum

Bid Item 6 includes the allowance for the District's Lump Sum estimated amount for the cost of all of the permit fees identified under Section 01060-2.2, Local Agency and Building Code Fees and Permits, section 01060-2.3 Environmental Permits and section 01060-2.4 Other Permits. Contractor shall be reimbursed for the actual costs under this Bid Item upon the District's receipt of acceptable proof of payment of fees.

BID ITEM 7: Baseline Project Schedule – Lump Sum

Bid Item 7 includes the allowance for the development and preparation of the Baseline Schedule as required in Section 01310-3.3, BASELINE SCHEDULE. Fifty (50) percent of the listed lump sum allowance will be paid following the initial submission of the Baseline Schedule and upon the Construction Manager's confirmation that the schedule is in general conformance with the Contract requirements. The remaining fifty (50) percent of the listed lump sum allowance will be paid upon the Construction Manager's favorable review of the schedule.

BID ITEM 8: Monthly Schedule Updates – Each

Bid Item 8 includes payment for the preparation and submittal of schedule updates as required in Section 01310-5.0, SCHEDULE UPDATES. The unit price for each update listed on the Bid Schedule will be paid following the submission of the schedule update and upon the Construction Manager's confirmation that the update is in general conformance with the Contract requirements. No more than one update payment will be made per each monthly progress payment application.

BID ITEM 9: Operation and Maintenance Manuals – Lump Sum

Bid Item 9 includes an allowance for payment for the preparation and submittal of Operation and Maintenance Manuals as required in Section 01730 and elsewhere in the technical specifications. Payment will be made in accordance with a Bid Item Breakdown for this bid item, which will include all O&M Manuals. Payment will be made upon favorable acceptance of and delivery of all required copies of each required O&M Manual.

BID ITEM 10: Start-Up, Testing and Training – Lump Sum

Bid Item 10 includes an allowance for payment for the preparation and submittal of a Start-Up and Testing Plan and successful Start-Up and Testing as required in Section 01660 and elsewhere in the technical specifications. Payment will be made in accordance with a Bid Item Breakdown for this bid item, which will include all activities related to start-up, testing and training. Payment will be made upon satisfactory completion of start-up, testing and training.

BID ITEM 11: All Other Work – Lump Sum

Bid Item 11 includes payment for all work required under the Contract except for work specifically being provided under Bid Items 1 through 11. This item shall constitute full compensation for all such work as required per the Contract Documents.

Payment for the Bid Item "All Other Work" shall be by lump sum which price named on the Bid

Schedule under this Bid Item shall constitute full compensation for completion of all such Work as required per the Contract Documents.

3.0 CONTRACTOR'S COST BREAKDOWN

For work to be performed for a lump sum amount, the Contractor shall submit a cost breakdown to the Construction Manager prior to the first payment and within ten (10) days after Notice to Proceed. The cost breakdown, as agreed upon by the Contractor and the Construction Manager, shall be used for preparing future estimates for partial payments to the Contractor, and shall list the major items of work with a price fairly apportioned to each item. Mobilization, overhead, bond, insurance, other general costs and profit shall be prorated to each item so that the total of the prices for all items equal the lump sum price. At the discretion of the Construction Manager, mobilization, bond and insurance costs may be provided for separately if accompanied by invoices to verify actual expenses.

The cost breakdown shall be generally in the same format as the Contract specifications divisions and subdivisions, with major items of work listed individually. The cost breakdown shall be by structure, civil, landscaping, or other logical division of work. The cost breakdown for architectural, structural, mechanical, and electrical work shall include separate items for identifiable portions of the structures. The cost breakdown shall include separate allowances for any testing and startup work required. Measurable approximate quantities of work performed by the Contractor or its subcontractors shall be provided. For quantities that are the sum total of several individual quantities, backup summaries shall be provided which list the individual descriptions and quantities. These summaries then will be used to determine the quantities of work in place in subsequent progress payment requests.

The above is a statement of the intent of the Contract Documents to provide a moderate level of detail, acceptable to the Construction Manager, to allow a fair and reasonable estimate to be made of the value of work installed. The detail of the cost breakdown must be sufficient to provide timely processing of the monthly progress payment request.

The cost breakdown will be subject to the approval of the Construction Manager, and upon request, the Contractor shall substantiate the price for any or all items and provide additional level of detail, including quantities of work. The cost breakdown shall be sufficiently detailed to permit its use by the Construction Manager as one of the bases for evaluating requests for payments. The Construction Manager shall be the sole judge of the adequacy of the cost breakdown.

The cost breakdown shall be solely used to determine progress payments. The cost breakdown shall not be considered in determining payment or credit for additional or deleted work.

4.0 PAYMENT SCHEDULE FOR PIPELINE PROJECTS—NOT USED

***** END OF SECTION *****

SECTION 01035

MODIFICATION PROCEDURES

1.0 CHANGES IN CONTRACT PRICE

This section provides supplementary procedures for the administration of changes to the Contract as specified in Section 00700-7.0, **CHANGES IN THE WORK**. Whenever corrections, alterations, or modifications of the work under this Contract are ordered by the Construction Manager and approved by the Owner which increases the amount of work to be done, such added work shall be known as extra work; and when such corrections, alterations, or modifications decrease the amount of work to be done, such subtracted work shall be known as omitted work.

The difference in cost of the work affected by such change will be added to or deducted from the amount of said Contract price, as the case may be, by a fair and reasonable valuation, which shall be determined in one or more of the following ways as directed by the Construction Manager:

- A. Where applicable, by unit prices accepted by the Owner and stated in the Contract Documents;
- B. By unit prices subsequently fixed by agreement between the parties;
- C. By an acceptable lump sum proposal from the Contractor; or
- D. By Force Account.

The prices agreed upon and any agreed upon adjustment in Contract Time shall be incorporated in the written order issued by the Owner, which shall be written so as to indicate an acceptance on the part of the Contractor as evidenced by its signature. By signature of the Change Order, the Contractor acknowledges that the adjustments to cost and time contained in the Change Order are in full satisfaction and accord, payment in full, and so waives any right to claim any further cost and time impacts at any time during and after completion of the Contract for the changes encompassed by the Change Order. The form attached at the end of this section shall be used for Change Orders and shall not be modified without mutual agreement of both the Owner and Contractor.

2.0 NEGOTIATED CHANGE ORDERS

Under the methods described in Paragraph 01035-1.0.B and 1.0.C above, the Contractor shall submit substantiating documentation with an itemized breakdown of Contractor's and subcontractor's direct costs, including labor, material, equipment rentals, and approved services, pertaining to such ordered work in the form and detail acceptable to the Construction Manager. The direct costs shall include only costs as described in Section 01035-4.0, **DIRECT COST CATEGORIES**.

The Construction Manager will review the Contractor's proposal for the change and negotiate an equitable adjustment with the Contractor. After there is an agreement, the Construction Manager will prepare and process the Change Order and make a recommendation for action by the Owner. All Change Orders must be approved by the Owner in writing before the work can be authorized and the Change Order executed.

3.0 FORCE ACCOUNT PAYMENT

If either the amount of work or payment for a Change Order cannot be determined or agreed upon beforehand, the Owner may direct by written Change Order or Field Order that the work be done on a force account basis. The term "force account" shall be understood to mean that payment for the work will be done on a time and expense basis, that is, on an accounting of the Contractor's forces, materials, equipment, and other items of cost as required and used to do the work. For the work performed, payment will be made for the documented actual cost of the work as described in Section 01035-4.0, **DIRECT COST CATEGORIES**.

Prior to the commencement of force account work, the Contractor shall notify the Construction Manager of its intent to begin work. Labor, equipment and materials furnished on force account work shall be recorded daily by the Contractor upon report sheets acceptable to the Construction Manager. The reports, if found to be correct, shall be signed by both the Contractor and Construction Manager, or inspector, and a copy of which shall be furnished to the Construction Manager no later than the working day following the performance of said work. The daily report sheet shall thereafter be considered the true record of force account work provided. If the Construction Manager, or inspector, do not agree with the labor, equipment and/or materials listed on the Contractor's daily force account report, the Contractor and Construction Manager, or inspector, shall sign-off on the items on which they are in agreement. The Construction Manager shall then review the items of disagreement and will advise the Contractor, in writing, of its determination. If the Contractor disagrees with this determination, it shall have the right to file a claim notice as provided in Paragraph 00700-7.3.1, Notice.

The Contractor shall maintain its records in such a manner as to provide a clear distinction between the direct costs of work paid for on a force account basis and the costs of other operations.

To receive partial payments and final payment for force account work, the Contractor shall submit, in a manner approved by the Construction Manager, detailed and complete documented verification of the Contractor's and any of its subcontractor's actual costs involved in the force account pursuant to the pertinent Change Order or Field Order. Such costs shall be submitted within thirty (30) days after said work has been performed. No payments will be made for work billed and submitted to the Construction Manager after the thirty (30) day period has expired.

The force account invoice shall itemize the materials used and shall cover the direct costs of labor and the charges for equipment rental, whether furnished by the Contractor, subcontractor, or other forces. The invoice shall be in a form acceptable to the Construction Manager and shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked, and also the size, type, and identification number of equipment and hours operated. Material charges shall be substantiated by valid copies of vendor's invoices.

4.0 DIRECT COST CATEGORIES

The categories described below are defined to be direct costs. No other type of costs will be allowable as direct costs. Direct costs shall not include any labor costs pertaining to the Contractor's and subcontractor's managers or superintendents, their office and engineering staffs, the cost of their offices, facilities, vehicles, or anyone not directly employed on such work, nor small tools and supplies. All such items are considered indirect costs which form a part of the Contractor's and subcontractors'

overhead expenses.

The Owner reserves the right to furnish such labor, materials and equipment as it deems expedient, and the Contractor shall have no claim for profit or added fees on the cost of such items.

4.1 **Direct Labor**

The Contractor will be paid the cost of direct craft labor for the workers and foremen (when authorized by the Construction Manager) used or proposed to be utilized in the actual and direct performance of the work.

The direct labor cost will be the actual payroll cost, including wages, subsistence and travel payments, fringe benefits as established by negotiated labor agreements or state prevailing wages. To these actual wages, will be added a labor surcharge set forth in the State of California Department of Transportation publication entitled Labor Surcharge & Equipment Rental Rates. An additional allowance of eight (8%) percent will be added to this labor rate surcharge. No other fixed labor burdens will be considered, unless approved in writing by the Construction Manager.

Except as otherwise provided, the Contractor shall receive no additional compensation for wage premiums resulting from overtime work performed under change conditions without the prior written authorization of the Construction Manager.

4.2 **Materials**

The Contractor will be paid the cost of the materials to the purchaser, including tax and delivery if paid. If the Contractor does not furnish satisfactory evidence of the cost of such materials, it shall be deemed to be the lowest current price for the materials delivered to the jobsite for the applicable quantities of the materials.

Small tools and supplies will be paid for based on seven and a half percent (7.5%) of the direct labor costs for the change prior to inclusion of the markup allowances provided for in Section 01035-5.0, **MARKUP ALLOWANCES**. The allowance for small tools and supplies shall be deemed as full compensation for all tools and materials which are incidental to performing work including safety equipment provided by the Contractor to its employees.

4.3 **Construction Equipment**

The cost of construction machinery and equipment for changes shall be based on fair rental cost or equivalent rental cost of owned equipment. Such costs will be allowed for only those days or hours during which the equipment is in actual use. Payment shall be based on actual rental and transportation invoices but shall not exceed the rental rates listed for such equipment in the State of California Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates" which is in effect on the date upon which the work is performed. Owner-operated equipment rates shall not exceed the rates in the aforesaid Rental Rate publication plus the labor costs as provided in Section 01035-4.1, **Direct Labor**. The rental cost allowed for equipment will, in all cases, be understood to cover all fuel, supplies, repairs, ownership, and incidental costs and no further allowances will be made for those items, unless specific written agreement to that effect is made. Compensation for idle time of equipment through delays caused by the Owner will be made consistent with Section 8-1.09, Right of Way Delays, of the Caltrans Standard Specifications.

5.0 MARKUP ALLOWANCES

The Contractor and subcontractors shall be entitled to compensation for indirect field and home office overhead costs, bond and insurance costs, profit and Contractor's risk for Change Order work. This compensation shall be in the form of markup percentages applied to the direct cost of the Change Order work, as further described below. The maximum markup which will be allowed for the Contractor's combined overhead and profit will be:

- A. For work by its own organization, the Contractor may add up to the following percentages:
 - 1. Direct Labor
 - a. Negotiated Change Orders - Section 01035-2.0: 25 percent
 - b. Force Account - Section 01035-3.0: 15 percent
 - 2. Materials, including Small Tools: 10 percent
 - 3. Equipment (owned or rented): 15 percent
- B. For all such work performed by subcontractors, such subcontractor may add the same percentages as the Contractor as listed in (A) above to its actual net increase in costs for combined overhead and profit. The Contractor may add up to five (5) percent of the subcontractor's total for its combined overhead and profit. No further compensation will be allowed for the Contractor's administration of the work performed by the subcontractor.
- C. For all such work done by subtier-subcontractors, such sub-subcontractors may add the same percentages as the Contractor as listed in (A) above to its actual net increase in costs for combined overhead and profit. The subcontractor may then add up to five (5) percent of the sub-subcontractor's total for its combined overhead and profit. The Contractor may add up to five (5) percent of the subcontractor's total for its combined overhead and profit. No further compensation will be allowed for the subcontractors' and Contractor's administration of the work performed by the subtier-subcontractor. No additional mark-ups will be allowed for further tier-ed subcontracts.
- D. For all such work performed by consultants, engineers, surveyors, etc. there shall be no mark-up or fees with the exception that added to their costs the combined total allowable markup for the Contractor and all subcontractors is five (5) percent of the fee total.
- E. To the total of the actual costs and fees allowed hereinunder, not more than two and one half (2.5) percent shall be added for additional bond and insurance. The compensable percentage for additional bonds and insurance shall be based on the Contractor's actual costs, as substantiated through documentation submitted to the Construction Manager.

When both additional and deleted work are involved in any one change, the markup allowances of this section shall be applied to the net extra cost of the work, if any, after subtraction of the costs for the omitted work from the extra work. For Change Order work which results in a net decrease in cost a minimum of five (5) percent markup shall be added to the sum of the direct labor, materials and equipment as a deduction for profit, costs, and reduction in bond and insurance. The Contractor shall not be entitled to nor claim for anticipated profits on work that may be omitted.

The added fixed fees shall be considered to be full compensation, covering the cost of general supervision, overhead, profit, Contractor's risk, incidentals and any other general expenses. The above

fixed fees represent the maximum limits which will be allowed, and they include but are not limited to the Contractor's and all subcontractors' indirect field and home office expenses and all other costs for cost proposal preparation, schedule analysis and preparation, operation and maintenance manual documentation, record documents and change order administration.

6.0 INCREASED OR DECREASED QUANTITIES

Increases or decreases in the quantity of a Contract unit price bid item of work will be determined by comparing the total pay quantity of such item of work with the Bid Schedule quantity.

If the total pay quantity of any item of work required under the Contract varies from the Bid Schedule quantity by 25 percent or less, payment will be made for the quantity of work of said item performed at the Contract unit prices therefor, unless eligible for adjustment pursuant to Section 01035-6.4, **Changes in Character of Work**.

If the total pay quantity of any item of work required under the Contract varies from the Bid Schedule quantity by more than 25 percent, in the absence of an executed Contract change order specifying the compensation to be paid, the compensation payable to the Contractor will be determined in accordance with Sections 01035-6.1, 6.2 or 6.3, as the case may be.

6.1 Increases of More Than 25 Percent

Should the total pay quantity of any item of work required under the Contract exceed the Bid Schedule quantity by more than 25 percent, the work in excess of 125 percent of the Bid Schedule quantity will be paid for by adjusting the Contract unit price, as hereinafter provided. At the option of the Construction Manager, payment for the work involved in such excess will be made on the basis of force account as provided by Section 01035-3.0, **FORCE ACCOUNT PAYMENT**.

Such adjustment of the Contract unit price will be the difference between the Contract unit prices and the actual unit costs, which will be determined as hereinafter provided, of the total pay quantity of the item. If the costs applicable to such item of work include fixed costs, such fixed costs will be deemed to have been recovered by the Contractor by the payments made for 125 percent of the Bid Schedule quantity for such item, and in computing the actual unit cost, such fixed costs will be excluded. Subject to the above provisions, such actual unit cost will be determined by the Construction Manager in the same manner as if the work were to be paid for on a force account basis as provided in Section 01035-3.0, **FORCE ACCOUNT PAYMENT** or such adjustment will be as agreed to by the Contractor and the Construction Manager.

When the compensation payable for the number of units of an item of work performed in excess of 125 percent of the Bid Schedule quantity is less than \$5,000 at the applicable Contract unit price, the Construction Manager reserves the right to make no adjustment in said price if it so elects, except that an adjustment will be further considered if requested in writing by the Contractor.

6.2 Decreases of More Than 25 Percent

Should the total pay quantity of any item of work required under the Contract be less than 75 percent of the Bid Schedule quantity, an adjustment in compensation pursuant to this Section will not be made unless the Contractor so requests in writing. If the Contractor so requests, the revised quantity will be paid for by adjusting the Contract unit price as hereinafter provided. At the option of the Construction

Manager, payment for the quantity of the work of such item performed will be made on the basis of force account as provided in Section 01035-3.0, **FORCE ACCOUNT PAYMENT**. However, in no case shall the payment for such work be less than that which would be made at the Contract unit price.

Such adjustment of the Contract unit price will be the difference between the Contract unit price and the actual unit cost of the total pay quantity of the item, including fixed costs. Such actual unit cost will be determined by the Construction Manager in the same manner as if the work were to be paid for on a force account basis as provided in Section 01035-3.0, **FORCE ACCOUNT PAYMENT**; or such adjustment will be as agreed to by the Contractor and the Construction Manager.

The payment for the total pay quantity of such item of work will in no case exceed the payment which would have been made for the performance of 75 percent of the Bid Schedule of the quantity for such item at the original Contract unit price.

6.3 Eliminated Items

In the event that a part of the Work is to be eliminated in its entirety and such Work is covered by unit price(s) contained in the Bid and/or Contract Documents, the price of the eliminated Work item shall be based on the applicable unit price(s). The Contractor shall be paid five (5) percent of the total extended amount (bid price times quantity) for the eliminated Work item in consideration of the applicable Contractor's overhead costs.

Should any Contract item of the Work be eliminated in its entirety, in the absence of an executed Contract change order covering such elimination, payment will be made to the Contractor for actual costs incurred in connection with such eliminated Contract item if incurred prior to the date of notification in writing by the Construction Manager of such elimination.

If acceptable material is ordered by the Contractor for the eliminated item prior to the date of notification of such elimination by the Construction Manager, and if orders for such material cannot be canceled, it will be paid for at the actual cost. In such case, the material paid for shall become the property of the Owner and the actual cost of any further handling will be paid for. If the material is returnable to the vendor and if the Construction Manager so directs, the material shall be returned and the Contractor will be paid for the actual costs of charges made by the vendor for returning the material. The actual cost of handling returned material will be paid for by the Owner.

6.4 Changes in Character of Work

If an ordered change in the plans and specifications materially changes the character of work of a Contract unit price bid item from that on which the Contractor based its Bid price, and if the change increases or decreases the actual unit cost of such changed item as compared to the actual or estimated actual unit cost of performing the work of said item in accordance with the plans and specifications originally applicable thereto, in the absence of an executed Contract change order specifying the compensation payable, an adjustment in compensation therefor will be made in accordance with the following:

The basis of such adjustment in compensation will be the difference between the actual unit cost to perform the work of said item or portion thereof involved in the change as originally planned and the actual unit cost of performing the work of said item or portion thereof involved in the change, as

changed. Actual unit costs will be determined by the Construction Manager in the same manner as if the work were to be paid for on a force account basis as provided in Section 01035-3.0, **FORCE ACCOUNT PAYMENT**; or such adjustment will be agreed to by the Contractor and the Construction Manager. Any such adjustment will apply only to the portion of the work of said item actually changed in character. At the option of the Construction Manager, the work of said item or portion of item which is changed in character will be paid for by force account as provided in Section 01035-3.0, **FORCE ACCOUNT PAYMENT**.

If the compensation for an item of work is adjusted under this Section, the costs recognized in determining such adjustment shall be excluded from consideration in making an adjustment for such item of work under the provisions in Sections 01035-6.1, **Increases of More Than 25 Percent** and 6.2, **Decreases of More Than 25 Percent**.

7.0 COST PRICING DATA AND ACCESS TO RECORDS

All cost and pricing data submitted by the Contractor with respect to any change, prospective or executed, or any claim for extra compensation shall be a true, complete, accurate and current representation of actual cost and pricing of the work. The Construction Manager may require a formal certification as to cost and pricing data submitted by the Contractor.

The Construction Manager shall have access, upon reasonable notice during normal business hours, to any books, documents, accounting records, papers, project correspondence, project files, scheduling information and other relevant records of the Contractor and all subcontractors directly or indirectly pertinent to the work, original as well as changes and claimed extra work, and the Contract for the purpose of making audit, examination, excerpts and transcriptions and in order to verify or evaluate any change, prospective or executed, or any claim for which compensation has been requested or notice of potential claim has been tendered.

Such books, documents, and other records mentioned above shall include, but are not limited to all those reasonably necessary to determine the accurate amount of direct and indirect costs, job site, and delay and impact costs, however characterized, and shall include the original Bid and all documents related to the Bid and its preparation, as well as, the as-planned construction schedule and all related documents.

Such access shall include the right to examine and audit such records and make excerpts, transcriptions, and photocopies at the Owner's cost.

8.0 TIME EXTENSIONS FOR CHANGE ORDERS

If the Contractor requests a time extension for the extra work necessitated by a proposed Change Order, the request must comply with the applicable requirements of Paragraph 01310-6.0, **TIME IMPACT ANALYSES**.

9.0 COST-REDUCTION INCENTIVE

9.1 General

The cost-reduction incentive program provides a mechanism by which the Contractor can be

motivated to use his construction expertise to improve contract performance and thereby create an overall reduction in the total cost of the Contract. The Contractor and its subcontractors may participate in the cost-reduction program; however, participation of the subcontractors shall be through the Contractor. In addition, the sharing arrangement between the Contractor and the subcontractor must be mutually agreed upon by the Contractor and its subcontractor, and written evidence of such agreement will be submitted along with the submittal of the cost-reduction proposal.

No cost reduction proposals shall be submitted for which the Owner's share in the participation of the proposals is not greater than \$5,000.

Cost-reduction proposals shall comply with the following conditions:

1. The proposed change shall not impair, in any manner, the essential functions or characteristics of the project, including but not limited to, service life, economy of operation, ease of maintenance, desired appearance, or design and safety standards.
2. The proposed change will not cause undue interruption of the Contract work, nor shall the proposed change be allowed to extend the Contract completion date of the project unless an extension provides a specific project benefit.
3. The proposed change shall be in compliance with all local permits and regulations and code requirements as set forth in the contract documents.
4. The proposed change shall not involve payment of royalties by the Owner to the Contractor.

9.2 **Proposal Submittal**

The cost-reduction proposal shall generally conform to Section 01340, **SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**.

The cost-reduction proposals shall contain as a minimum the following information:

1. Name of individuals associated with the development and preparation of the cost-reduction proposal.
2. A detailed description and duly signed plans and specifications showing work as presently designed and the proposed changes. Clear identification of all advantages and disadvantages for each change proposed.
3. A summary of estimated costs which shall include but not be limited to the following:
 - a. Project construction costs before and after the cost-reduction proposal. This shall be a detailed estimate identifying the following items:
 - 1) Quantities of material and equipment.
 - 2) Unit prices of materials and equipment.
 - 3) Labor hours and rates for installation.
 - 4) Equipment hours and rates for installation.
 - 5) Subcontractors and prime contractor markups.

- 6) Other estimate items necessary to evaluate the proposal.
 - b. Operation and maintenance costs before and after the cost-reduction proposal.
 - c. Costs for implementing the cost-reduction proposal not included in item 3a above.
 - d. Other costs as required to meet all local permits, regulations, and code requirements as set forth in the contract documents.
 - e. Time required for execution of the proposed change.
4. A preliminary schedule indicating the general time impacts for implementing the proposed change. Also indicate the date that the cost-reduction proposal needs to be approved for implementation.
5. If the Owner advises the Contractor that the proposed change will be reviewed for more detailed consideration and approval, a detailed procedure and schedule for implementing the proposed change shall be submitted. This detailed procedure and schedule shall include all necessary Contract amendments. This submittal shall also include a copy of the current Contractor's schedule showing all changes which would occur if the cost-reduction proposal were accepted.

The provisions of Section 01035-9.0, **COST-REDUCTION INCENTIVE** shall not be construed to require the Owner or Design consultant to consider any cost-reduction proposal which may be submitted. The Owner will not be liable to the Contractor for failure to accept or act upon any cost-reduction proposal submitted pursuant to this section nor for any delays to the work attributable to any such proposal. The Owner shall not be responsible or liable for payment of any of the Contractor's costs associated with a non-accepted proposal.

If a cost-reduction proposal is similar to a change in the Contract Documents under consideration by the Owner at the time said proposal is submitted, or if such a proposal is based upon or similar to standard specifications, standard special provisions, or standard plans adopted by the Owner after the advertisement for the Contract, the Owner will not accept such proposal, and the Owner reserves the right to made such changes without cost-reduction compensation to the Contractor under the provisions of this section.

The Contractor shall continue to perform the work in accordance with the requirements of the contract until an executed change order, incorporating the cost-reduction proposal has been issued. If an executed change order has not been issued by the date upon which the Contractor's cost-reduction proposal specifies that a decision thereon should be made, or such other date as the Contractor may subsequently have specified in writing, such cost-reduction proposal shall be deemed rejected.

The Owner shall be the sole judge of the acceptability of the cost-reduction proposal and the estimated net savings in construction costs from the adoption of all or any part of such proposal. In determining the estimated net savings, the right is reserved to disregard the contract bid prices if in

the judgement of the Owner, such prices do not represent a fair measure of the value of work to be performed or to be deleted.

The Owner reserves the right, where it deems such action appropriate, to require the Contractor to share in the Owner's costs of investigating a cost-reduction proposal submitted by the Contractor as a condition of considering such proposal. Where such a condition is imposed, the Contractor shall indicate its acceptance thereof in writing, and such acceptance shall constitute full authority for the Owner to deduct amounts payable to the Owner from any monies due or may become due to the Contractor under the Contract.

9.3 **Acceptance**

If the Contractor's cost-reduction proposal is accepted in whole or in part, such acceptance will be by a Contract change order, which shall specifically state that it is executed pursuant to Section 01035, **MODIFICATION PROCEDURES**. Such change order shall incorporate the changes in the plans and specifications, which are necessary to be put into effect and shall include any conditions upon which the Owner's approval thereof is based if the approval of the Owner is conditional. The change order shall also set forth estimated net savings in construction costs attributable to the cost-reduction proposal effectuated by the change order and shall further provide that the Contractor be paid 50 percent of said estimated net savings amount. The Contractor's cost of preparing the cost-reduction proposal and the Owner's costs of investigating a cost-reduction proposal, including any portion thereof paid by the Contractor, shall be excluded from consideration in determining the estimated net savings in construction costs.

Acceptance of the cost-reduction proposal and performance of the work thereunder shall not extend the time of completion of the contract, unless specifically provided for in the contract change order authorizing the use of the cost-reduction proposal.

The amount specified to be paid to the Contractor in the change order which effectuates a cost-reduction proposal shall constitute full compensation to the Contractor for the cost-reduction proposal and the performance of the work thereof pursuant to the said change order.

The Owner expressly reserves the rights to adopt a cost-reduction proposal for general use on contracts administered by the Owner when it determines that said proposal is suitable for the application to other contracts. When an accepted cost-reduction proposal is adopted for general use, only the Contractor who first submitted such proposal will be eligible for compensation pursuant to this section, and in that case, only as to those contracts awarded to this same Contractor prior to submission of the accepted cost-reduction proposal and as to which such cost-reduction proposal is also submitted and accepted. Cost-reduction proposals identical or similar to previously submitted proposals will be eligible for consideration and compensation under the provisions of this section, if the identical or similar previously submitted proposals were not adopted for general application to other contracts administered by the Owner.

*****END OF SECTION*****



DUBLIN SAN RAMON SERVICES DISTRICT
WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT
CONTRACT CHANGE ORDER NO. 00
DATE: Date

Title/Subject: Type text here.

Description of Change: Type text here.

- Type text here.
- Type text here.

Item 1: Item Description

\$Cost

Type text here.

Item 2: Item Description

\$Cost

Type text here.

Cost of Change: \$Cost

Contract Time Adjustment: Substantial Completion: # of days Calendar Days New S.C. Date: Date

Percent of Original Contract Percent% (cumulative to date)

This change order constitutes full and complete compensation for all labor equipment, materials, overhead, profit, any and all indirect costs, and time adjustments required to perform the above described change.

Contractor Acceptance:

Company Name

Contractor Name

Date

Construction Manager Recommended Approval:

Company Name

Construction Manager Name

Date

Project Manager Recommended Approval:

DSRSD Project Manager

Project Manager Name

Date

District Approval:

Engineering Services Director

Steve Delight, P.E.

Date

*General Manager

*Jan R. Lee

Date

**GM approval required for CCOs exceeding \$60k.*

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01050

FIELD ENGINEERING

1.0 DATUM

Vertical and horizontal datum is based on the coordinates and benchmarks shown on the Drawings or as provided by Owner prior to the start of construction. The Contractor is to locate and protect Owner furnished control points prior to starting the Work and preserve control points during construction. The Contractor shall re-establish all control points disturbed by its operations at no cost to Owner.

The Contractor shall establish other vertical and horizontal control from these Owner furnished reference points as required to properly layout and construct the Work. All connections shall be installed based on actual elevations of existing structures to which connections are made.

The Contractor's layout shall be based upon existing structures and the vertical and horizontal datum established by the Owner.

The Contractor shall be responsible for the preservation of all existing survey monuments or permanent bench marks. Any monuments or bench marks disturbed or destroyed by Contractor shall be referenced and replaced by a licensed land surveyor. A corner record or record of survey, as appropriate, shall be filed by the licensed land surveyor as required by the Land Surveyor's Act with the appropriate local government agencies.

2.0 QUALITY ASSURANCE

The Contractor's Surveyor shall be a land surveyor registered in California or civil engineer qualified and licensed in California with at least five (5) years surveying experience of similar projects.

Dimensions for all existing structures, piping, paving, and other nonstructural items are taken from the available information during the Owner's planning and design. The Contractor shall field verify all dimensions and conditions in advance of any construction in the area. Any discrepancy between the field survey by the Contractor and the information indicated in the Contract Documents shall be immediately brought to Construction Manager's attention by written notification. In all questions arising as to proper location of lines and grades, the Construction Manager's decision will be final.

Accuracy of the Contractor's stakes, alignments and grades may be periodically and randomly checked by the Construction Manager. If requested by Construction Manager, the Contractor shall supply field labor as required, at no extra charge to Owner, to aid and assist the Construction Manager in checking location and grades of the work as set by the Contractor. This shall include postponing parts of the Work affected by survey check, moving materials and equipment that interfere with a clear line of sight between horizontal control points and the construction work. The Contractor is not to assume that Construction Manager's check substitutes or complements the Contractor's required field quality control procedures.

The Contractor's registered land surveyor to check the line and grade of the slab or footing concrete forms prior to the first slab or footing pour at each structure and building.

3.0 PROJECT SURVEY REQUIREMENTS

As part of the bid price for the construction of the improvements the Contractor shall provide and be responsible for the layout of all work specified in the contract. The Contractor shall provide all necessary surveys, field staking, and positioning for the construction of all components at the proper alignment, elevations, grades, and positions, as indicated on the Drawings and as required for the proper operation and function.

The Contractor shall stake the work limits and right-of-way lines prior to the start of sitework.

The Contractor shall lay out all work, including structures and pipelines, and shall be solely responsible for executing the Work in accordance with the lines and grades indicated.

4.0 RECORD DOCUMENTS

The Contractor is to prepare, maintain and submit Record Documents as specified in **Section 01720-PROJECT RECORD DOCUMENTS**. The Contractor's land surveyor is to affix his signature and registration number to applicable record drawings certifying the accuracy of lines and grades shown.

*****END OF SECTION*****

SECTION 01060

REGULATORY REQUIREMENTS AND PERMITS

1.0 APPLICABLE CODES

See Technical Specifications for Applicable Codes.

2.0 FEES AND PERMITS

2.1 Contractor Fees and Permits

Contractor shall apply for, obtain, and comply with all the terms, conditions and requirements attached to all permits, bonds and licenses required by any local, state, or federal agencies to perform work, construct, erect, test and start up of any equipment or facility for this Contract. Where operating permits are required, the Contractor shall apply for and obtain such operating permits in the name of the Owner and provide the permit in an appropriate frame or file holder when the Owner accepts the equipment or facility for beneficial use. The Contractor shall give all notices necessary and incidental to the due and lawful prosecution of the Work.

Any permits, bonds, licenses and fees therefore required for the performance of work under this Contract and not specifically mentioned herein as being reimbursed by the Owner shall be included in the Contractor's Bid price (see Section 2.2). The Contractor shall apply for and obtain all safety permits for excavations, tunneling, trenches, construction (building structure, scaffolding, or falsework) and demolition required by CAL/OSHA.

2.2 Local Agency and Building Code Fees and Permits

The Contractor shall apply for and obtain in its name the necessary building, plumbing and electrical permits and shall be responsible for satisfying all code requirements, calling for inspections, and obtaining final approvals. The Contractor shall notify the Construction Manager of the need and the readiness of all required inspections. All inspections are to be coordinated with the Construction Manager. The Contractor shall comply with all construction conditions stipulated in the permits. The Contractor shall initially pay for all permits, fees and inspections required to comply with local agency and code requirements. The Contractor shall submit invoices to the Construction Manager for the Owner's reimbursement of such costs. All other permits and inspection fees will be the sole responsibility of the Contractor and shall be included in the Bid Price. The Contractor shall be responsible for and the Owner shall not provide reimbursement for any costs required for the reinspection of defective work or additional costs due to the Contractor's failure to properly schedule the inspections. The Contractor shall comply with the provisions of any and all permits obtained by the Owner and contained in the appendix to these Specifications.

2.3 Environmental Permits

The Contractor shall be responsible for compliance with the following listed environmental permits and the applicable constraints for each of these permits. The Contractor shall coordinate its work

relating to these permits with the Construction Manager. The Owner has obtained these permits and paid for the permit fees.

None.

2.4 **Other Permits—Not Used**

3.0 **STORM WATER AND NON-STORM WATER QUALITY CONTROLS WITHIN TREATMENT PLANT DRAINAGE BOUNDARIES**

3.1 **REGULATORY REQUIREMENTS**

Construction activities are regulated under the National Pollutant Discharge Elimination System (NPDES) General Permit (GP) for Storm Water Discharges Associated with Construction and Land Disturbances Activities (State Water Resources Control Board [SWRCB] Order No. 2009-0009-DWQ, NPDES Permit No. CAS00002 generally referred to as the GP). The appropriate Regional Water Quality Control Board (RWQCB) enforces the GP. The GP indicates the construction projects that are within the drainage footprint of a sewage treatment plant do not require coverage under the GP. The District has determined that this Project falls under this category. This determination eliminates the preparation of a Storm Water Pollution Prevention Plan (SWPPP), Risk Assessment and a report of Known Pollutants and Contaminants by the District and/or the Contractor.

3.2 **GENERAL**

The Contractor shall not discharge water, wastewater or other waste that will impact the District's sanitary sewerage facilities, the District's staff working in those facilities, the facilities' effluent quality, biosolids quality, recycled water quality or the air emissions from the District's facilities.

The Contractor shall be responsible for meeting the requirements of the "REGULATIONS of Dublin San Ramon Services District". Failure of the Contractor to comply with Section 01060-3.4, CONTRACTOR RESPONSIBILITIES, will result in the Contractor being responsible for any fines, applicable remediation requirements and all other costs associated with the failure.

3.3 **NOT USED**

3.4 **CONTRACTOR RESPONSIBILITIES**

The Contractor shall be responsible for meeting the requirements of this Section which incorporates the "REGULATIONS of Dublin San Ramon Services District", by reference.

Prior to soil disturbing work, the Contractor shall implement all measures to assure that all storm runoff, drainage and construction water is directed to the Plant Storm Water System. The Contractor shall prevent pollutants and all other hazardous substances and contaminants from entering the Plant's Storm Water System. The Contractor shall prevent any and all solids material from entering the Plant's Storm Water System, including construction debris and waste materials, garbage and any materials not intended to enter the Plant's Storm Water System.

General Discharge Prohibitions: The Contractor shall not discharge waste into the sewerage facilities which cause, threaten to cause, or are capable of causing, either alone or by interaction with other substances:

- A. A fire or explosion
- B. Obstruction of flow in, or injury to, the sewerage facilities, or any portion thereof;
- C. Danger to life or safety of persons;
- D. Conditions inhibiting or preventing the effective maintenance or operation of the sewerage facilities;
- E. Strong or offensive odors, air pollution, or any noxious, toxic, or malodorous gas or substance, or gas producing substances;
- F. Interference with the wastewater treatment process, or overloading of the sewerage facilities, or excessive collection or treatment costs, or use of a disproportionate share of the capacity of the sewerage facilities;
- G. Interference with any wastewater reclamation process, which does or may operate in conjunction with the sewerage facilities, or overloading, or a breakdown of such reclamation process, or excessive reclamation costs, or any product of the treatment process which renders such reclamation process impracticable or not feasible under normal operating conditions;
- H. A detrimental environmental impact, or a nuisance wherever located, or a condition unacceptable to any public agency having regulatory jurisdiction over operation of the sewerage facilities;
- I. Discoloration, or any other adverse condition in the quality of the effluent from the sewerage facilities such that receiving water quality requirements established by any statute, rule, regulation, ordinance, or permit condition cannot be met by the District;
- J. Conditions at or near the sewerage facilities, or any portion thereof, which cause, or may cause, the District to be in violation of the requirements of law.
- K. Pollutants introduced into the sewerage facilities which pass through or interfere with the operation or performance of the sewerage facilities.

Specific Discharge Prohibitions: The Contractor shall not discharge waste into the sewerage facilities that are prohibited by the following requirements:

- A. The temperature of which is higher than 150° Fahrenheit (65° centigrade);
- B. Containing more than 300 mg/l of oil or grease of animal or vegetable origin;
- C. Containing more than 100 mg/l of oil or grease of mineral or petroleum origin;

- D. Having a pH lower than 6.0 or having a corrosive property capable of causing damage or hazard to structures or equipment of the sewerage facilities, or any portion thereof;
- E. Any sand, grit, straw, metal, glass, rags, feathers, paper, tar, plastic, wood, leaves, garden clippings, manure, dead animals, offal, or any other solid or viscous substance capable of causing obstruction to the flow in the sewerage facilities, or which in any way interferes with the proper operation of the sewerage facilities;
- F. Any pollutant not otherwise specifically prohibited in these regulations, in sufficient quantities to constitute a hazard to humans or animals, or to create a hazard to the sewerage facilities, or to injure or interfere with the operation thereof;
- G. Any waste containing suspended solids not otherwise specifically prohibited under the provisions of these regulations, the characteristics or quantity of which require or requires unusual attention, treatment, or expense in handling or treating in the sewerage facilities, or any portion thereof;
- H. Any waste streams with a closed cup flashpoint of less than 140° Fahrenheit.
- I. Any trucked or hauled wastes except at points designated by the District.
- J. Should the Contractor fail to meet any of the requirements stated above immediate action by the Contractor is required to mitigate and remediate the occurrence. The Contractor is required to provide immediate notification to the District if any of the requirements of Section 01060-3.4 have been violated or are suspected of being violated by the Contractor.

3.5 DISTRICT RESPONSIBILITIES

The District reserves the right to request the Contractor to prepare a submittal to address storm water and construction water for any circumstances the District determines as necessary for special treatment and care by the Contractor. The Contractor must provide such submittal within the time period requested by the District.

***** END OF SECTION *****

SECTION 01090

REFERENCES

1.0 CODES AND STANDARDS

Whenever reference is made to a code or standard, it means the latest edition in effect the date that the Contract Documents are dated. Where codes, standards and reference documents are referred to in the Contract Documents, the Contractor may submit a written request to the Construction Manager for assistance in locating such documents. Within three days of receipt of such request, the Construction Manager or the Design Consultant will notify the Contractor as to where the document(s) can be reviewed.

2.0 DEFINITIONS OF WORDS AND TERMS

Where used in the project manual, the following words and terms shall have the meanings indicated. The meanings shall be applicable to the singular, plural, masculine and feminine of the words and terms.

Acceptance, Final Acceptance. Formal action of the District's Board of Directors in determining that the Contractor's work has been completed in accordance with the Contract Documents and in notifying the Contractor in writing of the acceptability of the Work.

Acts of God. "Acts of God" shall include only the following occurrences or conditions and effects: earthquakes in excess of a magnitude of 3.5 on the Richter Scale and tidal waves.

Addenda. Supplemental written specifications or drawings issued prior to bid submittal which modify or interpret the project manual by addition, deletion, clarification, or corrections.

Agreement. The written document covering the performance of the Work as more fully described in the Contract Documents.

Bid. Offer of a bidder submitted on the prescribed form setting forth prices of the work to be performed.

Bidder. Individual, partnership, corporation, or a combination thereof, including joint ventures, offering a bid to perform the work.

Claim. A separate demand by a Contractor for one or more of the following: (1) A time extension, including without limitation, for relief from damages or penalties for delay assessed by the District under the Contract Documents for the Project, (2) Payment by the District of money or damages arising from work done by, or on behalf of, the Contractor pursuant to the Contract Documents for the Project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled, or (3) Payment of an amount that is disputed by the District.

Clarification Letter. A Clarification Letter is issued by the Construction Manager to address the clarification of Contract issues raised by the Construction Manager, Design Consultant or Owner.

Completion. The word completion shall indicate substantial completion. See Substantial Completion.

Construction Manager. The person designated, in writing, by the Owner to act as its representative at the construction site and to perform construction inspection services and administrative functions relating to this Contract. All contact by the Contractor with the Owner shall be through the Construction Manager.

Contract Change Order. A written order to the Contractor, covering changes in the plans or specification quantities, or both, and establishing the basis of payment and time adjustments for the work affected by the changes. Also referred to as a Change Order.

Contract Documents. The words "Contract Documents" shall mean any or all of the following items, as applicable:

- Notice Inviting Bids
- Instructions to Bidders
- Bid Form and Bid Schedule
- Designation of Subcontractors
- Bidder's Bond
- Agreement
- Performance Bond
- Payment Bond
- Insurance Endorsements
- Non-Collusion Affidavit
- General Conditions
- Supplementary General Conditions
- General Requirements
- Specifications
- Drawings
- Addenda, if any
- Executed Change Orders, if any
- Field Orders
- Notice to Proceed
- Permits

Each of these items is to be considered by reference as part of the Contract Documents, also referred to as Contract.

Contract Price (also referred to as Contract Amount). The amount payable to the Contractor under the terms and conditions of the Contract based on the price given on the bidding schedule, with adjustments made in accordance with the Contract. The base amount given in the bidding schedule shall be either a lump sum bid or the summation of the unit price bids multiplied by the estimated quantities set forth in the bid form.

Contract Time. Number of calendar days stated in the Contract for the completion of the Work.

Contractor. The individual partnership, corporation, or combination thereof including joint venturers who enter into the Contract with the Owner for the performance of the Work. The term covers

subcontractors, subtier subcontractors, consultants, equipment and material suppliers, and their employees.

Contractor's Plant and Equipment. Equipment, material, supplies, and all other items, except labor, brought onto the site by the Contractor to carry out the Work, but not to be incorporated in the Work.

Corrective Work Item List. List of incomplete items of work, incomplete administrative requirements and items of work which are not in conformance with the Contract, prepared by the Construction Manager and issued to the Contractor during the course of the project and prior to the owner issuing the notice of Substantial Completion.

Days. The word "Days" shall mean calendar days, including legal holidays, Saturdays and Sundays, unless specifically noted otherwise.

Design Consultant. The engineer or architect designated by the Owner to have design control over the Work or a specified portion of the Work, acting either directly or through duly authorized representatives. Such representatives shall act within the scope of the particular duties delegated to them. The Design Consultant may also furnish inspection services as provided by the Contract.

District. The word "District" refers to the Dublin San Ramon Services District, the governing body of which is termed the Board.

District Representative. The person designated in writing by the District to act as its agent on specified matters relating to this Contract. The District's Representative is not the Construction Manager, but an employee of the District who has been designated to represent the District.

Drawings. Also referred to as "Plans". That part of the Contract Documents consisting of the graphical and technical requirements of the Contract as included on the plan sheets.

Engineer. Engineer shall refer to either the Construction Manager or Design Consultant based on their roles as defined in Section 00700, **GENERAL CONDITIONS**, and their separate contracts with the Owner.

Favorable Review. "Favorable Review" means that the person or entity acting on behalf of the District has reviewed a proposal or submittal and found it acceptable as to the aspects for which review was sought. "Favorable Review" does not imply any approval of deviations from the Contract Documents which can only be made by formal Field Directive, Field Order or Contract Change Order.

Field Directive. Written documentation of the actions of the Owner or Construction Manager in directing the Contractor. Also referred to as a Directive.

Field Order. A written instruction given to the Contractor authorizing work that is a change to the scope of work carried out on a time and material basis.

Final Completion. The date when the Work is 100% complete, including completion and acceptance of all punch list corrections, as certified by the Owner.

Final Inspection List. List of materials, equipment, workmanship, or administrative requirements

which are not in conformance with the Contract. The list shall be prepared by the Construction Manager and submitted to the Contractor following the Contractor's notice of completion of the Work, including all items on the Punch List.

Furnish. To deliver to the job site or other specified location any item, equipment or material.

General Conditions. Sections 00700, **GENERAL CONDITIONS**, and 00800, **SUPPLEMENTARY GENERAL CONDITIONS**, which form the part of the Contract Documents representing the general clauses that establish how the Project is to be administered.

General Requirements. Division 1, **GENERAL REQUIREMENTS**, which forms the part of the Contract Documents establishing special conditions or requirements peculiar to the Work and supplementary to the General Conditions.

Herein. Refers to information presented in the Contract Documents.

Holidays. Legal holidays shall include the following holidays designated by the Owner: New Year's Day, Martin Luther King Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the day after Thanksgiving, and Christmas Day.

Install. Placing, erecting, or constructing complete in place any item, equipment, or material.

Notice to Proceed. Notice to Proceed shall mean the written notice issued by Owner to Contractor authorizing him to proceed with the work and establishing the date of commencement of the Contract Time. Notice to Proceed may or may not include separate dates establishing the date of commencement of the submittal process.

Owner. The word "Owner" shall have the same meaning as the term "District".

Owner's Representative. The person designated in writing by the Owner to act as its agent on specified matters relating to this Contract. The Owner's Representative is not the Construction Manager, but an employee of the Owner who has been designated to represent the Owner.

Paragraph. For reference or citation purposes, a paragraph shall refer to the paragraph, or paragraphs, called out by paragraph number and alphanumeric designator.

Person. The term, person, includes firms, companies, corporations, partnerships, and joint ventures.

Plans. See "Drawings".

Project. The undertaking to be performed under the provisions of the Contract Documents.

Project Manual. The bound documentary information prepared for bidding and constructing the work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the Table of Contents.

Provide. Furnish and install, complete in place.

Punch List. List of incomplete items of Work, incomplete administrative requirements and items of Work which are not in conformance with the Contract, prepared by the Construction Manager and issued to the Contractor as an attachment to the Certificate of Substantial Completion.

Request for Information. Also referred to as “Request for Clarification”. A Request for Information (RFI) is issued by the Contractor to the Construction Manager to request resolution of a question on a Contract issue. A RFI is not to be used for request for material/equipment substitutions or value engineering/cost reduction incentive proposals.

Request for Quotation. A request for a proposed cost made of the Contractor by the Owner to add, delete or change the Work. A Contract Change Order is issued upon Agreement of Price and nature of the change of the Work.

Shall. Refers to actions entered into by the Contractor or the Owner as a covenant with the other party to do or to perform the action.

Shown. Refers to information presented on the drawings, with or without reference to the drawings.

Specifications. That part of the Contract Documents consisting of written descriptions of the technical features of materials, equipment, constructions systems, standards, and workmanship.

Specify. Refers to information described, shown, noted or presented in any manner in any part of the contract.

State of California Specifications. The State of California Department of Transportation Standard Specifications in effect at the date of Notice Inviting Bids, Section 00010. Also referred to as State Standard Specifications and Caltrans Standard Specifications.

Subcontractor. A subcontractor is a person or entity who has a direct contract with the Contractor or a sub-tier subcontractor who has a direct contract with a subcontractor to perform any of the Work associated with the Project. The term subcontractor means a subcontractor or subcontractor's authorized representative. The term subcontractor, does not include any separate contractor or any separate contractor's subcontractors.

Submittals. The information which is specified for submission to the Construction Manager in accordance with the Contract Documents.

Substantial Completion. Sufficient completion of the project or the portion thereof to permit a utilization of the project. Determination of substantial completion is solely at the discretion of the Owner. Substantial completion does not mean complete in accordance with the Contract nor shall substantial completion of all or any part of the project entitle the Contractor to acceptance under the Contract.

Substantial Completion Date. Date when the Owner puts into service, the Project, or that portion of the Project that has been determined to be substantially complete.

Sub-subcontractor. A sub-subcontractor is a person or entity who has a direct or indirect contract with a subcontractor to perform any of the Work associated with the Project. The term sub-subcontractor

means a sub-subcontractor or an authorized representative thereof, also referred to as subtier-subcontractor.

Supplier. Any person, firm, corporation, or organization who supplies materials or equipment for the Work, including that fabricated to a special design, and may also be a Subcontractor or a Sub-contractor.

Surety. The person, firm, corporation, or organization that joins with the Contractor in assuming the liability for the faithful performance of the Work and for the payment of all obligations pertaining to the Work in accordance with the Contract Documents by issuing the Bonds required by the Contract Documents or by law.

Warranty Period. Period where the Contractor is responsible for repairs to equipment or the Work at no cost to the District after Substantial Completion. Length of period is as established in the Section 01740, **WARRANTIES AND BONDS**, and/or elsewhere in the Contract Document.

Will. See definition of "Shall".

Work. The labor, materials, equipment, supplies, services, and other items necessary for the execution, completion and fulfillment of the Contract.

Work Day. Any day except Saturday, Sunday, and legal District holidays.

3.0 ABBREVIATIONS

Whenever the following terms are used, the intent and meaning shall be as follows:

Abbreviation Stands For

AASHTO	American Association of State and Highway and Transportation Officials
AAMA	Architectural Aluminum Manufacturers Association
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standard Institute (formerly United States of America Standards Institute)
APA	American Plywood Association
API	American Petroleum Institute
AREA	American Railway Engineers Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Construction Managers
ASME	American Society of Mechanical Engineers

ASTM	American Society of Testing and Materials
AWPA	American Wood-Preserver's Association
AWS	American Welding Society
AWWA	American Water Works Association
CAGI	Compressed Air and Gas Institute CAL/OSHA State of California Department of Industrial Relations, Division of Industrial Safety
CBM	Certified Ballast Manufacturers
CBR	California Bearing Ratio
CI	Chlorine Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CPSC	Consumer Products Safety Commission
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CTI	Cooling Tower Institute
DFPA	Douglas Fir Plywood Association
EIA	Electronic Industries Association
EPA	U.S. Environmental Protection Agency
ETL	Electronic Testing Laboratory
FM	Factory Mutual Insurance Company
FPS	Fluid Power Society
FS	Federal Specifications
GO 95	General Order No. 95, California Public Utilities Commission Rules for Overhead Electric Line Construction
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
IAPMO	International Association of Plumbing and Mechanical Officials
IBR	Institute of Boiler and Radiator Manufacturers
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPCE	International Power Cable Engineers Association
ISA	Instrument Society of America
MIL	Military Specifications
MSS	Manufacturer's Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCMAC	Prestressed Concrete Manufacturers Association of California
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Structural Steel Painting Council TCA Tile Council of America
UBC	Uniform Building Code
UFC	Uniform Fire Code

UPC	Uniform Plumbing Code
UL	Underwriters Laboratories
WCLIB	West Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California

***** END OF SECTION *****

SECTION 01200

PROJECT MEETINGS

1.0 PRE-CONSTRUCTION CONFERENCE

Prior to the start of construction the Construction Manager will conduct a pre-construction conference that shall be attended by the Contractor's Project Manager/Project Engineers and major subcontractors and major equipment and material suppliers, effected utilities and others as determined by the Contractor and Construction Manager. At the conference the following shall be reviewed - the Contractor's proposed schedule of operations and the construction procedure and sequence requirements, Contractor's field organization, submittals, progress payments procedures, change order procedures, Contractor Safety Program, safety requirements, permits and inspections, and other matters.

2.0 PROGRESS MEETINGS

The Construction Manager shall schedule, arrange and conduct progress meetings. These meetings shall be conducted not more than once per week and shall be attended by the Contractor's superintendent and representatives of all subcontractors, utilities, and others, that are active in the execution of the Work. The purpose of these meetings shall be to review the Contractor's three week schedule provided in accordance with Section 01310-7.0, **WEEKLY SCHEDULE**, resolve conflicts, and in general, coordinate and expedite the execution of the Work.

The agenda of progress meetings shall include, as a minimum, review of progress and schedule of the Work and any other matters related to the execution of the Work. The Construction Manager shall prepare and distribute record of discussions of the meetings.

3.0 PARTNERING MEETINGS—NOT USED

4.0 SUBMITTAL MEETINGS

When required in the individual technical specification, or if requested by the Contractor or the Construction Manager, a meeting regarding a required submittal will be held to facilitate the timeliness of the submittal preparation and review process. This meeting will convene at a mutually agreeable place. The party responsible for preparing the submittal shall be in attendance along with the Design Consultant.

5.0 QUALITY ASSURANCE MEETINGS

The Contractor or the Construction Manager may request a meeting prior to the start of a particular phase of the Project to discuss how the Work shall be accomplished in accordance with the quality requirements of the contract documents, codes, permits and industry standards. All required inspection and testing applicable to this phase of the Project will be discussed in detail. The Contractor shall require that all management and quality control personnel employed by the Contractor for this phase of the Project are in attendance. Quality assurance meetings might be requested for such phases of the Project as site work, concrete, piping, mechanical, specialty subtrades and electrical/instrumentation.

6.0 PRE-INSTALLATION MEETINGS

If requested by the Contractor or Construction Manager, a pre-installation meeting will be held to review conditions of the installation, installation procedures and coordination with related work. This meeting should take place at least seven (7) days in advance of installation or as required in the technical specifications. Meeting is to be attended by all parties involved in the installation.

7.0 SPECIAL MEETINGS

Any time during progress of the Work, the Owner and the Construction Manager shall have the authority to require the Contractor and any subcontractor, suppliers, or service providers to attend job-site conferences on matters which require immediate or special attention. Any notice of such conference shall be duly observed and complied with by the Contractor and subcontractors, suppliers, or service providers without extra cost to Owner.

8.0 POST CONSTRUCTION GUARANTY PERIOD MEETING—NOT USED

***** END OF SECTION *****

SECTION 01308

PROJECT PLAN

1.0 GENERAL

To compliment the Progress Schedule requirements described in Section 01310, **PROGRESS SCHEDULES AND REPORTS**, the Contractor shall develop and submit a Project Plan. The plan shall be used to outline the construction objectives, milestones, general resource requirements and the approach to major activities. The Project Plan shall be the “planning document” that demonstrates the Contractor’s, subcontractors and suppliers commitment to providing adequate resources to meet the Contractual milestones, Substantial Completion and Final Completion.

2.0 PROJECT PLAN REQUIREMENTS

The Project Plan shall be in narrative, tabular and bar chart format and shall include the following information:

- A. Description of the Contractor’s approach to each major structure, process, component, discipline and indirect activities (such as public notifications, environmental compliance and traffic control)
- B. Description of the Contractor’s key interfaces with the Owner and other third parties.
- C. Description of the Contractor’s approach to communication, coordination and planning the Work with each subcontractor, as listed in Section 00430, **DESIGNATION OF SUBCONTRACTORS** and other major suppliers.
- D. Description of long-lead procurement items and their anticipated submittal, fabrication and delivery dates for all equipment listed in Section 00450, **MAJOR EQUIPMENT AND MATERIAL SUPPLIERS**.
- E. Description of the Contractor’s understanding and commitment of the key interim milestones.
- F. Description of the Contractor’s understanding and approach to start-up, testing and training as described in Section 01660, **TESTING AND TRAINING**.
- G. Description of the Contractor’s field construction organization, including management and supervision for the Contractor and subcontractors listed in Section 00430, **DESIGNATION OF SUBCONTRACTORS**.
- H. A table which indicates the type and quantity of trades and craft workers required at each stage of the Project.
- I. A table which indicates the type and quantity of construction equipment required at each stage of the Project.
- J. A description of the Contractor’s overall strategy that demonstrates a planned sequence that lists major dependencies, interfaces, milestone events, testing, training and completion.
- K. A summary bar chart that depicts the Contractor’s overall strategy for achieving the Plan.

3.0 SUBMITTALS

- A. The Contractor shall submit seven (7) copies of the initial Project Plan with the executed Contract documents.

- B. Owner shall review and return comments to the Contractor prior to issuance of the Notice to Proceed.
- C. Contractor shall incorporate Owner's comments and re-submit no later than five (5) days after issuance of the Notice to Proceed.
- D. The Contractor shall prepare and submit monthly updates of the Project Plan. The updated Plan shall address all the items listed in 01308-2.0, **PROJECT PLAN REQUIREMENTS**. The updated Plan shall also provide a description of any impacts or effects to the Work that has occurred.
- E. The monthly updates shall be submitted within ten (10) days of the end of the reporting period and shall include narrative, tables and a summary bar chart.

***** END OF SECTION *****

SECTION 01310

PROGRESS SCHEDULES AND REPORTS

1.0 GENERAL

The Progress Schedule for this Project will also be referred to as the Critical Path Method (CPM) Schedule. A CPM network schedule is a graphical depiction of the Contractor's construction plan, showing the sequential activities necessary to complete the Work within the specified contract times and constraints. The CPM network schedule for this Project shall depict events and tasks as activities, showing their interrelationships, and shall identify the progress required for each activity before subsequent activities can start. Activities shall be logically presented in a network showing the activities' interrelationships chronologically. Because each activity has an assigned duration, the completed network shall show the critical path of activities that must be completed on time to ensure timely project completion. The earliest and latest start and finish times for each activity shall also be shown. The CPM network shall be comprehensive and shall include all interdependencies and interactions required to perform the Work.

The Owner, Construction Manager and/or Design Consultant will regularly analyze the most current progress schedule during construction to monitor progress status of the project relative to contract times and to coordinate work activities. The Schedule Updates and Weekly Schedules will be an agenda item at all project progress meetings as project participants work together in prioritizing their respective tasks and action items to efficiently perform their duties.

Time Impact Analyses will be required as part of the scheduling requirements of this Contract. Time Impact Analyses will be used by the Construction Manager and Owner as they evaluate possible changes to the Contract time and/or viable options to mitigate time impacts.

By submitting a bid for this Project, the Contractor represents to the Owner that the Contractor has included all costs within its Total Bid Price to fully comply with all scheduling and reporting requirements hereinafter prescribed in this Section 01310.

Schedule Format: Utilize critical path method (CPM) format utilizing Precedence Diagramming Method.

Prepare computerized schedules utilizing Primavera Project Planner (P6) scheduling software.

2.0 RESPONSIBLE SCHEDULING PERSON

Within five (5) days after the Notice of Award, the Contractor shall designate, in writing, an authorized representative in its firm who will be responsible for the preparation, revising, and updating of the Construction Schedule. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the construction scheduling requirements set forth herein, and such authority will not be interrupted throughout the duration of the Project. The requirements for the Construction Schedule are included to assure adequate planning and execution of the work and to assist the Construction Manager in appraising the reasonableness of the proposed schedule and evaluating progress of the work.

3.0 CONSTRUCTION SCHEDULE

3.1 Preconstruction Scheduling Meeting and Preparation

The Construction Manager will conduct a Preconstruction Scheduling Meeting with Contractor's Project Manager and Responsible Scheduling Person within five (5) days after the Notice to Proceed date. This meeting is separate from the Preconstruction Conference Meeting and is intended to only cover schedule requirements for this Project. These requirements will include, at a minimum, formatting, color coding, activity detail, coding structure, calendar requirements, reporting requirements, updates, revisions, and schedule delay analysis.

Contractor shall present their schedule methodology, planned sequence of operations and proposed activity coding structure. All Progress Schedules shall be consistent with the Project Plan as required by Section 01308, **PROJECT PLAN**. The coding structure shall, at a minimum, include code fields for Project Segment or Phase, Area of Work, Type of Work, Submittal/Procurement/ Construction and Responsibilities (this would include all subcontractors). The activity code structure shall be sufficient to allow future sorting and/or grouping by responsibility or subcontractor, area/location, CSI division, milestones and change orders. This will allow the "rollup" of the activities in the form of a Summary Schedule.

During preparation of the Preliminary and Baseline Schedules the Construction Manager will be available to answer questions regarding sequencing issues, scheduling constraints, interface points, and dependency relationships.

3.2 Preliminary Progress Schedule

Within five (5) days after receipt of the Notice to Proceed or the Preconstruction Conference, whichever occurs first, the Contractor shall submit a Preliminary Progress Schedule in the form of a time scaled logic diagram and a bar chart which shows the Contractor's intended plan for execution of the Work within the specified Contract times and constraints. The Preliminary Progress Schedule shall be consistent with the Project Plan as required by Section, **01308 PROJECT PLAN**. The Preliminary Progress Schedule shall cover the following project phases and activities:

Procurement and Submittals, including shop drawings and fabrication and delivery of key and long lead time procurement items. The Contractor's submittal information shall show intended submittal dates and shall include, as a minimum, the maximum allowable review period as specified as a separate predecessor activity. The information shall provide sufficient durations for administration, fabrication and transportation to produce realistic delivery dates for the procurement items.

- A. All activities planned for the first ninety (90) days in the execution of the Work.
- B. The approach to scheduling the remaining activities or phases of the Work shall be represented by at least one summary activity for each major phase or activity. The total duration of the summary activities shall equal the Contract Time.
- C. Approximate duration for each summary activity representing the Contractor's best estimate for the work the summary activity represents.
- D. Weather days.

The Contractor shall produce and provide one (1) complete set on 22-inch by 34-inch sheets and two (2) complete sets on 11-inch by 17-inch sheets of each time scaled logic diagram and one electronic copy on a CD with data in the scheduling program format.

The Preliminary Progress Schedule shall describe the activities to be accomplished and their dependency subject to all requirements under these Construction Schedule provisions, as appropriate. The Preliminary Progress Schedule will be used temporarily to record and monitor the progress of the Work until the Baseline Schedule, specified hereinafter, has been completely developed and favorably reviewed. Recorded data on the Preliminary Progress Schedule shall be incorporated into the Baseline Schedule during the first schedule update.

The Construction Manager shall review the Preliminary Progress Schedule and provide any comments, provide favorable review of the Preliminary Progress Schedule, or request a meeting to review the Preliminary Progress Schedule with the Contractor within ten (10) days of receipt of the schedule. If requested, the Contractor shall participate in a review and evaluation of the schedule with the Construction Manager. Any revisions necessary as a result of this review shall be resubmitted for review by the Construction Manager within five (5) days.

The Contractor shall update the Preliminary Progress Schedule as required by the Construction Manager until the Baseline Schedule, specified hereinafter, has been favorably reviewed.

3.3 **Baseline Schedule**

The Contractor shall submit a conforming Critical Path Method (CPM) Baseline Schedule to the Construction Manager within thirty-five (35) days after the receipt of the Notice to Proceed for all Work of the Project. The Baseline Schedule shall be consistent with the Project Plan as required by Section 01308, **PROJECT PLAN**. Subsequent revisions to the Baseline Schedule shall be submitted as set forth hereinafter.

The Contractor shall produce and provide one (1) complete set on 22-inch by 34-inch sheets and two (2) complete sets on 11-inch by 17-inch sheets each of time-scaled network logic diagrams and bar charts in color and one electronic copy on a CD with data in P3 format. The network logic diagram shall be clear and legible. Critical activities shall be indicated in red color on both schedules.

The Contractor shall include with the Baseline Schedule Submittal a signed statement from each Subcontractor listed on the Contractor's Bid Form Section 00430, **DESIGNATION OF SUBCONTRACTORS** which confirms they have evaluated the Contractor's Baseline Schedule and agree that the Baseline Schedule accurately depicts the quantity, logic and durations for all activities assigned to their company.

The Construction Manager shall review the schedule and provide any comments, its favorable review of the schedule, or request a meeting to review the schedule with the Contractor within twenty (20) days of receipt of the schedule. If requested, the Contractor shall participate in a review and evaluation of the proposed network diagrams and analysis by the Construction Manager. Any revisions necessary as a result of this review shall be resubmitted for review by the Construction Manager within ten (10) days. When completed, the favorably reviewed schedule shall then be the schedule to be used by the Contractor for planning, organizing, and directing the work, and for reporting progress. If the Contractor thereafter desires to make significant changes in its method of

operating and scheduling, the Contractor shall notify the Construction Manager in writing stating the reasons for the change.

Failure to include an activity required for execution of the Work does not excuse the Contractor from completing the Work and portions thereof within specified contract times and contract price. Failure of the Contractor to include required schedule constraints, sequences or milestones in schedule shall not relieve the Contractor of the obligation to conform to the requirements of the Contract. The favorable review of the schedule shall not waive the Contract requirements. In event of conflict between the accepted schedule and the Contract requirements, terms of the Contract shall govern at all times, unless requirements are waived in writing by the Owner.

Contractor shall not unilaterally change the favorably reviewed Baseline Schedule without the prior written notification to and acceptance and consent of the Construction Manager, excepting only the reporting of Actual Start, Actual Finish, and Activity Progress. The accepted Baseline Schedule shall be used for comparison with the current updated schedule, and possible revised schedules, during the Contract.

3.3.2 Baseline Schedule Requirements - The Contractor's proposed Baseline Schedule and all updates or revisions thereto, shall meet the following requirements:

- A. Schedule and Project Completion- The Schedule shall indicate completion of the Project at the Contract completion date and shall incorporate the entire Project duration. As provided for in Section 00700-6.2, **Contract Time**, the Contractor is required to base their bid and the construction schedule on the entire Contract Time and include its field and home office overhead costs in the bid for the entire Contract Time as defined in Section 00800-1.1, **Time Allowed for Completion**.
- B. Critical Path – The critical path is defined as the longest continuous path of activities in a network logic diagram with the least amount of float. Critical path activities are defined only as those activities included in the previously defined critical path. The Contractor's inclusion of other activity(ies) on the critical path based on the selection of an arbitrary number of days of float is not allowed.
- C. Schedule Logic- Schedule shall be assembled to show order in which Contractor proposes to carry out Work, indicate restrictions of access, availability of Work areas, and availability and use of manpower, materials and equipment. The Contractor shall indicate all dependencies and logic between activities so that it may be established what effect the progress of any one activity has on the schedule. The following criteria shall form basis for assembly of schedule logic.
 - 1. Which activities must be completed before subsequent activities can be started?
 - 2. Which activities can be performed concurrently?
 - 3. Which activities must be started immediately following completed activities?
 - 4. What major facility, equipment or manpower restrictions are required for sequencing these activities?

The schedule shall not incorporate resource loading and leveling. The Contractor shall provide hard coded logic constraints as necessary to incorporate any resource requirements that may be applicable to the Project construction. The Contractor shall determine and allocate the proper resources to complete the Project by the specified Contract completion date.

D. Network Activities - The selection and number of detailed network activities shall be subject to favorable review by the Construction Manager and shall meet the following requirements:

1. All Work activities should be of sufficient detail to ensure adequate planning and execution of the Work, consistent with the Project Plan and such that schedules provide an appropriate basis for monitoring and evaluating the progress of the Work. A work activity is defined as a single task that requires time and resources (manpower, equipment and/or material) to complete in a continuous operation, excluding submittal activities, review/acceptance activities, and fabrication/procurement activities. Durations for on-site work activities shall be in working days and shall not exceed ten (10) workdays. Passive on-site activities such as curing and testing periods can be in calendar days if desired by Contractor. All such passive on-site activities shall be included in the Contractor's schedule and durations should be as specified in the Contract Documents. To accommodate tracking of the progress of work and review of the schedule updates, the Contractor shall provide detailed information to support the proposed breakdown of work activities, e.g. concrete pour schedules, pipeline stationing, etc.
2. The submittal and approval of samples and equipment, fabrication of special material and equipment and their installation and testing. Should the Contractor expect multiple submittals and deliveries for materials or equipment from the same supplier, the Contractor shall show each planned submittal and delivery and the logic to the respective on-site Work activity(s).
3. The critical path shall be shown on all reports and on the graphic network logic diagram. The activities which constitute the critical path shall be identified.
4. Progress milestone events or other significant stages of completion, as defined in Section 00800-1.1, **Time Allowed for Completion**, and Section 01010-2.0, **WORK SEQUENCE AND CONSTRAINTS**. System shutdown and tie-in dates must be specifically and conspicuously identified and included on the schedule.
5. The lead time required for testing, inspection and other procedures required prior to acceptance of the work. All witnessed factory tests shall be shown as individual activities.
6. The activity numbers shall be grouped by responsibility, phases, milestones, work area, trade and subcontractor to provide logical summary activities.
7. All activities of the Owner and the Construction Manager that affect progress along with required contract dates for completion of all parts of the work.
8. All activities of utilities, regulatory agencies and permitting agencies.
9. All mobilization and demobilization activities, including temporary controls.
10. Schedule shall show all hydraulic testing of structures, pipe testing, field testing, training and demonstration periods as required. Field testing and training activities should be broken down to reflect all individual system and equipment components.
11. Float shall not be an activity unless approved by the Construction Manager.

E. Network Logic Diagram - The graphic network diagram shall include for each activity, the description, activity number, the estimated duration in workdays, and all activity relationship lines. The network diagram shall be drawn for the early start and early finish of all activities. The diagrams shall show elements of the project in detail and an entire project summary. Diagrams shall show the order and interdependence of all activities and sequence in which the work is to be accomplished as planned by the Contractor and its subcontractors. The basic concept of a network analysis diagram shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts

the start of following activities. The layout of the network logic diagrams shall be time-scaled and show the following as a minimum:

1. Activity numbers and description
2. Activity duration and total float
3. Critical path, highlighted in red color
4. Relationships between activities and lag times, if any
5. Start, completion and milestone dates

F. Bar Chart- The layout of the bar chart shall show the following as a minimum:

1. Activity numbers and description
2. Early-start-early-finish, duration and total float time of activities
3. Critical path, highlighted in red color
4. Percent complete on bar, highlighted in blue color
5. Relationships between activities and lag times, if any
6. Start, completion and milestone dates

The layout of the columns, printed on the left-hand side of the bar chart, shall include the following as a minimum:

1. Activity ID Number
2. Activity Description
3. Original Duration
4. Remaining Duration
5. Early Start, Early Finish, Late Start and Late Finish dates
6. Percent Complete
7. Current Total Float
8. Change in Total Float since previous update.

G. Float – “Total Float” or “Float” shall be defined as the difference between the early finish and late finish dates for an activity. On the CPM Schedule delineate the specified Contract duration and identify the planned completion of the Work as the final finish milestone. The time-period between these two dates, if any, shall be considered float. Float in any activity, milestone completion date or Contract completion date shall be considered a resource available to both the Owner and the Contractor. Neither the Owner nor the Contractor has ownership of the float.

The parties agree that float, as properly shown on the Baseline Schedule and all updates thereto, is not for the exclusive benefit of either party. Consequently, either party may, without liability to the other for actual or liquidated damages for delay, delay a schedule activity provided that such delay shall not cause the Total Project Float to become negative and extend the Project completion date.

If the Contractor’s schedule is based on less time than the maximum time allowed for milestone(s) or Contract completion no compensation for extended overhead expenses will

be considered until the expiration of the entire time periods provided for in the Contract as adjusted by any time extensions granted other than compensable time extensions. In such case refer to Section 00700-6.4.3, **Indirect Overhead**, for further provisions on the reimbursement of overhead expenses.

Acceptance of the Contractor's Baseline Schedule, monthly updates or revised schedule, when based on less time than the maximum time allowed for milestone(s) or Contract completion does not serve to change any Contract duration, nor serve as a waiver of the Contractor's nor the Owner's right to utilize the full amount of time specified in the Contract, unless so modified in a Contract Change Order.

If the Project has interim milestones with separate liquidated damages, only compensable delays by the Owner to the Project Critical Path shall potentially entitle the Contractor to extended overhead costs subject to the limitations of Section 00700-6.4 et seq.

Pursuant to these float sharing requirements, use of float suppression techniques such as preferential sequencing or logic, special lead or lag logic restraints, extended activity duration's or imposed dates shall be cause for rejection of any schedule submittal.

- H. Owner-furnished Equipment or Materials (if applicable)- Immediately after Award of Contract, Contractor shall obtain from Construction Manager anticipated delivery dates of Owner furnished equipment or materials if they are not already specified in the Contract Documents. These dates shall be shown on Baseline Construction Schedule in same manner indicated by Construction Manager.
- I. Baseline Tabular Reports - The Baseline Schedule submission shall include two (2) copies of the following tabular reports:
 - (1) Tabular Reports
 - a. Activity Report: Sort report by Activity ID
 - b. Total Float Report: Sort report by Total Float, Early Start, Activity ID

The following information shall be furnished as a minimum for each activity;

- c. activity description and number
- d. estimated duration of activities
- e. earliest start date (by calendar date)
- f. earliest finish date (by calendar date)
- g. latest start date (by calendar date)
- h. latest finish date (by calendar date)
- i. float
- j. percentage of activity completed.
- k. percentage of activity completed

(2) Tabular Report – Predecessor/Successor Report: The report shall include the same information listed above plus the additional information listed below. This report shall be sorted by Activity ID.

- a. Preceding and succeeding activities
- b. Activity constraints

The schedule reports shall include a Project calendar in workdays indicating all non-working periods and an Activity Code dictionary which identifies all code values and code titles used.

4.0 WEATHER CONDITIONS AND WEATHER DAY ALLOWANCE

Weather conditions shall be considered in the planning and scheduling of work activity durations influenced by high or low ambient temperatures or precipitation to ensure the completion of the Work within the Contract Time. No time extensions will be granted for the Contractor's failure to take into account such weather conditions for the location of the Work and for the period of time in which the Work is to be accomplished.

The expected loss of working days specified in the Supplementary General Conditions, Section 00800-1.3, **Weather Days**, shall be included in a separate identifiable critical activity labeled "Weather Days Allowance" to be included as the last critical activity of the Project schedule or milestone activity. When weather days are experienced, notice is to be provided by the Contractor in accordance with Section 00700-6.3.1, **Notice of Delays**. When weather days are approved as such by the Construction Manager, the Contractor shall either:

- A. Increase the duration of the current critical activity(ies) by the number of weather days experienced, or
- B. Add a critical activity to the schedule to reflect the occurrence of the weather day(s).

The duration of the weather day allowance activity shall be reduced as weather days are experienced and included in the schedule. Any remaining weather days in the weather day allowance activity at the completion of the project shall be considered as float and shall not be for the exclusive use or benefit of either the Owner or Contractor.

5.0 SCHEDULE UPDATES

5.1 General

The Contractor shall update the Baseline Schedule on a monthly basis for the purpose of recording and monitoring the progress of the Work. Each monthly report shall cover a period of approximately thirty (30) days. The monthly reports shall be submitted within ten (10) days of the end of the reporting period. The monthly updates shall be consistent with and submitted concurrent with the updated Project Plan as required in Section 01308, **PROJECT PLAN**. The end of the reporting period shall be as agreed upon by the Construction Manager and the Contractor. The Updated Baseline Schedule shall incorporate changes mutually agreed upon by Contractor and Construction Manager during preceding periodic reviews and changes resulting from approved Change Orders and Field Orders.

The Activity Numbers, Descriptions and Original Durations in the original submittal shall not be changed in the future submittals. New Activity Numbers and Descriptions may be added and Activity Numbers and Descriptions may be eliminated if the work intended to be included in the Activity has never been performed and is eliminated at a future date.

The Contractor shall produce and provide two (2) complete sets each of time-scaled network logic diagrams and bar charts in color on 11-inch by 17-inch sheets and one electronic copy on a CD with data in the scheduling program format. The network logic diagram shall be clear and legible. Critical activities shall be indicated in red color on both schedules.

- A. Tabular Reports- Each Updated and Revised Schedule shall include a separate report that provides a comparative analysis between the updated or revised schedule and the previously accepted schedule submitted to the Construction Manager. This report shall be provided in both electronic and hard copy form and shall include the following information:
1. List of all Activities deleted since last schedule update.
 2. List of all Activities added since last schedule update.
 3. List of all Activities with any changes in original duration since last schedule update.
 4. List of all changes in percent completes for each activity since last schedule update.
 5. List of all Activities who should have began since last schedule update and did not.
 6. List of all Activities that should have completed since last schedule update and did not.
 7. List of all changes in activity Total Floats since last schedule update.
 8. List of all changes in activity Free Floats since last schedule update.
 9. List of any activity description or number changes since last schedule update.
 10. List of all activity relationship changes, additions or deletions since last schedule update.
 11. List of all changes to any schedule constraints since last schedule update.
- B. Narrative - This report should also include a narrative. The narrative shall show the activities or portions of activities completed during the reporting period. The report shall state the percentage of the work actually completed and scheduled, the remaining duration, and the progress along the Critical Path in terms of days ahead or behind the allowable dates as of the report date. Any changes made by the Contractor to the Baseline Schedule or prior schedule updates, including activity numbers and activity descriptions, shall be listed in a detailed report which describes the reason for each change. The narrative shall also include a report on any current or anticipated problems affecting the progress of Work, impact of these problems and the measures taken to mitigate impact.

5.2 Delayed Schedule Updates

If, in the opinion of the Construction Manager, the project is behind schedule, the monthly report shall include a revised network logic diagram and/or tabular reports showing the Contractor's proposed revised schedule. The schedule shall be revised under the conditions defined in Section 01310-5.4, **Schedule Revisions**. An analysis of the effect that the delay has on progress along other paths shall also be included in the report. The Contractor shall also submit a narrative report with each updated analysis which shall include but not be limited to, a description of current and anticipated problem areas, delaying factors and their impact, and an explanation of corrective actions taken or proposed.

5.3 **Schedule Review**

Once each month, on a date mutually agreed upon, but no later than ten (10) days after the submittal of the monthly update specified herein, a jobsite meeting will be held to review the schedule, job progress and the monthly update, or the Construction Manager will provide written comments on the monthly update.

5.4 **Schedule Revisions**

The conditions under which the Construction Manager may require revisions of the Construction Schedule include the following:

- A. When delay in completion of any work item or sequence of work item results in an estimated extension of project completion by either fifteen (15) working days or by five percent (5%) of the remaining duration of time to complete the Contract, whichever is less. This slippage duration may be reduced further for any contract time that is a critical fixed completion date which must be met.
- B. When delays in submittals or deliveries make re-planning or re-scheduling of the work necessary.
- C. When the schedule does not represent actual prosecution and progress of the work.
- D. When any change to the sequence of activities, the completion date for major portions of the work, or changes occur which affect the critical path.
- E. When Contract modification necessitates schedule revision.

6.0 **TIME IMPACT ANALYSIS**

When change orders are initiated, delays are experienced, or the Contractor desires to revise the schedule logic, the Contractor shall submit to the Construction Manager a written Time Impact Analysis illustrating the influence of each change, delay, or Contractor request on the current contract schedule completion date.

6.1. **CPM Schedule - Analysis**

- A. Each Time Impact Analysis shall include a fragmentary network analysis demonstrating how the Contractor proposes to incorporate the change order, delay, or Contractor request into the CPM Schedule.
- B. The analysis shall demonstrate the time impact based on the date of occurrence of the change, delay or revision; the status of construction at that point in time; and the event time computation of all affected activities.
- C. The event times used in the analysis shall be those included in the latest updated copy of the CPM Schedule encompassing both the actual start and actual finish of the event activity or as adjusted by mutual agreement between the Construction Manager and Contractor.

6.2 Delays/Time Extensions

Activity time delays will not automatically mean that an extension of Contract Time is warranted or due the Contractor.

- A. It is possible that an excusable delay or contract modification will not affect existing critical activities or cause noncritical activities to become critical, i.e., a delay or modification may result in only absorbing a part of the available total float that may exist within an activity chain of the network, thereby not causing any effect on the Contract completion date or time.
- B. The Contractor acknowledges and agrees that mitigation for delays due to changes, differing site conditions, and other causes will require revision of preferential sequences of the Work. Accordingly, to mitigate delays, the activities shall be re-sequenced prior to the Contractor proposing an updated schedule which supports a delay to the Project as a whole. When a delay to the Project as a whole can be avoided by revising preferential sequencing, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension but is not entitled to compensation for indirect overhead for this extended duration.
- C. Actual delays in activities which do not affect the critical path work or which do not move the Contractor's planned completion date beyond a milestone or the Contract completion date will not be the basis for an adjustment to the Contract Time.
- D. Extensions of time can be granted for a delayed or impacted activity only for the duration of the time adjustment which exceeds the total float for the schedule path wherein the activity is located. The adjustment is only applicable during the time the delay occurred or when the change is ordered.

6.3 Time Impact Submittal and Review

Time Impact Analyses shall be submitted in triplicate and within fifteen (15) days after a delay occurs or with the Contractor's cost proposal in response to a notice of change from the Construction Manager. In cases where the Contractor does not submit a Time Impact Analysis for a specific change order, delay, or Contractor request within the specified period of time, then it is mutually agreed that the particular change order, delay, or Contractor request has no time impact on the Contract completion date and no time extension is required.

- A. Approval or rejection of Time Impact Analyses by the Construction Manager and the Owner will be made within fifteen (15) days after receipt of the Time Impact Analysis unless subsequent meetings and negotiations are necessary.
- B. Upon approval, a copy of the Time Impact Analysis signed by the Construction Manager and Owner will be returned to the Contractor.
- C. Upon mutual agreement by both parties, schedule revisions illustrating the influence of change orders, delays, and/or Contractor requests will be incorporated into the next schedule update.

7.0 WEEKLY SCHEDULE

Submit to the Construction Manager at the Weekly Progress Meetings, a progress schedule showing the activities completed during the previous week and the Contractor's schedule of activities for the following three (3) weeks.

The Weekly Schedule may be a CPM schedule or a bar chart but shall utilize the logic and conform to the status of the current progress schedule. In the event that the Weekly Schedule no longer conforms to the current schedule, the Contractor may be required to revise the schedule in accordance with Section 01310-5.4, **Schedule Revisions**.

The activity designations used in the Weekly Schedule shall be consistent with those used in the Baseline Schedule and the monthly Schedule Updates.

The format of the Weekly Schedule shall be as agreed upon between the Contractor and the Construction Manager.

8.0 FINAL SCHEDULE SUBMITTAL

As a condition precedent to the release of retainage the final Schedule Update shall be identified by the Contractor as the As-Built Schedule.

The As-Built Schedule shall reflect the manner in which the project was constructed by reflecting actual start and completion dates for all activities accomplished on the project.

The As-Built Schedule shall be signed and certified by the Contractor's Project Manager and Responsible Scheduler as being an accurate record of the way in which the project was actually constructed.

***** END OF SECTION *****

SECTION 01322

WEB BASED DOCUMENT CONTROL

1.0 WEB DATABASE

1.1 Summary

The project team will use and maintain a web-based database as the primary means of communication related to the Project's correspondence, submittals, requests for information (RFIs), advisory notices, and non-compliance issues. Correspondence from the CONTRACTOR shall be sent to the CONSTRUCTION MANAGER via the PROCORE System.

The CONSTRUCTION MANAGER and CONTRACTOR shall utilize PROCORE's system for electronic submittal of all data and documents (unless specified otherwise by the CONSTRUCTION MANAGER) throughout the duration of the Contract. PROCORE is a web-based electronic media site that is hosted by PROCORE LLC utilizing their PROCORE web solution. PROCORE will be made available to all CONTRACTOR's project personnel. The joint use of this system is to facilitate; electronic exchange of information, automation of key processes, and overall management of the Contract. PROCORE shall be the primary means of project information submission and management. When required by the CONSTRUCTION MANAGER, paper documents will also be required. In the event of discrepancy between the electronic version and paper documents, the paper documents will govern. PROCORE is a registered trademarks of PROCORE LLC.

1.2 User Access Limitations

The CONSTRUCTION MANAGER will control the CONTRACTOR's access to PROCORE by allowing access and assigning user profiles to accepted CONTRACTOR personnel. User profiles will define levels of access into the system; determine assigned function-based authorizations (determines what can be seen) and user privileges (determines what they can do).

1.3 Automated System Notification and Audit Log Tracking

Review comments made (or lack thereof) by the CONSTRUCTION MANAGER and ENGINEER on CONTRACTOR submitted documentation shall not relieve the CONTRACTOR from compliance with requirements of the Contract Documents. The CONTRACTOR is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. The CONSTRUCTION MANAGER's acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the CONTRACTOR's submitted information.

1.4 Contractor Responsibility

The CONTRACTOR shall be responsible for the validity of their information placed in PROCORE and for the abilities of their personnel. Accepted users shall be knowledgeable in the use of computers, including Internet Browsers, email programs, CAD drawing applications, and Adobe Portable Document Format (PDF) document distribution program. Adobe PDF documents will be created through electronic conversion rather than optically scanned whenever possible. The CONTRACTOR is

responsible for the training of their personnel in the use of PROCORE (outside what is provided by the CONSTRUCTION MANAGER) and the other programs indicated above as needed.

1.5 User Access Administration

Provide a list of CONTRACTOR's key PROCORE personnel for the CONSTRUCTION MANAGER's acceptance. The CONSTRUCTION MANAGER is responsible for adding and removing users from the system. The CONSTRUCTION MANAGER reserves the right to perform a security check on all potential users.

1.6 Connectivity Problems

PROCORE is a web-based environment and therefore subject to the inherent speed and connectivity problems of the Internet. The CONTRACTOR is responsible for its own connectivity to the Internet. PROCORE response time is dependent on the CONTRACTOR's equipment, including processor speed, Internet access speed, etc. and current traffic on the Internet. The OWNER and CONSTRUCTION MANAGER will not be liable for any delays associated from the usage of PROCORE including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information. The CONTRACTOR will ensure that its connectivity to the PROCORE system (whether at the home office or job site) is accomplished through some form of high-speed communications with 128 kb/s as the minimum bandwidth requirements for using the system. It is recommended a faster connection be used when uploading pictures and files into the system. Under no circumstances shall the usage of PROCORE be grounds for a time extension or cost adjustment to the Contract. If there are problems that persist with the PROCORE site for more than 24 consecutive hours that prevent the electronic submission of data by the CONTRACTOR, the CONTRACTOR may submit documents in paper form to the CONSTRUCTION MANAGER until such time that the CONSTRUCTION MANAGER notifies the CONTRACTOR that the PROCORE site is operable and available for use. Construction Manager shall likewise send documents to Contractor in paper form during such disruption of the Procore system.

1.7 Training

The CONSTRUCTION MANAGER has arranged for the following training to be provided to the CONTRACTOR. The CONSTRUCTION MANAGER will provide a one-hour training class to the CONTRACTOR within ten (10) days of NTP at a time mutually agreeable to CONTRACTOR and CONSTRUCTION MANAGER. Thereafter the CONSTRUCTION MANAGER will provide up to one hour of additional training via telephone during the project per month of the project life.

2.0 EQUIPMENT

2.1 Summary

In order to process correspondence, submittals, and RFIs, the CONTRACTOR must provide and have in place for its own use the required basic components outlined below.

2.2 Hardware

A computer with internet access and sufficient capabilities to perform all project duties; a scanner at least large enough to scan 11" x 17" sheets with sufficient resolution to maintain clarity and legibility

of the document at its native size; and a color printer of sufficient size and capacity to accept incoming correspondence as described in this section.

2.3 Software

- A. Adobe Acrobat 9 or higher; Microsoft's Internet Explorer v7 or higher; Microsoft Office 2003 or higher, including but not limited to Microsoft Word and Microsoft Excel.
- B. PROCORE currently supports Mozilla's Firefox v3.5 and newer, Apple's Safari v4 and newer, Google Chrome, and Microsoft's Internet Explorer v7 and v8 web browsers for accessing the application. Certain functions may not be available when using any program other than the newest version of Microsoft's Internet Explorer.

2.4 Facilities

The CONTRACTOR shall make its own arrangements to provide high-speed (minimum speed: download 1Mbps/upload 256Kbps) internet connection for its own use as soon as practicable.

3.0 EXECUTION

3.1 Summary

Items to be uploaded to PROCORE by the CONSTRUCTION MANAGER include but are not limited to: RFI responses, Submittal comments, Clarification letters, Design Clarifications, Field Orders, et al. These items will be emailed as attachments in PDF file format. These attachments may include files that need to be viewed and/or printed in color. Formal letters, stop notices, Field Orders, Progress Payment Requests, and Contract Change Orders will always include a wet-signed hard copy.

3.2 Procure Utilization

All project related correspondence (RFIs, submittals, etc.) originated by the CONTRACTOR or Subcontractor, Supplier, et al. shall be directed to the CONSTRUCTION MANAGER, unless otherwise indicated in the Specifications.

3.3 Submittals

- A. The use of the electronic communication does not waive the requirement for the provision of hard copies of all formal correspondence and submittals. The hard copies of all documents must match the electronic copies of all correspondence and submittals.
- B. Submittals shall be in accordance with Section 01330. The provisions of Section 01330 shall apply both to electronic copies and hard copies of submittals.
- C. In addition to above, PROCORE shall be utilized in connection with submittal preparation and information management required by but not limited to Sections:
 - 1. Section 01035 - Modification Procedures.
 - 2. Section 01310 - Progress Schedules.
 - 3. Section 01340 - Submittal Procedures.

4. Section 01720 - Record Documents.
 5. Section 01730 – Operations and Maintenance Data
- D. PROCORE will be utilized by all other Sections not listed above and as required by the CONSTRUCTION MANAGER.
- E. If a submittal package has multiple items that are not directly related, each item shall be considered a separate submittal and shall be sent separately. For example, “Concrete Mix Design,” and “Concrete Curing Compound” shall be submitted as separate items to the CONSTRUCTION MANAGER.

3.4 **Termination in Use**

The OWNER may request a termination of the use of PROCORE for the electronic submission of data, and alternatively the use of paper documents submitted in accordance with the Contract Documents by providing notification in writing with ten (10) days notice that it intends to discontinue use of PROCORE.

3.5 **Adobe PDF**

- A. All information, comments, questions, and statements shall be scanned and/or converted to the PDF file format and attached to the email. Items to be sent via email include but are not limited to large-format plan sheets (22” x 34” or larger), small-format plan sheets, pages within tabbed binders, RFIs, transmittal sheets, et al. The PDF attachments supplied to the CONSTRUCTION MANAGER shall be in a sufficient resolution to be fully legible at its native size.
- B. All separate files within a given piece of correspondence shall be combined into a single PDF document (i.e., An RFI that contains a text file and two photo files shall be combined into a single PDF document prior to delivery to the CONSTRUCTION MANAGER.)

3.6 **Labeling Format**

- A. The subject line of each email, and the file name of any attached files shall begin with the file labeling scheme:
1. RFI_XXX.Y_(CONTRACTOR Name)_(Subject).
 2. Letter_XXX_(CONTRACTOR Name)_(Subject).
 3. Transmittal_XXX_(CONTRACTOR Name)_(Subject).
 4. PCO_XXX.Y_(CONTRACTOR Name)_(Subject).
 5. Submittal_XXXXX-YY-Z_(CONTRACTOR Name)_(Subject).
- B. The first section of the label indicates the type of correspondence (i.e RFI). “XXX” indicates a unique number, sequentially assigned for the given piece of correspondence. “Y” is a sequential letter assigned for revised or resubmitted documents, i.e. A, B, or C being the 1st, 2nd, and 3rd revision or resubmittal, respectively. “(CONTRACTOR Name)” indicates to the database that the correspondence is from the CONTRACTOR. The CONTRACTOR will indicate the subject at the end of the numbering scheme. For submittals, XXXXX denotes the Specification Number, YY denotes the sequential number of submittals in that Specification Section, and “ZZ” indicates whether the submittal is an original or a resubmittal, as described

in Specification Section 01340.4.1. Each piece of correspondence shall be sent in a separate email.

3.7 **Original Documents**

Where possible, the CONTRACTOR will obtain the electronic document from its original source to maintain the integrity, legibility, and searchability of the document.

3.8 **Organization**

The information included in the attachments shall be organized in a logical and thoughtful manner. Where the information originated in a tabbed format (a binder, for example), the scanned and/or converted PDF file shall be electronically bookmarked accordingly using the “bookmark” function of Adobe Acrobat 9 Std.

3.9 **Printing**

Except where otherwise indicated, the CONTRACTOR will receive no hard copies of the above outlined correspondence. The CONTRACTOR will be required to print for its use, in color if necessary, any record copies, field copies, sub-CONTRACTOR copies, etc., if such copies are desired.

3.10 **Project Forms**

The CONTRACTOR may use its own correspondence forms to be attached to correspondence emails as long as the CONTRACTOR’s forms comply with this and all submittal sections.

*****END OF SECTION****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

1.0 SUBMITTALS

1.1 General

Where the Contractor is required by these Specifications to make submittals, they shall be made to the Construction Manager with a letter of transmittal and in accordance with the requirements of this section.

Unless specified otherwise in the Contract Documents, electronic submission of submittals is required. See Section 01322 **WEB BASED DOCUMENT CONTROL** for details of the web based document management system. Upon request, or when electronic files are not practical, the Contractor shall provide a sufficient number of copies to allow three (3) copies to be retained by the Construction Manager of the following items:

- Contractor's Representative
- Cost Breakdown
- Safety Program with Designated "Competent Person(s)"
- Construction Schedules
- Substitutions
- Shop Drawings, Product Data, and Samples
- Material Safety Data Sheets
- Operation and Maintenance Manuals
- Working Drawings
- Warranty Data
- Others as Specified in the Technical Specifications

Upon completion of review, any hard copies provided will be retained by the Construction Manager. It shall be the Contractor's responsibility to copy and/or conform reviewed submittals in sufficient numbers for its files, subcontractors, and vendors.

1.1.1 General Submittal Instructions

- A. Provide submittals that are specified or reasonably required for construction, operation, and maintenance of the Work.
- B. Provide submittal information from only 1 manufacturer for a specified product. Submittals with multiple manufacturers for 1 product will be rejected without review.
- C. Where multiple submittals are required, provide a separate submittal for each specification section.
 - 1. In order to expedite construction, the Contractor may make more than 1 submittal per specification section, but a single submittal may not cover more than 1 specification section.
 - 2. The only exception to this requirement is when 1 specification section covers the requirements for a component of equipment specified in another section.

- D. For example, circuit breakers are a component of switchgear. The switchgear submittal must also contain data for the associated circuit breakers, even though they are covered in a different specification section.
- E. Edit all submittals so that the submittal specifically applies to only the equipment furnished. Neatly cross out all extraneous text, options, models, etc. that do not apply to the equipment being furnished, so that the information remaining is only applicable to the equipment being furnished.
- F. Prepare submittals in the English language. Do not include information in other languages.
- G. Present measurements in customary American units (feet, inches, pounds, etc.).
- H. Show dimensions, construction details, wiring diagrams, controls, manufacturers, catalog numbers, and all other pertinent details.
- I. Indicate project designated equipment tag numbers from P&IDs for submittal of devices, equipment, and assemblies.
- J. Hardcopy submittals, if required:
 - 1. Must be clear and legible, and of sufficient size for presentation of information.
 - a. Minimum page size will be 8 1/2 inches by 11 inches.
 - b. Maximum page size will be 11 inches by 17 inches.
- K. Submittals in electronic media format:

All information, comments, questions and statements shall be scanned and/or converted to the PDF file format and attached to the web-based database system. Items to be sent via the system include but are not limited to large-format plan sheets (22" x 34" or larger), small-format plan sheets, pages within tabbed binders, transmittal sheets, et al. The PDF attachments shall be in a sufficient resolution to be fully legible at its native size.

- L. Submittal Organization
 - 1. Fully indexed with a tabbed divider for every component.
 - 2. Sequentially number pages within the tabbed sections.
 - 3. Organize submittals in exactly the same order as the items are referenced, listed, and/or organized in the specification section.
 - 4. For submittals that cover multiple devices used in different areas under the same specification section, the submittal for the individual devices must list the area where the device is used.
 - 5. All electronic format submittals with multiple separate files shall be combined into a single PDF document.

1.2 **Contractor's Responsibilities**

The Contractor shall submit, at its own expense, submittals and details of structural and reinforcing steel, equipment, material, electrical controls, architectural fabrications, pipe, pipe joints, special pipe sections, and any other appurtenances as required in technical specifications.

All submittals and supporting data, catalogs, schedules, etc., shall be submitted as the instruments of the Contractor, who shall be responsible for their accuracy and completeness and coordination. Such responsibility shall not be delegated in whole or part to subcontractors or suppliers. These submittals may be prepared by the Contractor, subcontractors, or suppliers, but the Contractor shall ascertain that submittals meet all of the requirements of the Contract Documents, while conforming to structural, space, and access conditions at the point of installation. Designation of work "by others," if shown in submittals, shall mean that the work will be the responsibility of the Contractor rather than the subcontractor or supplier who prepared the submittals. The Contractor shall insure that there is no conflict with other submittals and notify the Construction Manager in each case where its submittal may affect the work of another contractor or the Owner. The Contractor shall insure coordination of submittals among the related crafts and subcontractors. The Contractor accepts the responsibility and expense for additional costs and delays which may result from Work performed without favorably reviewed submittals.

Submittals shall be prepared in such form that data can be identified with the applicable Specification paragraph. The data shall clearly demonstrate compliance with the Contract Plans and Specifications and shall relate to the specific equipment to be furnished. Where manufacturer's standard drawings are employed, they shall be marked clearly to show what portion of the data is applicable to this project.

2.0 MATERIAL AND EQUIPMENT SUBSTITUTIONS

2.1 General

In preparing these Specifications, the Design Consultant has named those products, which to its knowledge meet the Specifications and are equivalent in construction, functional efficiency, and durability.

Wherever catalog numbers and specific brands or trade names preceded by "similar and equal" or followed by the designation "or equal" are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Specifications, they are used to establish the standards of quality and utility required.

The first-named manufacturer is the basis for the project design and the use of alternative-named or unnamed manufacturer's products proposed by the Contractor may require modifications in the project design and construction. Where only one product has been named by brand, it is the only brand, trade name, or manufactured product known to the Design Consultant that meets these Specifications.

2.2 Substitutions

2.2.1 General - Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered "requests for substitutions." The following are not considered substitutions:

1. Revisions to Contract Documents requested by the Owner.
2. Specified options of products and construction methods included in Contract Documents.

3. Compliance with governing regulations and orders issued by governing authorities.

2.2.2 Submittal - Requests for substitution will be considered if received within 35 days from the date of Award, or within 15 days from the date the Notice to Proceed is issued, whichever is the later. Requests received after this period may be accepted or rejected at the discretion of the Owner.

Each request for substitution shall be prepared and presented to the Owner in accordance with the procedures for submittals, except that the following additional information shall be provided.

1. An explanation of the advantages to the Owner for accepting the substitution.
2. A comparison of significant qualities of the proposed substitution with those specified.
3. A list of changes or modifications needed to other parts of the work and to construction performed by the Owner and separate Contractors that will be necessary to accommodate the proposed substitution.
4. A statement indicating the substitution's effect on the Construction Schedule compared to the Construction Schedule without acceptance of the substitution. Indicate the effect of the proposed substitution on overall contract time.
5. Cost information, including a proposal of the net change, if any, in the Contract Sum.
6. Certification that the substitution is equal to or better in every respect to that required by Contract Documents, and that it will perform adequately in application indicated. Include Contractor's waiver of rights to additional payment or time extensions that may be necessary because of the substitution's failure to perform adequately.

2.2.3 Substitution Conditions - The Contractor's substitution request will be considered by the Owner when the following conditions are satisfied, as determined by the Owner; otherwise, requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of Contract Documents.
3. The request is timely, fully documented and properly submitted.

The specified product or method of construction cannot be provided within the Contract Time. The request may not be considered if the product or method cannot be provided as a result of failure of the Contractor to pursue the work promptly or coordinate activities properly, unless the product proposed is at least equal or better.

A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate contractors, and similar considerations.

The specified product or method of construction cannot receive necessary approval by a regulatory agency, and the requested substitution can be approved.

The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the compatibility.

The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution can provide the required warranty.

2.2.4 Unacceptable Substitution Conditions - The Contractor's submittal and Owner's acceptance of Shop Drawings, Product Data or Samples that do not comply with the Contract Documents does not constitute a valid request for substitution, nor does it constitute acceptance of a substitution.

2.2.5 Owner's Action - Within 14 days of receipt of the request for substitution, the Owner may request additional information necessary for evaluation. Within 28 days from receipt of the request for substitution, or 14 days from the receipt of additional information, whichever is later, the Owner will respond to the request for substitution.

2.2.6 Time Extension - With the submittal of a proposed substitution, the Contractor agrees that the time for the Owner to review and consider such substitution shall not constitute a cause for a delay in contract completion or a reason for an extension of Contract Time. Any delay due to the rejection of proposed substitutions shall be the sole responsibility of the Contractor.

2.3 Modifications and Costs

If alternative named or substitutions are proposed by the Contractor and favorably reviewed by the Design Consultant, the Contractor is responsible for providing, at no additional cost to the Owner, any electrical, mechanical, structural, or other related changes or testing that may be required to accommodate or provide the particular material or equipment the Contractor desires to use. Any deviation from the Specifications or the Drawings resulting from the type of material or equipment to be used shall not be the basis for any "extra charges" above and in excess of the original bid price of the work.

In addition, the Contractor is responsible for all additional costs to the Owner, and its agents and representatives, for evaluation of data submitted by the Contractor for alternative named or substitutions and any redesign necessary. The Owner shall deduct said costs from the Contract monies due the Contractor.

3.0 SUBMITTAL AND MATERIAL LIST

Within ten (10) days of the Notice of Award the Owner will provide the Contractor with a Preliminary List of anticipated submittals. This list is intended as a reference to assist the Contractor in the submittal process and may not include all submittals required by the Contract. Accordingly, the Contract requirements shall govern over the Owner provided Preliminary List.

Within five (5) days after the Notice to Proceed and prior to the submission of the initial shop drawings, the Contractor shall submit a complete list of all required submittals to the Construction Manager for favorable review. The Submittal and Material List shall include a description of each item, Specification reference and the anticipated submittal date. The List shall include all items of equipment and materials for architectural, structural, mechanical, piping, electrical, heating and ventilating, equipment piping, and plumbing work; and the names of manufacturers with whom purchase orders have been placed. Items on the List shall be arranged in the same order as in these Specifications, and shall contain sufficient data to identify precisely the items of material and equipment the Contractor proposes to furnish. The List shall reference the applicable Specification section or Drawing. After the submission is favorably reviewed and returned to the Contractor by the Construction Manager, it shall become the basis for the submission of detailed manufacturer's drawings, catalog cuts, curves, diagrams, schematics, data, and information on each separate item for review. No work shall proceed on any item until it has been submitted and favorably reviewed. An incomplete submittal list is not a basis for avoiding a submittal required by the specifications.

4.0 TRANSMITTAL PROCEDURES

4.1 Transmittal Form

A separate transmittal form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole. The specification section and subsection or paragraph to which the submittal is related shall be indicated on the transmittal form.

A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: "XXX"; where "XXX" is the sequential number assigned by the Contractor. Resubmittals shall have the following format: "XXX-Y"; where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of submittal 25.

4.2 Deviations From The Contract

If the submittals show any deviations from the Contract requirements, the Contractor shall submit with the submittal submission a separate written description of such deviations and the reasons therefor. If the Owner accepts such deviation, the Owner shall issue an appropriate Contract Change Order, except that, if the deviation is minor, or does not involve a change in price or in time of performance, a Change Order need not be issued. If any deviations from the Contract requirements are not noted on the submittal, the review of the shop drawing shall not constitute acceptance of such deviations.

4.3 Submittal Completeness

The Contractor shall review and check all submittals before submitting them to the Construction Manager. The Contractor shall stamp and certify on the transmittal letter and on each shop drawing

that they have been checked, are in compliance with the Plans and Specifications, and all deviations from the Contract requirements are noted.

If the Contractor submits an incomplete submittal, the submittal will be returned to the Contractor without review. A complete submittal shall contain sufficient data to demonstrate that the items comply with the Specifications, shall meet the minimum requirements for submissions cited in the technical specifications, shall include materials and equipment data and seismic anchorage certifications where required, and shall include any necessary revisions required for equipment other than first named.

It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Construction Manager at least by the second submission of data. The Owner reserves the right to deduct monies from payments due the Contractor to cover additional costs of review beyond the second submission.

4.4 **Submittal Period**

The Contractor shall submit the intended schedule for submission of the major submittals as defined in Section 01310, **PROGRESS SCHEDULES**. Submittals shall be submitted in time to allow appropriate time for review and response to submittals as provided for herein prior to the incorporation of materials and equipment in the Work.

4.5 **Certificates of Compliance**

For materials furnished and installed in accordance with Division 2 of these Specifications and for standard "off-the-shelf" materials where the Contractor is furnishing the materials listed in the Contract Documents, the Contractor may furnish a Certificate of Compliance in lieu of a full shop drawing for such materials. The Certificate of Compliance shall be submitted as otherwise stipulated in Section 01340-4.0, **TRANSMITTAL PROCEDURES**. The certificate shall be signed by the manufacturer or supplier of the material and shall state that the materials involved comply in all respects with the requirements of the Contract Documents. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the Work which conforms to the requirements of the Contract Documents

4.6 **Alternate Submittals**

If a submittal is approved and the Contractor elects to submit an alternate item for review for the same application, the Contractor shall be responsible for the review costs for the alternate submittal.

5.0 **REVIEW PROCEDURE**

Submittals shall be submitted to the Construction Manager for review and returned to the Contractor within thirty (30) days after receipt. When a submittal cannot be returned within this period, the Construction Manager will within a reasonable time after receipt of the submittal give notice of the date by which that submittal will be returned. Review of submittals by the Design Consultant has as its primary objective the completion for the Owner of a project in full conformance with the Contract Documents, unmarred by field corrections, and within the time provided. In addition to this primary objective, submittal review as a secondary objective will assist the Contractor in its procurement of

equipment that will meet all requirements of the Contract Documents, will fit the structures detailed on the Plans, will be completed with respect to piping, electrical, and control connections, will have the proper functional characteristics, and will become an integral part of a complete operating facility.

After review by the Design Consultant of each of the Contractor's submissions, the material will be returned to the Contractor with actions defined as follows:

- A. **NO EXCEPTIONS NOTED (RESUBMITTAL NOT REQUIRED)** - Accepted subject to its compatibility with future submissions and additional partial submissions for portions of the work not covered in this submission. Does not constitute approval or deletion of specified or required items not shown in the partial submission.
- B. **MAKE CORRECTIONS NOTED (RESUBMITTAL NOT REQUIRED)** - Same as A, except that minor corrections as noted shall be made by the Contractor. Contractor shall provide partial resubmittal where required by the review comments.
- C. **MAKE CORRECTIONS NOTED (RESUBMIT)** - Rejected because of major inconsistencies or errors which shall be resolved or corrected by the Contractor prior to subsequent review by the Design Consultant.
- D. **NOT ACCEPTABLE (RESUBMIT)** - Submitted material does not conform to Plans and Specifications in major respect., i.e.: wrong size, model, capacity, or material.
- F. **REVIEW NOT REQUIRED, FOR RECORD ONLY** - The submittal was not required in the specifications or the information was provided for the project files.

Items A and B above are considered "favorable review." Items C and D above (correction and resubmittal required) are considered "unfavorable review."

6.0 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTALS

The Design Consultant's favorable review of submittals shall be obtained prior to the fabrication, delivery and construction of items requiring submittal review.

Favorable review of submittals does not constitute a Change Order to the Contract requirements.

The favorable review of all submittals by the Design Consultant shall apply in general design only and shall in no way relieve the Contractor from responsibility for errors or omissions contained therein. Favorable review by the Design Consultant shall not relieve the Contractor of its obligation to meet contractual requirements, safety requirements and all other requirements of laws, nor constitute a Contract Change Order. Favorable review will not constitute acceptance of any responsibility for the accuracy, coordination, and completeness of the submittals or the items of equipment represented on the submittals.

7.0 SEISMIC DESIGN AND ANCHORAGE OF EQUIPMENT AND OTHER APPURTENANT FACILITIES

All pieces of electrical, mechanical, and instrumentation equipment and appurtenant facilities which are mounted or anchored shall be so designed and installed as to be in conformance to all

requirements of the California Building Code for the edition adopted by the governing jurisdiction, both for vertical and lateral loading. This requirement applies, but is not limited to, such items as light fixtures, electrical and instrumentation panels, tanks, pumps, piping, pipe supports and hangers, conduits and supports, generators, motors, fans, ventilating ducts and equipment, and other similar equipment or facilities. All Authority equipment or facilities within these Specifications or on the Drawings shall be considered essential and shall be designed and anchored to resist seismic forces. Such equipment or facilities shall be functional during and after an earthquake. Anchorage or restraints shall be so designed as to resist the greater of the specified or code required forces acting in any direction. The design of the entire anchoring system, and the furnishing of any part of the anchoring system which must be integral with the equipment or facilities, shall be the responsibility of the manufacturer or supplier. The Contractor, working closely with the manufacturer or Supplier, shall be responsible for furnishing or installing any anchors or restraints which are independent of the equipment or facilities. Examples, but not limited to those noted, are anchor bolts, restraining curbs, walls, or angles and similar items.

Shop drawings for seismic anchorages listed in these specifications shall be submitted. Shop drawing submittals shall include calculations, details, and other amplifying data demonstrating conformance to the seismic requirements of this paragraph. Such calculations shall be prepared and signed by a Civil or Structural Engineer registered in the State of California.

Although calculations will not be required, manufacturers shall assure that equipment has been designed and constructed to safely transfer seismic induced loads through the equipment and to the anchorage systems without failure of equipment components.

*****END OF SECTION*****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01345

REQUESTS FOR INFORMATION AND CLARIFICATIONS

1.0 GENERAL

Should the Contractor discover conflicts, omissions, or errors in the Contract Documents, or have any questions concerning interpretation or clarification of the Contract Documents, or if it appears to the Contractor that work to be done or any matter relative thereto are not sufficiently detailed or explained in the Contract Documents, then, before proceeding with the work effected, the Contractor shall immediately notify the Construction Manager in writing and request interpretation, clarification, or additional detailed instructions concerning the work. The Contractor shall ask for any clarification or request for information immediately upon discovery and prior to the start of the effected work. Contractor shall be responsible for its costs to implement and administer RFI's throughout the Contract duration. Regardless of the number of RFI's submitted, Contractor will not be entitled to additional compensation.

An RFI is not to be used for request for materials/equipment substitutions or value engineering/cost reduction incentive proposals.

2.0 RFI PROCEDURES

2.1 Contractor Review and Submittal

A. Contractor's review

Before submitting each RFI, the Contractor shall carefully review the following for relevant information:

1. All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.
2. All materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work.
3. All information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto.
4. The coordination of each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
5. The Contract Documents.
6. The Project correspondence and documentation.

B. Submittal requests

The Contractor shall submit all requests for clarification and/or additional information in writing through the Construction Manager using a form acceptable to the Construction Manager. Contractor shall provide a detailed written statement that indicates the specific Drawings or Specifications in need of clarification and the nature of the clarification requested.

Each RFI shall be dated and bear a signed certification that Contractor has performed the review defined above. No consideration for review by Construction Manager of an RFI will be made for any item which has not been certified by the Contractor. All non-certified RFI's will be returned to the Contractor without action taken by the Construction Manager, and any delays caused thereby shall be the total responsibility of Contractor.

Each RFI shall be limited to one subject.

2.2 RFI Numbering System

The Contractor shall consecutively number each RFI with the date of issue, except for re-issuance of a respective RFI in which the subscript A, B, C, etc., will be added until the RFI is resolved. If Contractor believes the RFI reviewer's response is incomplete, Contractor shall issue another RFI (with the same RFI number with the letter "A" indicating if it is a follow-up RFI) to Construction Manager clarifying original RFI. Additionally, Construction Manager may return RFI requesting additional information should original RFI be inadequate in describing condition.

2.3 Owner's RFI Review and Response Time

Except as may otherwise be provided herein, the Construction Manager will return one copy of each RFI form to Contractor, with its comments noted thereon or on a separate comment sheet, within a reasonable amount of time, but no more than fifteen (15) calendar days following their receipt from Contractor, or if it is necessary to extend this period, the Construction Manager shall notify the Contractor in writing or at the Weekly Progress Meeting as to when a decision will be provided.

The Owner's review will be only to provide clarification and interpretation of the Contract Documents. The Owner's review shall not relieve the Contractor of the responsibility for compliance with the Contract Documents.

The Owner's review will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto.

The Construction Manager may furnish additional detailed written instructions to further explain the Work, and such instructions shall be a part of the Contract Documents. Clarifications will be issued using the above RFI system or as a Clarification Letter. Should additional detailed instructions in the opinion of the Contractor constitute work in excess of the scope of the Contract, the Contractor shall submit notification immediately and written notification thereof to the Construction Manager no more than ten (10) days following receipt of such instruction, and in any event prior to the

commencement of work thereon. If the Construction Manager considers the Contractor's notice justified, the instructions and/or interpretation will be revised or a proposed change order will be issued in accordance with Section 01035, **MODIFICATION PROCEDURES**. The Contractor shall have no claim for additional compensation or extension of the schedule because of any such additional instructions unless the Contractor provides the Construction Manager written notice thereof within the time frame specified above.

Should the Contractor proceed with the work affected before receipt of a response from the Construction Manager, any portion of the work which is not done in accordance with the Owner's interpretation, clarifications, instructions, or decisions are subject to removal or replacement and the Contractor shall be responsible for all losses.

RFI's will not be recognized or accepted, if in the opinion of the Construction Manager, one of the following conditions exists:

- A. The Contractor submits an RFI as a submittal.
- B. The Contractor submits the RFI under the pretense of a Contract Documents discrepancy or omission without thoroughly reviewing the documents. In this case, the Contractor shall be responsible for both the Construction Manager's and Design Consultant's administrative costs to process the RFI. Such costs may be deducted from the Contractor's progress payments.
- C. The Contractor submits the RFI in a manner that suggests that specific portions of the Contract Documents are assumed to be excluded, or be taken as an isolated portion of the Contract Documents in part rather than whole.
- D. The Contractor submits an RFI in an untimely manner without proper coordination and scheduling of work or related trades.

The Owner's review shall not relieve the Contractor from the responsibility for a variation from the requirements of the Contract Documents unless the Contractor has in writing called attention to each such variation at the time of each RFI submittal and Construction Manager has given written approval of each such variation by specific written notation thereof incorporated in the RFI review; nor will any review by Owner relieve Contractor from responsibility for compliance with the requirements for careful review above.

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01400

QUALITY CONTROL

1.0 CONTRACTOR'S QUALITY CONTROL

1.1 General

The Contractor is to ensure that products, services, workmanship and Site conditions comply with the requirements of the Contract Documents by coordinating, supervising, testing and inspecting its Work. The Contractor shall utilize only suitably qualified, skilled and trained personnel experienced in the tasks required to complete the Work in accordance with the quality requirements of the Contract Documents. Should there be no quality basis specifically prescribed for any portion of the Work, the quality and testing procedures shall be in accordance with the best-accepted practices of the construction industry in the State of California, for projects of this type, or standards set by engineering or technical societies (e.g., ASTM or ASHRAE), whichever is more stringent.

1.2 Quality of Work

The Contractor's quality of Work shall include, but not be limited to, the following requirements:

Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects, and fit for the intended use.

Quality of installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements, as shown on or required by Contract Documents.

Protection of Completed Work: Take all measures necessary to preserve completed Work free from damage, deterioration, soiling, and staining, until acceptance by Owner.

Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting, and finishing Work.

Deviations from Standards and Code Compliance and Manufacturer's instructions and Recommendations: Secure Owner's advanced written consent. Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

Verification of Quality: Work shall be subject to verification of quality by Owner in accordance with provisions of the Contract Documents.

1.3 **Defective Work**

Defective Work shall be modified, replaced, repaired or redone by the Contractor at no change in Contract Sum or Contract Time. Acceptance of Defective Work, without specific written acknowledgement and approval of Owner, shall not relieve the Contractor of the obligation to correct such Work. Should Owner determine that it is not feasible or in Owner's interest to require Defective Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between Owner and Contractor. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with the Contract Documents. Owner and Owner's consultants disclaim any and all responsibility for Work produced not in conformance with the Drawings and Specifications. Contractor shall have full responsibility for all consequences resulting from Defective Work, including without limitation all delays, disruptions, extra inspection and correction costs by Contractor and Owner and re-Work, and extra time and costs of all types. Contractor waives excuses for defective work relating to Owner's prior review of Submittals and/or prior failure to notice Defective Work in place on inspection.

2.0 **INSPECTION AND TESTING**

Additional requirements for tests are described in Section 01660, **TESTING AND ADJUSTING** and other Technical Paragraphs of these Specifications.

2.1 **General**

Where the Contract Documents require work to be field tested or approved, it shall be tested in the presence of the Construction Manager or its authorized representative. The Construction Manager shall have the right to witness all on-site tests performed by the Contractor and any shop tests. The results of any tests performed by the Contractor shall be made available for the information of the Construction Manager. Inspections, tests or favorable reviews by the Construction Manager or others shall not relieve the Contractor from its obligation to perform the work in accordance with the requirements of the Contract Documents or for its sole responsibility for the quality of workmanship and materials.

Except as specifically required under the technical specifications for testing and inspection, all tests for materials furnished by the Contractor will be done in accordance with commonly recognized standards of national organizations. Where tests are to be performed by the Construction Manager or by an independent laboratory or agency, the Contractor shall furnish such samples of all materials as required by the Construction Manager without charge. The sample or samples of materials to be tested shall be selected by such laboratory or agency, or the Construction Manager, and not by the Contractor. No material for which the Contract Documents require the submittal and approval of tests, certificates of compliance or other documentation shall be incorporated in the Work until such submittal has been made and approved.

The Contractor shall provide safe access for the Construction Manager and inspectors to adequately inspect the quality of work and the conformance with the Contract Documents. The Contractor shall furnish the Construction Manager the necessary labor and facilities for such things as excavation in the compacted fill to the depths required to take samples. The Contractor shall provide adequate lighting, ventilation, ladders and other protective facilities as may be necessary for the safe performance of inspections.

Upon completion of the Work the Construction Manager will conduct a final inspection as provided for in Section 00700-8.7, **Final Inspection and Payment**. Records shall be available at all reasonable hours for inspection by other local or State agencies to ascertain compliance with laws and regulations.

2.2 Notice

The Contractor shall notify the Construction Manager in writing at least 24 hours before any field testing or special inspections are required to be performed by the Construction Manager or independent laboratory furnished by the Owner. The Contractor shall notify the Construction Manager at least two hours before any inspection is required to be performed or to witness the Contractor's on-site field testing.

Whenever the Contractor varies the period during which work is carried on each day, the Contractor shall give due notice to the Construction Manager so that proper inspection may be provided. Any work done in the absence of the Construction Manager shall be considered to be rejected. It will be the responsibility of the Contractor to demonstrate to the satisfaction the Construction Manager that the work meets all conditions of the specification and if such conditions are not met to remove the work.

The Contractor shall give the Construction Manager written notification at least thirty (30) days prior to the shipment of materials and equipment to be tested and/or inspected at the point of origin. Satisfactory tests and inspections at the point of origin shall not be construed as a final acceptance of the materials and equipment nor shall such tests and inspections preclude retesting or reinspection at the site of the Work.

2.3 Costs of Testing

The Contractor shall be responsible for, and shall pay for, all quality control and off-site tests of materials required including all source and mix design tests for the approval of soil and concrete materials. The Owner will perform the soils and concrete confirmation tests detailed in the Technical Specifications during the performance of the Work. Owner will retain and pay a qualified testing agency to perform soil compaction testing and work identified as requiring special inspections and testing as defined by UBC section 1701. All other testing required by the technical specifications shall be the responsibility of the Contractor.

The Contractor shall be responsible for, and shall pay for, all source quality control and all on-site tests of materials required, except those tests specifically noted to be performed and paid for by the Owner.

The Construction Manager shall have the authority to require additional tests or inspections due to the manner in which the Contractor executes its work. Examples of such additional tests and inspections include; tests of materials substituted for previously accepted materials, or substituted for specified materials, or retests made necessary by failure of material to comply with the requirements of the Specifications. Where such tests and inspections are required by Contract to be performed by the Owner, the Owner will pay for the additional tests and inspections but will issue a unilateral Change Order to deduct these costs from the Contract price.

2.4 Work Covered Prior to Inspection and/or Testing

Work requiring inspection and/or testing shall not be concealed or buried prior to the acceptance of such inspection or testing. Work covered without the favorable review or consent of the Construction Manager shall, if required by the Construction Manager, be uncovered for inspection and/or testing at the Contractor's expense.

2.5 Work Covered With Prior Inspection and/or Testing

If the Construction Manager considers it necessary or advisable that covered work which was favorably inspected and tested be uncovered for reinspection and/or retesting, the Contractor, at the Construction Manager's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Construction Manager may require, that portion of the work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such work is defective, the Contractor will bear all expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such work is not found to be defective the Contractor will be allowed an increase in the Contract price or an extension of the Contract time, or both, directly attributable to such uncovering, exposure, observation, testing and reconstruction, and a Change Order shall be issued for such additional work.

2.6 Coordination of City Building and other Inspections

The Contractor is responsible for notifying the Construction Manager to schedule other agency inspections in accordance with the agency requirements. The Contractor shall notify the Construction Manager of all building and other work component inspection notices and schedules. Failure of the Contractor to properly coordinate and schedule these inspections shall not be cause for time extensions.

2.7 Special Tests and Inspections

As provided for in the Contract Documents, laws and regulations, specialized tests and inspections shall be performed by special inspectors certified by the International Conference of Building Officials (ICBO). Unless otherwise stated in the Contract Documents, each of these tests will be performed and paid for by the Owner.

2.8 Inspections and Tests by Serving Utilities

Unless otherwise indicated in the Contract Documents, the Contractor shall cause, schedule and conduct inspections and tests by serving Utilities required for the Work under this Contract.

2.9 Inspections and Tests by Serving Manufacturers

Unless otherwise indicated in the Contract Documents, the Contractor shall cause all required tests and inspections to be conducted by materials, equipment or systems manufacturers. Additionally, all tests and inspections required by materials, equipment or systems manufacturers as conditions of warranty or certification of Work shall be made, the cost of which shall be included in the Contractor's bid.

Each manufacturer's representative shall furnish to Owner, through Contractor, a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily. A sample service report form is in Section 01999 Reference Forms.

All costs for these services shall be included in the Contract Price.

2.9.1 Services Furnished by Others: The System Supplier of material and equipment furnished under the procurement contract will provide technically qualified field-service engineers for a period, specified in the Procurement Documents, during the installation and startup of the procured system. The field service personnel's qualifications will be submitted, in resume format, 21 days prior to commencement of services. Travel time is not included in the time period. The Contractor shall be responsible for planning, supervising, and executing the installation of the work and shall plan for using the time of the System Supplier's field representatives as defined in the Procurement Documents.

Additional services and travel expenses necessary to correct defective materials or equipment furnished by the System Supplier will be paid for by the System Supplier.

Any additional services in connection with installation that are required by reason of Contractor's progress shall be paid for by Contractor at the rate indicated in the Procurement Documents.

Field representatives will observe, instruct, guide, and direct Contractor's erection and installation procedures and perform installation checks as required herein or as requested by the Owner. Installation of the membrane filtration system equipment must be accepted in writing by the System Supplier prior to startup and testing.

2.10 Offsite Inspection

When the Contract Documents require inspection of material or equipment during the production, manufacturing, or fabricating process, or before shipment, such services will be performed by Owner or an independent testing firm or inspection organization acceptable to Owner.

Contractor shall require the producer, manufacturer, or fabricator to arrange for and pay an independent organization to perform the inspection services specified herein the Contract Documents.

Owner shall arrange for and pay an independent organization to perform the inspection services specified herein the Contract Documents.

Owner shall send a representative to the factory or shop to review the assembly and witness the factory testing and performance for the equipment specified.

Contractor shall give appropriate written notice to Owner not less than 10 days before offsite inspection services are required, and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.

The inspection organization will submit a written report to Owner, with a copy to Contractor, at least once each week.

2.11 Transmittal of Test Reports

Written reports of tests and engineering data furnished by Contractor for Owner's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.

The laboratory retained by Owner will furnish four copies of a written report of each test. Three copies of each test report will be transmitted to the Owner and one copy to Contractor, within 3 days after each test is completed.

An experienced, competent, and authorized representative of the manufacturer of each item of equipment listed in the individual equipment section shall visit the Site of the Work and inspect, check, adjust if necessary, and approve the equipment installation.

In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Owner.

Each manufacturer's representative shall furnish to Owner, through Contractor, a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily. A sample service report form is attached at the end of this section.

3.0 TEST WATER

The Contractor shall furnish and dispose of the water which is required for testing of piping and structures. The Contractor shall dispose of all testing water without damage to property, and in accordance with applicable regulations.

***** END OF SECTION *****

SECTION 01510

TEMPORARY UTILITIES

1.0 ELECTRICAL SERVICE

The Contractor shall arrange, at its own cost, with the local utility to provide adequate temporary electrical service at a location acceptable to the Owner. The Contractor shall then provide adequate jobsite distribution facilities conforming to applicable codes and safety regulations and with the approval of the Owner. The Contractor shall provide, at its own cost, all electric power required for construction, testing, general and security lighting, and all other purposes whether supplied through temporary or permanent facilities. All the power provided to the Contractor shall be through a meter that is separate from any and all Owner electrical supply.

2.0 WATER)

The Contractor shall pay for and shall construct all facilities necessary to furnish water for its use during construction, including potable water service. Water used for human consumption shall be kept free from contamination and shall conform to the requirements of the State and local authorities for potable water. The Contractor shall pay for all water used for the Contractor's operations prior to final acceptance.

3.0 TEMPORARY LIGHTING

The Contractor shall provide temporary lighting in all work areas sufficient to maintain a lighting level during working hours not less than the lighting required by California OSHA standards. As permanent lighting facilities are completed they may be used in lieu of temporary facilities, provided however, that bulbs, lamps or tubes of such facilities used by the Contractor shall be replaced prior to final acceptance of the Work.

4.0 HEATING AND VENTILATION

The Contractor shall provide means for heating and ventilating all work areas as may be required to protect the Work from damage by freezing, high temperatures, weather, or to provide a safe environment for workers. Unvented direct fired heaters shall not be used in areas where freshly placed concrete will be exposed to the combustion gases until at least two hours after the concrete has attained its initial set.

5.0 SANITARY CONVENIENCES

The Contractor shall provide suitable and adequate sanitary conveniences for the use of all persons at the site of the Work, including sewer service. Such conveniences shall include chemical toilets or water closets and shall be located at appropriate locations at the site of the Work. All sanitary conveniences shall conform to the regulations of the public authority having jurisdiction over such matters. At the completion of the Work, all such sanitary conveniences shall be removed and the site left in a sanitary condition.

The Contractor's personnel are not allowed to use Owner's facilities.

*****END OF SECTION*****

SECTION 01560

TEMPORARY CONTROLS

1.0 TEMPORARY FACILITIES

Construction hoists, elevators, scaffolds, stages, shoring, and similar temporary facilities shall be of ample size and capacity to adequately support and move the loads to which they will be subjected. Railings, enclosures, safety devices, and controls required by law or for adequate protection of life and property shall be provided.

2.0 STAGING AND FALSEWORK

Temporary supports shall be designed by a registered professional engineer with an adequate safety factor to assure adequate seismic and load bearing capability. If requested by the Construction Manager, the Contractor shall submit design calculations for staging and shoring prior to application of loads.

Excavation support shall be in accordance with Section 00700-4.7, **Safety**.

3.0 PROTECTION OF WORK, PROPERTY AND PERSONS

The Contractor shall be responsible for the care of all work until its completion and final acceptance; and the Contractor shall, at its own expense, replace damaged or lost material and repair damaged parts of the Work, or the same may be done by the Owner, and the Contractor and its sureties shall be liable therefor. The Contractor shall make its own provisions for properly storing and protecting all material and equipment against theft, injury, or damage from any and all causes. Damaged material and equipment shall not be used in the Work. The Contractor shall take all risks from floods and casualties, or for delays from such causes. The Contractor may, however, be allowed a reasonable extension of time on account of such delays, subject to the conditions hereinbefore specified. The Contractor shall remove from the vicinity of the completed work all plant, buildings, rubbish, unused material, concrete forms, sheeting or equipment belonging to the Contractor or used under its discretion during construction; and in the event of the Contractor's failure to do so, the same may be removed by the Owner at the expense of the Contractor, and the Contractor and its sureties shall be liable therefor.

The Contractor will be held responsible for and be required to make restitution, at its own expense, for all damage to persons or property caused by the Contractor or subcontractor, or the agents, or employees of either during the progress of the Work and until its final acceptance.

4.0 FENCES—NOT USED

5.0 TEMPORARY ENCLOSURES

When sandblasting, spray painting, spraying of insulation, or other activities inconveniencing or dangerous to property or the health of employees or the public are in progress, the area of activity shall be enclosed adequately to contain the dust, over-spray, or other hazard. In the event there are no permanent enclosures of the area, or such enclosures are incomplete or inadequate, the

Contractor shall provide suitable temporary enclosures.

6.0 ABOVE GRADE PROTECTION

On multi-level structures the Contractor shall provide safety protection that, as a minimum, shall meet the requirements of Title 8, California Code of Regulations.

7.0 WORKING HOURS

Construction shall be allowed only between the hours of 7 a.m. and 6 p.m. on weekdays. Normal Owner working hours are 7 a.m. to 4:30 p.m.

When approved in advance by the Owner, work on weekends or holidays will be limited to 9 a.m. to 6 p.m., unless otherwise approved by the Owner. Work on weekends and holidays may or may not be approved at the Owner's sole discretion. The Contractor shall request permission in writing from the Construction Manager at least 24 hours prior to any work to be performed outside the normal working hours defined above, on weekends or holidays.

The Contractor shall be responsible for any inspection and additional administration costs incurred by the Owner, or its agents and representatives for the following conditions:

- A. For work by the Contractor outside the hours defined above on weekdays, or any work on weekends or holidays recognized by the Owner.
- B. For overtime costs beyond ten (10) hours in any one workday shift, regardless if the ten (10) hours occur in the allowed working hours.

Such costs shall be withheld from the succeeding monthly progress payment. Any work in Section 01010, **SUMMARY OF WORK**, specifically required to be performed outside the normal working hours is excluded from the provisions of this paragraph.

8.0 DUST CONTROL

During the performance of all work under this Contract, the Contractor shall assume all responsibility for dust control and shall furnish all labor, equipment, and means required to carry out proper and efficient measures wherever and whenever dust control is necessary to prevent the Contractor's operations from producing dust damage and nuisance to persons and property.

Unless the construction and/or permits dictates otherwise, and unless otherwise approved by the Construction Manager, the Contractor shall furnish and operate a self-loading motor sweeper with spray nozzle at least once each working day to keep paved areas acceptably clean whenever construction, including restoration, is incomplete.

Any claims resulting from dust damage or nuisance shall be borne solely by the Contractor.

9.0 FIRE EXTINGUISHER

Sufficient number of fire extinguishers of the type and capacity required to protect the Work and

ancillary facilities, shall be provided and maintained by the Contractor in readily accessible locations.

10.0 USE OF EXPLOSIVES

The use of explosives is prohibited.

11.0 REMOVED MATERIALS

All concrete, paving, reinforcing steel, fencing materials, rock, soil, strips, and other waste material and construction debris shall be removed from the site by the Contractor and recycled in accordance with applicable ordinances, regulations and environmentally sustainable practices. All non-recyclable materials shall be disposed of in accordance with applicable regulations and laws.

12.0 CONSTRUCTION CLEANING

Throughout the period of construction the Contractor shall keep the Work site; including work, storage, parking, and employee areas; free and clean of all rubbish and debris, and shall promptly remove from the site, or from property adjacent to the site of the Work, all unused and rejected materials, surplus earth, concrete, plaster, and debris. In particular the Contractor shall keep the site clean to maintain safe access and to avoid fire hazard.

13.0 NOISE ABATEMENT

Operations at the Worksite shall be performed so as to minimize unnecessary noise. Special measures shall be taken to suppress noise during night hours. Noise levels due to construction activity shall not exceed limits as specified by local ordinance.

Internal combustion engines used on the Work shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated without said muffler.

14.0 DRAINAGE CONTROL

In excavation, fill, and grading operations care shall be taken to disturb the pre-existing drainage pattern as little as possible. Particular care shall be taken not to direct drainage water onto private property or into streets or drainage ways inadequate for the increased flow. Drainage means shall be provided to protect the Work.

15.0 EROSION CONTROL

- 15.1. All excavated areas shall be provided with temporary erosion control measures.
- 15.2. Temporary erosion control shall be required for all areas where natural ground cover is disturbed, all temporary excavation stockpiles, including structures and trench excavations.
- 15.3. Erosion control shall be by means of filter fabric fences or straw wattles placed to completely circumvent the downslope side of any excavated stockpile.

- 15.4. Protected areas shall be regularly inspected and maintained by the Contractor during the course of the work.
- 15.5. All excavations, spills, and waste materials shall not be placed in areas subject to washout, flooding or natural drainage.
- 15.6 See Section 01060-3.0 & 4.0, **STORM WATER QUALITY CONTROLS** for additional requirements.

16.0 WARNING DEVICES AND BARRICADES

The Contractor shall adequately identify and guard all hazardous areas and conditions by visual warning devices and, where necessary, physical barriers. Such devices shall, as a minimum, conform to the requirements of Cal/OSHA.

17.0 TRAFFIC REGULATIONS

17.1 General

The Contractor shall take all necessary steps to minimize inconvenience to the general public throughout all work under this Contract. No driveways or private roads shall be blocked without notifying the property owner and access must be restored during all non-working hours. Safe access must be maintained for pedestrian traffic throughout the work area at all times.

At least one lane of traffic in each direction must be kept open at all times unless prior approval is provided by the Owner and the Public Agency, which has authority for the right-of-way. No roads shall be blocked or made inaccessible, due to the Contractor's work, without prior written approval of the Owner and the affected agencies. More stringent requirements may be imposed in the right-of-way permits.

The Contractor shall not block or obstruct fire lanes at any time.

The Contractor shall adopt all practical means to minimize interference to traffic and inconvenience, discomfort, or damage. The Contractor shall protect against damage, any piling, duct or structures crossing trenching or encountered in the work and shall be responsible for any damage done to such structures or damage therefrom. The Contractor shall support or replace, any such structures without delay and without any additional compensation, to the entire satisfaction of the Construction Manager. All obstructions to traffic shall be guarded by flagmen as required and by barriers and illuminated at night. The Contractor shall be responsible for all damage to persons and property directly or indirectly caused by its operations, and under all circumstances the Contractor shall comply with the regulations of the City or County, and the laws and regulations of the State of California, relative to safety of persons and property and the interruption of traffic and the convenience of the public within the respective jurisdiction, and the Contractor shall be solely responsible for any damages caused by failure to provide proper safety.

17.2 Haul Routes

In addition to any haul routes designated in the Contract Documents, at the preconstruction

conference the Contractor shall furnish evidence that the Public Agency which has authority for the right-of-ways proposed to be utilized by the Contractor for haul routes has approved the proposed route(s) for all construction traffic on the Project. Upon approval, the Contractor shall strictly adhere to that route(s) only, unless written permission is obtained from such Public Agency to change the route(s).

17.3 Traffic Control

Traffic control shall be in accordance with the California Department of Transportation Traffic Manual. The Contractor shall submit for approval, by the Owner and any other applicable agency, its traffic control plans prior to work on public streets.

Traffic control shall include signs, warning lights, reflectors, barriers, and other necessary safety devices and measures, including sufficient flaggers to direct vehicular traffic through the construction areas.

No material or equipment shall be stored/parked where it will interfere with the free and safe passage of public traffic, and at the end of each day's work, and at other times when construction operations are suspended for any reason, the Contractor shall remove all equipment, materials and other obstructions from the public right-of-way.

Should the Contractor appear to be negligent in furnishing warning and protective measures, as above provided, the Construction Manager or representative permitting agency may direct attention to the existence of a hazard, and the necessary warning and protective measures shall be furnished and installed by the Contractor at its expense.

17.4 Temporary Signage

The Contractor shall include an allowance to supply, install, maintain and remove up to thirty (30) temporary construction signs to direct and route construction and plant traffic and identify work areas as necessary. The signs shall be supplied by a professional sign shop with a minimum size of three (3) feet by three (3) feet. The signs shall be installed where directed by the Construction Manager or as requested by the Contractor and agreed to by the Construction Manager.

18.0 ROADS AND FENCES

Roads subject to interference by the prosecution of the work covered by this Contract shall be kept open, and fences subject to interference shall be maintained by the Contractor during the Work and shall be replaced to their original condition unless specifically shown otherwise on the Drawings. Such signs and barricades as are required by local laws and as necessary for the safe prosecution of the Work shall be provided.

Excavated dirt shall not be stored on roads, paths, or planted areas. Care shall be taken to protect improvements.

19.0 PARKING AND STAGING AREAS

Contractor parking and staging within the Project area shall only be allowed within the areas, if any,

designated for such use by the Owner.

20.0 TREES AND SHRUBS

Except as noted on the plans, the Contractor shall not remove trees or shrubs without authorization of the Construction Manager. Injuries to tree roots and limbs shall be avoided. No roots shall be cut or limbs pruned, without prior notification to and review of Contractors proposed methods by the Construction Manager.

21.0 OFFICE OF CONTRACTOR AT SITE—NOT USED

22.0 CONTRACTOR'S WORK AND STORAGE AREA

The Contractor shall make its own arrangements for staging, storage and shop areas necessary for the proper execution of the work. The Contractor shall obtain a written agreement between the Contractor and the property owner(s) prior to use. The Owner shall be specifically exempted in any agreement from any liability incurred from the use of private property for construction purposes. Use of portions of the Owner's site for materials and equipment storage may be permitted upon approval of the Owner.

The Contractor shall take all responsibility for storage of materials. No equipment for incorporation in the project may be stored in any area subject to natural or man-made flooding.

The Contractor's construction equipment, vehicles, and materials shall not remain in public streets or right-of-way during non-working hours. It shall be the responsibility of the Contractor to transport and store such items at the Contractor's own facility or within construction easements on non-public areas at the end of each workday.

23.0 CONSTRUCTION MANAGER'S FIELD OFFICE—NOT USED

24.0 PUBLIC ACCESS AT TREATMENT PLANT

The existing facilities and the design of the facilities included in this project are based on the concept that the structures are not accessible to and usable by the handicapped and the general public. Consequently, stairs, landings, platforms, railings, ladders, exits, and the like were designed to conform only to the requirements for industrial use by authorized persons.

***** END OF SECTION *****

SECTION 01600

MATERIAL AND EQUIPMENT

1.0 SALVAGING AND STORAGE OF EQUIPMENT AND MATERIALS

Existing equipment, piping, materials, fittings and appurtenances, which are not stipulated by the Contract Documents to be reincorporated in the Work, shall be removed and properly disposed by the Contractor from the site.

2.0 HAZARDOUS MATERIALS

All hazardous materials shall be stored and handled in strict accordance with the Material Safety Data Sheets for the products. Material Safety Data Sheets shall be submitted to the Construction Manager prior to the delivery of materials to the project. The storage and handling of potential pollution causing and hazardous materials, including but not necessarily limited to, gasoline, oil and paint shall be in accordance with all local, state and federal requirements.

3.0 DISPOSAL OF EXCAVATED MATERIAL—NOT USED

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01612

SEISMIC DESIGN CRITERIA

1.0 SUMMARY

Section includes seismic design criteria for the following:

1. Anchorage of mechanical and electrical equipment.
2. Seismic design of tanks and anchorage of tanks.
3. Other structures or items as specified or indicated on the Drawings.

2.0 REFERENCES

- A. International Conference of Building Officials (ICBO).
- B. Uniform Building Code (UBC).

3.0 SYSTEM DESCRIPTION

- A. Design Requirements: Design in accordance with the requirements of the Uniform Building Code.
- B. Uniform Building Code Seismic Zone: 4.
- C. Uniform Building Code Seismic Source Type: A.
- D. Uniform Building Code Soil Profile Type: D.
- E. Uniform Building Code Proximity to Measure Known Seismic Source: 3.4 miles.
- F. Uniform Building Code Seismic Importance Factor For Temporary Construction Bracing and Shoring: 1.00.
- G. Uniform Building Code Seismic Importance Factor for Anchorage of Mechanical and Electrical Equipment: 1.50.
- H. Uniform Building Code Seismic Importance Factor for the Design of Tanks and the Anchorage of Tanks: 1.50.
- I. Do not use friction to resist sliding due to seismic forces.
- J. Do not use more than sixty percent (60%) of the weight of the mechanical and electrical equipment for designing anchors for resisting overturning due to seismic forces.
- K. Do not use more than sixty percent (60%) of the weight of the tank for resisting overturning due to seismic forces.
- L. Use anchor bolts, bolts, or welded studs for anchors for resisting seismic forces. Anchor bolts

used to resist seismic forces shall have a standard hex bolt head. Do not use anchor bolts fabricated from rod stock with an L or J shape.

- M. Do not use concrete anchors, flush shells, chemical anchors, powder actuated fasteners, or other types of anchors unless indicated on the Drawings or accepted in writing by the Engineer.
- N. Seismic forces must be resisted by direct bearing on the fasteners used to resist seismic forces. Do not use connections, which use friction to resist seismic forces.

4.0 SUBMITTALS

- A. Shop Drawings and Calculations: Complete shop drawings and seismic calculations.
- B. Calculations shall be signed and stamped by a civil or structural Professional Engineer licensed to practice in the state where the Project is located.

***** END OF SECTION *****

SECTION 01614

WIND DESIGN CRITERIA

1.0 SUMMARY

Section Includes: Wind design criteria.

2.0 REFERENCES

- A. International Conference of Building Officials (ICBO):
- B. Uniform Building Code (UBC).

3.0 SYSTEM DESCRIPTION

- A. Design Requirements: Design in accordance with the requirements of the Uniform Building Code.
 - 1. Uniform Building Code Basic Wind Speed: 70 miles per hour.
 - 2. Uniform Building Code Wind Exposure: D.
- B. Use anchor bolts, bolts, or welded studs for anchors for resisting wind forces. Anchor bolts used to resist wind forces shall have a standard hex bolt head. Do not use anchor bolts fabricated from rod stock with an L or J shape.
- C. Do not use concrete anchors, flush shells, chemical anchors, powder actuated fasteners, or other types of anchor unless indicated on the Drawings or accepted in writing by the Design Consultant.
- D. Wind forces must be resisted by direct bearing on the anchors used to resist wind forces. Do not use connections which use friction to resist wind forces.

4.0 SUBMITTALS

- A. Shop Drawings and Calculations: Complete shop drawings and wind calculations.
- B. Calculations shall be signed and stamped by a civil or structural Professional Engineer licensed to practice in the state where the Project is located.

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01660

TESTING AND TRAINING (Mechanical/Electrical Alternate)

1.0 TESTING

1.1 Contract Requirements

- A. The testing on the Project shall encompass at a minimum the following and shall be performed in the following sequence:
 - 1. Performance/Factory Testing: As specified in Section 01660-1.3 and individual equipment sections in Divisions 11 and 15.
 - 2. Installation Testing: As specified in Section 011660-1.4 and
 - a. Electrical Testing (Division 16)
 - b. Instrumentation and Controls Testing (Division 23)
 - c. Mechanical Pre-Operational Tests (Divisions 11 and 15)
 - 3. Functional and Equipment Testing (8-Hour Test): As specified in Section 01660-1.5
 - 4. Operational Testing (5-Day Test): As specified in Section 01660-1.6
 - 5. Process Commission Testing: As specified in Section 01660-1.7
- B. Contractor shall coordinate with Owner and Programmer for start-up and testing of the instrumentation and controls as specified in Division 23.
- C. The Contractor shall appoint a qualified person as Testing Coordinator to manage, coordinate, and supervise the Contractor's testing program. The Testing Coordinator shall have at least five (5) years of total experience, or experience on at least five separate projects, in managing the testing and startup of mechanical, electrical, instrumentation, HVAC and piping systems for a wastewater or water treatment plant.
- D. Complete testing, training, and start-up, along with full and complete documentation of these activities, within the Contract Times.
- E. Testing, training, and startup shall be integrated across equipment and systems. The Contractor shall coordinate and integrate the documentation and efforts of manufacturers and subcontractors to achieve unified tests and test plans.
- F. Allow realistic duration in the Progress Schedule for testing, training, start-up, and documentation activities.
- G. The Contractor shall be responsible for system setup and installation of bypasses, bulkheads, temporary piping or other controls as necessary to allow the testing to be performed. Furnish labor, power, tools, equipment, instruments, and services required for and incidental to completing testing.
- H. Provide competent, experienced technical representatives of equipment manufacturers for assembly, installation and testing guidance, and operator training.

- I. The Contractor shall allow adequate time in the project schedule and provide adequate labor, equipment, overhead and other costs in the project bid to allow for the Programmer to correct software problems with Programmer-provided software during startup and testing.

1.2 **Submittals – Start-up Plan**

- A. Submit start-up plan for each piece of equipment and each system not less than 70 days prior to planned initial start-up of equipment or system.
- B. Include overall testing, training, and start-up activities on the project progress schedule specified in Section 01310, **PROGRESS SCHEDULES AND REPORTS**. Testing, training, and start-up shall be detailed in a sub-network of the overall project progress schedule with the following activities identified:
 - 1. Manufacturer's services.
 - 2. Installation certifications.
 - 3. Operator training.
 - 4. Submission of Operation and Maintenance Manual.
 - 5. Electrical testing
 - 6. Instrumentation testing
 - 7. Installation Testing
 - 8. Functional testing.
 - 9. Operational testing.
 - 10. Process Testing
- C. Provide testing plan with test logs for each item of equipment and each system. Include testing of alarms, control circuits, capacities, speeds, flows, pressures, vibrations, sound levels, and other parameters.
- D. Contractor shall prepare functional testing plans and procedures for all project equipment and systems and for all modes of operation. Functional testing procedures shall be in the cause and effect format. The person conducting the operating test shall initiate an action (cause) and, upon the systems or subsystems producing the required result (effect), the specific test requirement will have been satisfied. A sample form illustrating this concept and which shows the level of detail required in the Contractor-developed functional testing form is appended to the end of this Section. Only computer-generated functional testing forms shall be submitted; handwritten forms are unacceptable.
- E. Submittal requirements for field calibration, loop acceptance, and end-to-end acceptance testing are specified in Division 23.
- F. Submittal requirements for mechanical equipment testing are specified in individual equipment sections and Division 23.
- G. Submittal requirements for electrical testing are specified in Division 26.
- H. Provide summary of shutdown requirements for existing systems which are necessary to complete start-up of new equipment and systems.

- I. Revise and update start-up plan based upon review comments, actual progress, or to accommodate changes in the sequence of activities.
- J. Contractor is responsible for regulatory non-compliance and local area complaints for noise, odors, and other nuisance conditions resulting from start-up plan actions and activities.
- K. The Instrumentation and Control Systems startup plan shall be prepared and submitted as specified in Division 23.
- L. The Functional and Operational Testing Plans required for Sections 01660-1.5 and 1.6 shall list the personnel who will be present to assist with and witness the tests. This list shall include the Testing Coordinator, any Contractor personnel, the Instrumentation and Control Systems Installation Supervisor, subcontractors, manufacturer's representatives, Owner staff, Construction Manager, Design Consultant, and any other required personnel.
- M. The Startup Team shall jointly develop the startup plans for the Functional, Operational and Process Testing specified in Sections 01660-1.5, 1.6 and 1.7 at least 90 days before testing is scheduled at each area. The Owner will provide and designate other members of the Startup Team from the Design Consultant, Programmer, and Operations Staff. The Contractor's Testing Coordinator and the Instrumentation and Control Systems Installation Supervisor shall each be members of this Startup Team and shall each be dedicated a minimum of 200 hours to working directly with the Startup Team in the development of these startup plans.

1.3 **Performance Testing**

- A. Test equipment for proper performance at point of manufacture or assembly when specified.
- B. When source quality control testing is specified:
 - 1. Demonstrate equipment meets specified performance requirements.
 - 2. Provide certified copies of test results.
 - 3. Do not ship equipment until certified copies have received written acceptance from Construction Manager. Written acceptance does not constitute final acceptance.
 - 4. Perform testing as specified in the equipment specification sections.

1.4 **Installation Testing**

- A. Mechanical Systems: As specified in the individual equipment specification sections in Division 23:
 - 1. Remove rust preventatives and oils applied to protect equipment during construction.
 - 2. Flush lubrication systems and dispose of flushing oils. Recharge lubrication system with lubricant recommended by manufacturer.
 - 3. Flush fuel system and provide fuel for testing and start-up.

4. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace defective seals.
 5. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
 6. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
 7. Perform cold alignment and hot alignment to manufacturer's tolerances.
 8. Adjust V-belt tension and variable pitch sheaves.
 9. Inspect hand and motorized valves for proper adjustment. Tighten packing glands to insure no leakage, but permit valve stems to rotate without galling. Verify valve seats are positioned for proper flow direction.
 10. Tighten leaking flanges or replace flange gasket. Inspect screwed joints for leakage.
 11. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to operational testing.
 12. Implement lockout/tagout procedures.
 13. Demonstrate alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration over the full operating range of equipment and systems. Perform initial checks in the presence of and with the assistance of the manufacturer's representative.
 14. Other requirements as defined in the equipment Operation and Maintenance Manuals.
- B. Electrical Systems: As specified in Divisions 23 and 26, and the individual equipment specification sections.
1. Electrical testing shall be performed in two stages. The first stage shall consist of electrical equipment testing prior to energization and operation of electrical equipment. The following shall be submitted to Construction Manager for review prior to equipment startup and energization:
 - a. Completed field calibration testing data forms as specified in Division 23.
 - b. The following completed electrical equipment testing data forms required by Division 26:
 - 1) Low-Voltage Cables.
 - 2) Medium-Voltage Cables.
 - 3) Grounding Systems.
 - 4) Rotating Machinery: AC Motors.Unsatisfactory equipment test results shall require that the equipment be repaired and re-tested until acceptable results are obtained at no additional cost to the Owner.
 2. The second stage of electrical testing shall occur after energization and start-up of equipment and shall consist of performing the complete testing of all other equipment as specified in Division 26.
- C. Instrumentation Systems: As specified in Division 23 and the individual equipment specification sections:
1. Requirements for field calibration, loop acceptance, and end-to-end acceptance testing are specified in Division 23.

2. Field calibration, loop acceptance, and end-to-end acceptance testing shall not begin until design submittals and Contractor-prepared drawings required by Divisions 23 and 26 have been reviewed by the Design Consultant and returned marked as "No Exceptions Noted".
3. General:
 - a. Bench or field calibrate instruments and make required adjustments and control point settings and document these changes as required in Divisions 23 and 26.
 - b. Energize transmitting and control signal systems, verify proper operation, ranges, and settings; update documentation if changes were made.

1.5 Functional Testing and Equipment Operation Test (8-Hour Test)

- A. Functional testing and initial equipment operation test shall not begin until after the Installation Testing including the Electrical Testing specified in Section 01660-1.4 have been completed for individual systems or pieces of equipment.
- B. The functional stage of testing shall involve the completion of functional testing forms which include all possible operating scenarios, alarm conditions, prohibitive interlocks, and indication functions. Contractor shall perform a "dry run" for all functional tests to ensure that systems are working properly prior to witnessing by the Construction Manager. After the "dry run" is successfully completed, Contractor shall provide minimum 48 hours notice to the Construction Manager that systems are ready for witnessed functional testing. The Construction Manager will witness functional testing and will initial all functional testing forms upon successful operation of systems.
- C. The Contractor is responsible for the installation and removal of any additional piping, valves, pumps, etc., to deliver the test water to the process area and to discharge the water.
- D. The Contractor is responsible for all costs of the functional testing, including the supply of materials and chemicals necessary for the performance of the tests.
- E. The Contractor is responsible for functional testing for all project equipment and systems in all modes of operation, including remote SCADA modes of operation. Verifying the required functional testing results for the SCADA modes of operation will be a joint effort between the Contractor and the Owner/Programmer as specified in Division 23 where the Owner provides the software programming and configuration.
- F. Demonstrate proper operation of each instrument loop function including alarms, local and remote controls, instrumentation and other equipment functions. Generate signals with test equipment to simulate operating conditions in each control mode as required in Division 23.
- G. Conduct continuous 8 hour test under normal operating conditions. If any equipment or system does not meet all of the parameters defined in the Functional Test Plan, the Contractor shall correct the problem and shall repeat the test until it is successful.

Software problems with Programmer-provided software shall be corrected by the Programmer. The Owner reserves the right to waive portions of functional test which fail due to problems with Programmer-provided software.

- H. Functional test of mechanical and electrical equipment required for operation of a process area shall be completed prior to performing the operational test for the process area.
- I. Certificate of Proper Installation:
 - 1. At completion of Functional Testing and prior to Operational Testing, furnish written report prepared and signed by manufacturer's authorized representative, certifying equipment:
 - a. Has been properly installed, adjusted, aligned, and lubricated.
 - b. Is free of any stresses imposed by connecting piping or anchor bolts.
 - c. Is suitable for satisfactory full-time operation under full load conditions.
 - d. Operates within the allowable limits for vibration.
 - e. Controls, protective devices, instrumentation, and control panels furnished as part of the equipment package are properly installed, calibrated, and functioning.
 - f. Control logic for start-up, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are properly functioning.
 - 2. Furnish written report prepared and signed by the electrical and/or instrumentation subcontractor certifying:
 - a. Control logic that resides in motor control centers, control panels, and circuit boards furnished by the electrical and/or instrumentation subcontractor has been calibrated and tested and is properly operating.
 - b. Control logic for equipment start-up, shutdown, sequencing, interlocks and emergency shutdown has been tested and is properly operating.
 - 3. Co-sign the reports along with the manufacturer's representative and subcontractors.

1.6 **Operational Testing (5-Day Test)**

- A. The Operational Test shall demonstrate satisfactory operation of equipment and systems in actual operation. Refer to Section 01010 for additional operational acceptance testing requirements.
- B. Conduct operational acceptance test for 5 sequential workdays for eight hours per day under the supervision and control of the Contractor. The test shall simulate actual operating conditions to the greatest extent possible.
- C. The Contractor is responsible for all costs of the functional testing, including the supply of materials and chemicals necessary for the performance of the tests.
- D. Immediately correct defects in material, workmanship, or equipment which become evident during operational test.

- E. Repeat operational test when malfunctions or deficiencies cause shutdown or partial operation of the facility or results in performance that is less than specified in the Contract Documents.
- F. Failure of any major process unit during the five (5)-day test will result in the abandonment of the test and the test procedures shall be restarted from the beginning.

1.7 **Process/Commission Testing**

- A. Cleanup: Following completion of an area Operational Test, the Contractor shall remove, clean and replace all permanent and temporary filters and strainers in all pipeline systems; replace all HVAC filters, dewater and clean sumps; and dewater, where directed by the Construction Manager, all process units for final inspection as a condition precedent to proceeding with Process Testing.
- B. Commissioning Team: The Contractor shall assemble under the direction of the Testing Coordinator a commissioning team. The commissioning team shall consist of representatives of the Contractor's mechanical, electrical, and instrumentation subcontractors, and others as appropriate. The commissioning team shall be available at the site of the work during normal working hours(8 hours a day, 5 days a week, Saturdays, Sunday and legal holidays excepted) and shall be available within 2 hours notice at all other times upon notice by telephone. The commissioning team shall at all times be equipped and ready to provide for emergency repairs, adjustments, and corrections to the equipment and systems installed and modified as a part of this Contract.
- C. Process testing of equipment and systems shall take place following Functional and Operational Testing at each process area and after the Owner's staff has acknowledged in writing that they have received the necessary training for the applicable equipment and systems. The Contractor shall remove all temporary piping, bulkheads, controls and other alterations to the permanent systems that may have been needed during the Functional and Operational Testing and shall perform the tasks necessary to make the improvements constructed under this Contract fully operational. Process Testing will be performed utilizing the intended process flows.
- D. The Owner will provide operations personnel, power, fuel, chemicals and other consumables for the Process Testing.
- E. All processes and systems shall be Process Tested during the performance of the Process Test for one of the areas defined below. Substantial Completion of an area will not be issued until after successful completion of the associated Process Test.
- F. Process testing shall be coordinated with Owner occupancy requirements as defined in Section 01010, **SUMMARY OF WORK**.
- G. Contractor shall document modifications to process equipment made during Process and startup testing.

1.8 **Record Keeping**

Maintain and submit following records generated during start-up and testing phase of Project:

1. Daily logs of equipment testing identifying all tests conducted and outcome.
2. Logs of time spent by manufacturer's representatives performing services on the job site.
3. Equipment lubrication records.
4. Electrical phase, voltage, and amperage measurements.
5. Insulate resistance measurements.
6. Data sheets of control loop testing including testing and calibration of instrumentation devices and set points.

2.0 **TRAINING OF OWNER PERSONNEL**

2.1 **General**

- A. Operation and maintenance training of Owner's personnel shall be provided for all equipment identified in the technical specifications. Training content is to be tailored to the needs of the operations group and the maintenance group.
- B. Training shall be conducted by competent representatives who are certified by the manufacturer to be thoroughly familiar with the subject matter as well as instructional methods.
- C. These training services shall be conducted onsite by the manufacturer's representative and shall ensure that Owner's personnel are trained to perform equipment task requirements, including essential knowledge and skills. The Owner may conduct objective evaluations of its employees receiving this training to verify compliance with the requirement. In addition the Owner will have the trainees provide an evaluation of the trainer and the training materials. If either evaluation process determines that the training was deficient, the Contractor shall be required to have the manufacturer re-perform the training at a schedule to be defined by the Owner and with an approved representative from the factory.
- D. Training materials shall be submitted to the Owner for review. Training materials shall include a list of task statements which the Owner's employees may perform with the equipment, the learning objectives (derived from the task list and by which the training will be evaluated) and the training plan (or lesson plan) to demonstrate how the learning objectives will be achieved. Acceptance of training materials is required prior to start of training. The Contractor shall provide an adequate number of printed trainee materials for all persons being trained. One electronic copy of training material shall be provided to the Owner.
- E. The Contractor shall submit, within ninety (90) days of Notice To Proceed, a list of all equipment items or systems for which training will be provided in accordance with the specifications. The list shall include item number, specification section, description and required training in hours.

- F. The Owner shall have the right to videotape all training sessions, or may designate separate sessions or portions thereof for the sole purpose of videotaping.

2.2 **Training Coordinator**

The Contractor shall designate and provide one or more persons to be responsible for coordinating and expediting the training duties. The person or persons so designated shall be present at all training coordination meetings with the Owner.

2.3 **Training Schedule**

- A. The Contractor's coordinator shall coordinate the training periods with the Construction Manager and shall submit a training schedule and the training materials for each piece of equipment or system for which training is to be provided. Said training schedule and materials shall be submitted not less than sixty (60) calendar days prior to the time that the associated training is to be provided, and the training materials shall be approved at least twenty (20) calendar days before the associated training is provided.
- B. Equipment and/or systems shall be deemed suitable for use in training upon satisfactory completion of functional testing. Training for equipment in a process system must be completed prior to commencement of the Process Test for that area.
- C. Training sessions for each piece of equipment shall be four (4) hours total except as otherwise noted. Training sessions shall be scheduled on Tuesdays through Thursdays. Training sessions shall be provided during the day between the hours of 8 a.m. and 4 p.m.
- D. The Contractor shall schedule separate training sessions for both operations and maintenance personnel and meet the following criteria:
 - 1. Maintenance training shall be provided for each piece of equipment listed in the approved Operation and Maintenance manual submitted by the Contractor. Training shall emphasize theory of operations, troubleshooting, preventative maintenance, predictive maintenance, and repair procedures. The training shall encompass issues relating to instrumentation, electrical and mechanical systems.
 - 2. Operations training shall be provided for each piece of equipment listed in the approved Operation and Maintenance manual submitted by the Contractor. Training shall emphasize theory of operations, startup and shutdown instructions, normal operation, abnormal and emergency operations (where applicable), lockout procedures, troubleshooting, preventative maintenance and alarm and control logic including fail-safe mode of operation.
- E. The Contractor shall confirm each training period a minimum of three (3) working days prior to the scheduled time.

***** END OF SECTION *****

EQUIPMENT TEST REPORT FORM

NOTE: This example equipment test report is provided for the benefit of the Contractor and is not specific to any piece of equipment to be installed as a part of this project. The example is furnished as a means of illustrating the level of detail required for the preparation of equipment test report forms for this project.

DSRSD

PROJECT NAME

ABC Construction Company, Inc., General Contractor
XYZ, Inc., Construction Manager

EQUIPMENT TEST REPORT

Equipment Name: _____
Equipment Number: _____
Specification Ref: _____
Location: _____

	Contractor		Construction Manager	
	Verified	Date	Verified	Date

PREOPERATIONAL CHECKLIST

Mechanical

Lubrication	_____	_____	_____	_____
Alignment	_____	_____	_____	_____
Anchor Bolts	_____	_____	_____	_____
Seal water system operational	_____	_____	_____	_____
Equipment rotates freely	_____	_____	_____	_____
Safety guards	_____	_____	_____	_____
Valves operational	_____	_____	_____	_____
Hopper purge systems operational	_____	_____	_____	_____
Sedimentation tank/hopper clean	_____	_____	_____	_____
O& M manual information complete	_____	_____	_____	_____
Manufacturer's installation certificate complete	_____	_____	_____	_____

	Contractor		Construction Manager	
	Verified	Date	Verified	Date
<u>Electrical</u> (circuit ring-out and high-pot tests)				
Circuits:				
Power to MCC 5				
Control to HOA				
Indicators at MCC:				
Red (running)				
Green (power)				
Amber (auto)				
Indicators at local control panels				
Wiring labels complete				
Nameplates:				
MCC				
Control station				
Control panel				
Equipment bumped for rotation				
<u>Piping Systems</u>				
Cleaned and flushed:				
Suction				
Discharge				
Pressure tests				
Temporary piping screens in place				
<u>Instrumentation and Controls</u>				
Flowmeter FE2502F calibration				
Calibration Report No.				
Flow recorder FR2502G calibrated against transmitter				
VFD speed indicator calibrated against independent reference				
Discharge overpressure shutdown switch calibration				
Simulate discharge overpressure shutdown				

	Contractor Verified	Date	Construction Manager Verified	Date
FUNCTIONAL and EQUIPMENT OPERATION TESTS				
<u>Mechanical</u>				
Motor operation temperature satisfactory	_____	_____	_____	_____
Pump operating temperature satisfactory	_____	_____	_____	_____
Unusual noise, etc?	_____	_____	_____	_____
Pump operation: 75 gpm/50 psig Measurement:	_____	_____	_____	_____
Flow	_____			
Pressure	_____			
Alignment hot	_____	_____	_____	_____
Doweled in	_____	_____	_____	_____
O& Manual information complete	_____	_____	_____	_____
Remarks:	_____			
<u>Electrical</u>				
Local switch function:	_____	_____	_____	_____
Runs in <i>HAND</i>	_____	_____	_____	_____
No control power in <i>OFF</i>	_____	_____	_____	_____
Timer control in <i>AUTO</i>	_____	_____	_____	_____
Overpressure protection switch PS2502C functional in both <i>HAND</i> and <i>AUTO</i>	_____	_____	_____	_____
Overpressure protection switch PS2502C set at 75 psig	_____	_____	_____	_____
PLC 2500 set at 24-hour cycle, 25 min <i>ON</i>	_____	_____	_____	_____
OPERATIONAL TEST				
Five (5) day continuous test. Pump cycles as specified, indicators functional, controls functional, pump maintains capacity, overpressure protection remains functional, hour meter functional				
RECOMMEND FOR BENEFICIAL OCCUPANCY				
Construction Manager	_____	Date	_____	_____
ACCEPTED FOR BENEFICIAL OCCUPANCY				
Owner's Representative	_____	Date	_____	_____

SECTION 01710

FINAL CLEAN-UP

1.0 FINAL SITE CLEAN-UP

Upon completion of the Work, and prior to final acceptance, the Contractor shall remove from the vicinity of the Work all plant, surplus material, and equipment belonging to the Contractor or used under its direction during construction.

In addition to general broom cleaning of paved surfaces and rake cleaning of other surfaces of grounds, the following shall be performed at completion of the Work:

- A. Remove waste and debris from the entire site.
- B. Sweep paved areas.
- C. Clean/landscape areas.
- D. Clean storm drains.

2.0 FINAL BUILDING CLEAN-UP

On all building projects and wherever else applicable, besides final site cleanup, the following special cleaning shall be performed at completion of the Work:

- A. Putty stains and paint shall be removed from glass; glass shall be washed inside and outside. Care shall be exercised so as not to scratch glass.
- B. Marks, stains, fingerprints, and other soil and dirt shall be removed from all work.
- C. Waxed woodwork shall be cleaned and polished.
- D. Hardware shall be cleaned and polished of all traces; this shall include removal of stains, dust, dirt, paints, and blemishes.
- E. Spots, soil, paint, plaster, and concrete shall be removed from tile; tile work shall be washed afterwards.
- F. Fixtures, equipment, and visible piping and ducts shall be cleaned, and stains, paint, dirt, and dust shall be removed.
- G. Temporary floor protections shall be removed; floors shall be cleaned, waxed, and buffed.
- H. Dust, cobwebs, and traces of insects and dirt shall be removed.

Marred surfaces shall be repaired, patched, and touched up to specified finish to match adjacent surfaces.

All interior spaces including inside cabinets shall be vacuum cleaned.

Air handling filters and light bulbs shall be replaced if units were operated during construction. Ducts, blowers and coils shall be cleaned if air-handling units were operated without filters during construction.

***** END OF SECTION *****

SECTION 01720

PROJECT RECORD DOCUMENTS

1.0 RECORD DOCUMENTS

- 1.1 Maintain at the Project site, available to the Owner and Construction Manager, one (1) copy of the Contract Documents, shop drawings and other submittals, in good order.
- A. Mark and record field changes and detailed information contained in submittals and change orders.
 - B. Record actual depths, horizontal and vertical location of underground pipes, duct banks and other buried utilities. Reference dimensions to permanent surface features.
 - C. Identify specific details of pipe connections, location of existing buried features located during excavation, and the final locations of piping, equipment, electrical conduits, manholes, and pull boxes.
 - D. Identify location of spare conduits including beginning, ending and routing through pull boxes, and manholes. Record spare conductors, including number and size, within spare conduits, and filled conduits.
 - E. Provide schedules, lists, layout drawings, and wiring diagrams.
 - F. Make annotations with erasable colored pencil conforming to the following color code:

Additions:	Red
Deletions:	Green
Comments	Blue
Dimensions:	Graphite

- 1.2 Maintain documents separate from those used for construction. Label documents "RECORD DOCUMENTS."
- 1.3 Record Documents shall be updated at least once each week and shall be available to the Construction Manager for review. Keep documents current. Record required information at the time the material and equipment is installed and before permanently concealing.
- 1.4 Deliver Record Documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor prior to request for Final Payment. The Contractor may transmit the drawings electronically in a format acceptable to the District.
- 1.5 Record documents shall be available for the Construction Manager to review to ascertain that changes have been recorded.
- 1.6 Failure of the Contractor to keep current with the updating of the Record Documents shall be grounds for withholding monies from partial payment estimates as specified in Section 00700-8.3.2, Other Withholds.

*** END OF SECTION ***

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01730

OPERATION AND MAINTENANCE DATA

1.0 OPERATION AND MAINTENANCE MANUALS

1.1 Preliminary Manuals

Prior to the delivery and installation of any item of machinery or equipment the Contractor shall submit a preliminary Operation and Maintenance Manual and the Equipment Summary Form. The preliminary manuals will be reviewed by the Construction Manager for general content, and the Construction Manager will advise the Contractor within five days of receipt if the manual is acceptable in general content for the delivery and installation of the equipment or machinery. The preliminary manuals must at a minimum include the detailed manufacturer's requirements for storage and installation of the equipment. No equipment or machinery shall be delivered or installed if the general content and storage and installation instructions of the manual are found to be deficient.

1.2 Operation and Maintenance Manual Submittal

The final Operation and Maintenance Manuals must be submitted and favorably reviewed prior to the initiation of the Process Testing for such machinery or equipment. Two (2) copies of each favorably reviewed Operation and Maintenance Manual shall be provided.

All manuals shall be bound in a 3-ring binder with rigid covers, marked to indicate the specific equipment furnished for this project, and shall utilize tab sheets to organize the information. Operation and maintenance manuals shall include:

1. Cover Page: Equipment Name, equipment tag number, project name, Owner's name, and other data as appropriate.
2. Laminated Table of Contents: General description of information provided within each tab section.
3. Equipment Summary Form: Completed form in the format attached below. Insert Equipment Summary Form after the tab sheet of each equipment section. The manufacturer's standard form will not be acceptable. Manuals submitted without equipment summary form fully completed, including equipment identification number, will be rejected and returned.
4. The manufacturer warrantee certificate.
5. Lubrication Information: Required lubricants and lubrication schedules.
6. Control Diagrams: Internal and connection wiring, including logic diagrams, wiring diagrams for control panels, ladder logic for computer based systems, and connections between existing systems and new additions, and adjustments such as calibrations and set points for relays, and control or alarm contact settings.
7. Start-up Procedures: Recommendations for installation, adjustment, calibration, and troubleshooting.
8. Operating Procedures:
 - a. Step-by-step procedures for starting, operating, and stopping equipment under specified modes of operation.
 - b. Include safety precautions and emergency operating shutdown instructions.
9. Preventative Maintenance Procedures: Recommended steps and schedules for maintaining equipment.
10. Overhaul Instructions: Directions for disassembly, inspection, repair and reassemble of the

equipment; safety precautions; and recommended tolerances, critical bolt torques, and special tools that are required.

11. Parts List: Generic title and identification number of each component part of equipment; include bearing manufacturer, model and ball or roller pass frequencies for every bearing.
12. Spare Parts List: Recommended number of parts to be stored at the site and special storage precautions.
13. Drawings: Exploded view or plan and section views with detailed callouts.
14. Provide electrical and instrumentation schematic record drawings.
15. Source (Factory) Quality Control Test Results: Provide copies of factory test reports as specified in the Technical Specifications.
16. Field Quality Control Test Results: After field testing is completed, insert field test reports as specified in the Technical Specifications.

In addition, all operation and maintenance manuals for electrical equipment shall include:

- Equipment ratings
- Calibration curves and rating tables if appropriate
- Control Diagrams

Operation and maintenance manuals for complex equipment shall also include:

- Alternate specified operating modes
- Normal shutdown instructions
- Long term shutdown instructions

1.3 **Electronic Operation and Maintenance**

All final Operation and Maintenance Manuals and materials shall also be provided in electronic data format on CD-ROM in the following formats:

- All text portions of the Operations and Maintenance Manual specifically tailored for this project shall be provided in HTML format.
- All graphical portions of the Operations and Maintenance Manual specifically tailored for this project shall be provided in GIF (schematics, line drawings, etc.) with a minimum 400-bpi resolution or JPG (photos, etc.) format.
- All shop drawings shall be provided in AutoCAD format, version 10 or later.
- All forms that may be required for maintenance shall be provided in MS Word, version 2010 or later format.

Standards shall be provided in MS Word, version 2010 or later format, with tracked changes.

- All other documents including, but not limited to, brochures that need to be scanned that are not specifically tailored for this project shall be provided in searchable PDF format.

Equipment Summary Form

1. Equipment Item: _____
Is it a packaged unit, i.e. pump, motor, shaft? Yes ____ No ____
If yes, please detail. _____

2. How many: _____
3. Cost: _____
4. Manufacturer: _____
Address: _____
Phone #: _____ Fax: _____
Email: _____ Website: _____
5. Equipment Identification Numbers:
Serial Number: _____
Model: _____
Part #: _____
Equipment ID No. _____
6. Location of Equipment: _____
7. Weight of Individual Components (Over 100 Pounds): _____

8. Nameplate Data:
- | | | | |
|-------------------------|--------------|----------------|-------|
| Horsepower: | _____ | RPM: | _____ |
| Amperage: | _____ | Size: | _____ |
| Voltage: | _____ | Frame Size: | _____ |
| Service Factor (S.F.): | _____ | Seal Size: | _____ |
| Speed: | _____ | Seal Type: | _____ |
| Enclosure Type: | _____ | Bearings: | _____ |
| GPM: | _____ | Impeller Size: | _____ |
| Maximum Capacity @ | _____ ft TDH | Other: | _____ |
| Design Point Capacity @ | _____ ft TDH | | |
9. Manufacturer's Local Representative:
Name: _____
Address: _____
Telephone Number: _____

Email: _____ Website: _____

10. Maintenance Requirements (including schedules):

TASK	SCHEDULE

11. Lubricant List:

12. Spare Parts (with accurate part #'s):

13. Comments:

14. General Info:

Year Installed: _____

Expected Life: _____

Project Name & Number: _____

Design Engineer: _____

15. Warranty:

Start Date: _____

Expiration Date: _____

Prorated: _____

*** END OF SECTION ***

SECTION 01740

WARRANTIES AND BONDS

1.0 GUARANTEE OF WORK

The Contractor hereby agrees to make, at its own expense, all repairs or replacements necessitated by defects in materials or workmanship, supplied under terms of this Contract, and pay for any damage to other works resulting from such defects, which becomes evident within one (1) year after the date of acceptance of the project or the Substantial Completion date whichever is applicable or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents. The Contractor further assumes responsibility for a similar guarantee for all work and materials provided by subcontractors or manufacturers of packaged equipment components. The Contractor also agrees to indemnify, defend, and hold the Owner harmless from liability of any kind arising from damage due to said defects.

The Contractor shall execute and submit a completed Warranty Form in the format as appended to this section for the Work, and any portion of the Work possessed in accordance with Paragraph 00700-3.4, **Owner's Right to Use or Occupy**. The Warranty Form shall be submitted prior to the Substantial Completion date or the final acceptance of the project or within five (5) days of the occupancy or use of a portion of the Work, whichever is applicable. In addition the Contractor shall submit the other specified additional warranties, guarantees, and bonds from manufacturers and suppliers.

The Contractor shall, upon the receipt of notice in writing from the Owner, promptly make all repairs arising out of defective materials, workmanship, or equipment. The Owner is hereby authorized to make such repairs, and the Contractor and its Surety shall be liable for the cost thereof, if ten (10) days after giving of such notice to the Contractor, the Contractor has failed to make or undertake the repairs with due diligence. In case of emergency, where in the opinion of the Owner delay could cause serious loss or damage, repairs may be made without notice being sent to the Contractor, and the expense in connection therewith shall be charged to the Contractor, and its Surety shall be liable for the cost thereof.

Prior to the expiration of the Warranty period, the Owner reserves the right to hold a meeting and require the attendance of the Contractor. The purpose of the meeting is to review warranties, bonds and maintenance requirements and determine required repair or replacement of defective items.

For the purpose of this paragraph, acceptance of the Work or a portion of the Work by the Owner, shall not extinguish any covenant or agreement on the part of the Contractor to be performed or fulfilled under this Contract which has not, in fact, been performed or fulfilled at the time of such acceptance. All covenants and agreements shall continue to be binding on the Contractor until they have been fulfilled.

The Owner and the Contractor agree that warranty on the parts of the work possessed and used by the Owner in accordance with Paragraph 00700-3.4, **Owner's Right to Use or Occupy**, shall commence on the date that the Owner takes possession of such work and so notifies the Contractor in writing. The Owner and the Contractor further agree that such possession, and use of the work shall not be deemed as Substantial Completion or acceptance of any other part of the Work.

If, after installation, the operation or use of the materials or equipment furnished under this Contract

proves to be unsatisfactory to the Construction Manager or Owner, the Owner shall have the right to operate and use such materials or equipment until it can, without damage to the Owner, be taken out of service for correction or replacement. Such period of use of the defective materials or equipment pending correction or replacement shall in no way decrease the guarantee period required for the acceptable corrected or replaced items of materials or equipment. Warranty Period for equipment shall be extended by the number of days from the date the equipment is found by the Owner to be non-functional or defective to the date the contractor repairs and makes fully operational the same equipment.

Nothing in this Section shall be construed to limit, relieve or release the Contractor's, subcontractor's and equipment supplier's liability to the Owner for damages sustained as the result of latent defects in the equipment furnished caused by the negligence of the supplier's agents, employees or subcontractors. Stated in another manner, the warranty contained in this Section shall not amount to nor shall it be deemed to be a waiver by the Owner of any rights or remedies (or time limits in which to enforce such rights or remedies) it may have against the supplier of the equipment to be furnished under these Specifications for defective workmanship or defective materials under the laws of this State pertaining to acts of negligence.

WARRANTY FORM

Warranty For

DSRSD

WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT

We hereby guarantee the **WWTP HVAC Replacements (CIP 22-P010) Project** that we have constructed for a period of one (1) year from _____ the date of acceptance _____ of the work/substantial completion by the DSRSD

The following are excluded from the provisions of this warranty:

We agree that if any of the equipment should fail due to any reason other than improper maintenance or improper operation, if any pipe or appurtenances should develop leakage, or if any settlement of fill or backfill occurs, or should any portion of the work fail to fulfill any of the requirements of the Specifications, we will, within ten (10) days after written notice of such defects, commence to repair or replace the same together with any other work which may be damaged or displaced in so doing.

In the event of our failure to comply with the above with the above mentioned conditions within a reasonable time after being notified, or should the exigencies of the case require repairs or replacements to be made before we can be notified or respond to notification, we do hereby authorize the DSRSD to proceed to have the defect repaired and made good at our expense, and we will pay the cost therefor upon demand.

The warranty provided herein shall not be in lieu of, but shall be in addition to any warranties or other obligations otherwise imposed by the Contract Documents and by law.

Contractor: _____

Signed: _____

Titled: _____

Date: _____

***** END OF SECTION *****

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01750

SPARE PARTS AND MAINTENANCE MATERIALS

1.0 RESPONSIBILITY FOR SPARE PARTS AND TOOLS

Where equipment, special repair tools, safety equipment, or other loose parts are specified to be furnished, they shall be stored by the Contractor until permanent building storage areas are complete, secure, and lockable.

The Contractor shall inventory such parts and transmit the inventory, using the form appended to this section, the Construction Manager at an agreed upon time. All spare parts and tools shall be labeled and neatly packed into boxes with contents of each box labeled and secured to the box. Any items over fifty (50) pounds shall be in wooden crates with hinged and lockable lids, placed on pallets and delivered to the Owner at a location to be defined.

All safety related items shall be provided prior to testing. Specified spare parts shall be transferred for related equipment prior to the use or occupancy of equipment as provided in Section 00700-3.4, **Owner's Right to Use or Occupy**, and Section 00700-8.6, **Substantial Completion**.

*****END OF SECTION*****

DSRSD

WWTP HVAC REPLACEMENTS (CIP 22-P010) PROJECT

Transfer of Spare Parts

No. _____

Equipment: _____

Manufacturer: _____

Specification Section: _____

Spare Parts

<u>Item</u>	<u>Quantity</u>	<u>Description</u>	<u>Part #</u>

Reviewed by Construction Manager: _____ Date: _____

Transferred by Contractor: _____ Date: _____

Accepted by DSRSD: _____ Date: _____

*****END OF SECTION *****

DIVISION 23 – HVAC

SECTION 23 01 30.51
HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleaning of HVAC duct system, equipment, and related components.
- B. Testing and inspection agency employed by Owner.

1.02 DEFINITIONS

- A. HVAC System: For purposes of this section, the surfaces to be cleaned include all interior surfaces of the heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system, including the inside of air distribution equipment, coils, and condensate drain pans; see NADCA ACR for more details.
 - 1. Makeup air system is required to be cleaned.
 - 2. Exhaust-only system is required to be cleaned.

1.03 REFERENCE STANDARDS

- A. NADCA ACR - The NADCA Standard for Assessment, Cleaning, and Restoration of HVAC System; 2021.
- B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.
- C. UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Project Cleanliness Evaluation and Cleaning Plan, as specified.
- C. Project Closeout Report: Include field quality control reports, evidence of satisfactory cleaning, and documentation of items needing further repair.

1.05 QUALITY ASSURANCE

- A. Information Available to Contractor: Upon request, Owner will provide the following:
 - 1. One copy of original construction drawings of HVAC system.
- B. Cleaning Contractor Qualifications: Company specializing in the cleaning and restoration of HVAC systems as specified in this section.
 - 1. Certified by one of the following:
 - a. NADCA, National Air Duct Cleaners Association: www.nadca.com.
 - 2. Having minimum of three years documented experience.
 - 3. Employing for this project a supervisor certified as an Air Systems Cleaning Specialist by NADCA.

PART 2 PRODUCTS

2.01 TOOLS AND EQUIPMENT

- A. Vacuum Devices and Other Tools: Exceptionally clean, in good working order, and sealed when brought into the facility.
- B. Vacuum Devices That Exhaust Air Inside Building, Including Hand-Held and Wet Vacuums: Equipped with HEPA filtration with 99.97 percent collection efficiency for minimum 0.3-micron size particles and DOP test number.
- C. Vacuum Devices That Exhaust Air Outside Building, Including Truck- and Trailer-Mounted Types: Equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system; exhausted in manner that prevents contaminant re-entry to building; compliant with applicable regulations as to outdoor environmental contamination.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

- A. Comply with applicable federal, state, and local requirements.
- B. Perform cleaning, inspection, and remediation in accordance with the recommendations of NADCA "Assessment, Cleaning and Restoration of HVAC Systems" (ACR) and as specified herein.
- C. Where NADCA ACR uses the terms "recommended", "highly recommended", or "ideally" in regard to a certain procedure or activity, do that unless it is clearly inapplicable to the project.
- D. Take precautions to prevent introduction of additional hazards into occupied spaces.
- E. Obtain Owner's approval of proposed temporary locations for large equipment.
- F. Designate a decontamination area and obtain Owner's approval.
- G. When portions of the facility are to remain occupied or in operation during cleaning activities, provide adequate controls or containment to prevent access to spaces being cleaned by unauthorized persons and provide detailed instructions to Owner as to these controls or containment.
- H. If unforeseen mold or other biological contamination is encountered, notify Engineer immediately, identifying areas affected and extent and type of contamination.
- I. All areas within the laboratory spaces that are subject to construction dirt/debris shall be covered with Visqueen and kept airtight throughout construction. Upon sufficient completion of construction within lab spaces, the areas shall be sufficiently cleaned to the Owner's approval and Visqueen removed to allow for the Owner to re-occupy the laboratory.

3.02 EXAMINATION

- A. Prior to the commencement of any cleaning work, prepare and submit to Engineer a project evaluation and plan for this project, including considerations recommended in NADCA ACR.
- B. Inspect the system as required to determine appropriate methods, tools, equipment, and protection.
- C. Start of cleaning work constitutes acceptance of existing conditions.
- D. When concealed spaces are later made accessible, examine and document interior conditions prior to beginning cleaning.
- E. Document all instances of mold growth, rodent droppings, other biological hazards, and damaged system components.

3.03 PREPARATION

- A. When cleaning work might adversely affect life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.
- B. Ensure that electrical components that might be adversely affected by cleaning are de-energized, locked out, and protected prior to beginning work.
- C. Air-Volume Control Devices: Mark the original position of dampers and other air-directional mechanical devices inside the HVAC system prior to starting cleaning.
- D. Access to Concealed Spaces: Use existing service openings and make additional service openings as required to accomplish cleaning and inspection.
 - 1. Do not cut openings in non-HVAC components without obtaining the prior approval of Owner.
 - 2. Make new openings in HVAC components in accordance with NADCA Standard 05; do not compromise the structural integrity of the system.
 - 3. Do not cut service openings into flexible duct; disconnect at ends for cleaning and inspection.

- E. Ceiling Tile: Lay-in ceiling tile may be removed to gain access to HVAC systems during the cleaning process; protect tile from damage and reinstall upon completion; replace damaged tile.

3.04 CLEANING

- A. Use any cleaning method recommended by NADCA ACR unless otherwise specified; do not use methods prohibited by NADCA ACR, or that will damage HVAC components or other work, or that will significantly alter the integrity of the system.
- B. Obtain Owner's approval before using wet cleaning methods; ensure that drainage is adequate before beginning.
- C. Ducts: Mechanically clean all portions of ducts.
- D. Registers, Diffusers, and Grilles: When removing, take care to prevent containment exposure due to accumulated debris.
- E. Coils: Follow NADCA ACR completely including measuring static pressure drop before and after cleaning; do not remove refrigeration coils from system to clean; report coils that are permanently impacted.
- F. Collect debris removed during cleaning; ensure that debris is not dispersed outside the HVAC system during the cleaning process.
- G. Store contaminated tools and equipment in polyethylene bags until cleaned in the designated decontamination area.

3.05 REPAIR

- A. Repair openings cut in the ventilation system so that they do not significantly alter the airflow or adversely impact the facility's indoor air quality.
- B. At insulated ducts and components, accomplish repairs in such a manner as to achieve the equivalent thermal value.
- C. Reseal new openings in accordance with NADCA Standard 05.
- D. Reseal rigid fiber glass duct systems using closure techniques that comply with UL 181 or UL 181A.
- E. When new openings are intended to be capable of being re-opened in the future, clearly mark them and report their locations to Owner in project report documents.

3.06 FIELD QUALITY CONTROL

- A. Ensure that the following field quality control activities are completed prior to application of any treatments or coatings and prior to returning HVAC system to normal operation.
- B. Visually inspect all portions of the cleaned components; if not visibly clean as defined in NADCA ACR, re-clean and reinspect.
- C. Coils: Cleaning must restore the coil pressure drop to within 10 percent of the coil's original installed pressure drop; if original pressure drop is not known, coil will be considered clean if free of foreign matter and chemical residue based on visual inspection.
- D. Notify Engineer when cleaned components are ready for inspection.
- E. Notify Owner's testing and inspection agency when cleaned components are ready for inspection.
- F. Owner reserves the right to verify cleanliness using NADCA ACR Surface Comparison Testing or NADCA Vacuum Test.
- G. When directed, re-clean components until they pass.
- H. Contractor shall bear the costs of retesting due to inadequate cleaning.
- I. Submit evidence that all portions of the system required to be cleaned have been cleaned satisfactorily.

3.07 ADJUSTING

- A. After satisfactory completion of field quality control activities, restore adjustable devices to original settings, including, but not limited to, dampers, air directional devices, valves, fuses, and circuit breakers.

3.08 WASTE MANAGEMENT

- A. Double-bag waste and debris in 6 mil, 0.006 inch thick polyethylene plastic bags.
- B. Dispose of debris off-site in accordance with applicable federal, state and local requirements.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Stencils.
- E. Pipe markers.
- F. Ceiling tacks.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.03 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Tags.
- C. Automatic Controls: Tags. Key to control schematic.
- D. Control Panels: Nameplates.
- E. Ductwork: Nameplates.
- F. Major Control Components: Nameplates.
- G. Piping: Tags.
- H. Pumps: Nameplates.
- I. Thermostats: Nameplates.
- J. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC; www.advancedgraphicengraving.com/#sle.
 - 2. Kolbi Pipe Marker Co; www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products, a Tricor Direct Company; www.seton.com/#sle.
 - 4. Substitutions: See Division 1.
- B. Nameplates:
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.

4. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
 1. Advanced Graphic Engraving; www.advancedgraphicengraving.com/#sle.
 2. Brady Corporation; www.bradycorp.com/#sle.
 3. Brimar Industries, Inc; www.pipemarker.com/#sle.
 4. Craftmark Pipe Markers; www.craftmarkid.com/#sle.
 5. Kolbi Pipe Marker Co; www.kolbipipemarkers.com/#sle.
 6. Seton Identification Products, a Tricor Company; www.seton.com/#sle.
 7. Substitutions: See Division 1.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 ADHESIVE-BACKED DUCT MARKERS

- A. Manufacturers:
 1. Brimar Industries, Inc; www.pipemarker.com/#sle.
 2. Craftmark Pipe Markers; www.craftmarkid.com/#sle.
 3. Kolbi Pipe Marker Co; www.kolbipipemarkers.com/#sle.
 4. Substitutions: See Division 1.
- B. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.
- C. Style: Individual Label.
- D. Color: Yellow/Black.

2.05 STENCILS

- A. Manufacturers:
 1. Brimar Industries, Inc; www.pipemarker.com/#sle.
 2. Craftmark Pipe Markers; www.craftmarkid.com/#sle.
 3. Insite Solutions, LLC; www.stop-painting.com/#sle.
 4. Kolbi Pipe Marker Co; www.kolbipipemarkers.com/#sle.
 5. Substitutions: See Division 1.
- B. Stencils: With clean cut symbols and letters of following size:
 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
 4. Ductwork and Equipment: 2-1/2 inch high letters.

2.06 PIPE MARKERS

- A. Manufacturers:
 1. Brade Corporation; www.bradycorp.com/#sle
 2. Brimar Industries, Inc; www.pipemarker.com/#sle.
 3. Craftmark Pipe Markers; www.craftmarkid.com/#sle.
 4. Kolbi Pipe Markers; www.kolbipipemarkers.com/#sle.
 5. MIFAB, Inc; www.mifab.com/#sle.
 6. Seton Identification Products, a Tricor Company; www.seton.com/#sle.
 7. Substitutions: See Division 1.

- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Color code as follows:
 - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
 - 2. Toxic and Corrosive Fluids: Orange with black letters.
 - 3. Compressed Air: Blue with white letters.

2.07 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark Pipe Markers; www.craftmarkid.com/#sle.
- B. Description: Steel with 3/4 inch diameter color coded head.
- C. Color code as follows:
 - 1. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- G. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Field quality-control testing of Laboratory fume hoods.
- D. Measurement of final operating condition of HVAC systems.
- E. Sound measurement of equipment operating conditions.

1.02 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016, with Errata.
- C. AABC MN-1 - AABC National Standards for Total System Balance; 2002.
- D. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- E. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, with Errata (2017).
- F. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to Engineer.
 - 2. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Engineer and other installers to sufficiently understand the design intent for each system.
 - 3. Include at least the following in the plan:
 - a. Preface: An explanation of the intended use of the control system.
 - b. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - d. Identification and types of measurement instruments to be used and their most recent calibration date.
 - e. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - f. Final test report forms to be used.
 - g. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
 - 2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
 - h. Confirmation of understanding of the outside air ventilation criteria under all conditions.
 - i. Method of checking building static and exhaust fan and/or relief damper capacity.
 - j. Methods for making coil or other system plant capacity measurements, if specified.
 - k. Time schedule for TAB work to be done in phases (by floor, etc.).

- l. Description of TAB work for areas to be built out later, if any.
 - m. Exhaust fan, air handler, chemical and Type II hoods balancing and capacity verifications, including any required room pressure differentials using actual flow rate calculations from the EMS.
 - n. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Field Quality-control Testing of Laboratory Fume Hoods:
 - 1. Product Data sheets for all equipment proposed for use in on-site as-installed testing.
 - 2. Sample Test Report.
 - 3. List of laboratory fume hoods, snorkels, and type II hoods to be tested. Submit a minimum of one week prior to commencement of testing.
 - 4. Test data demonstrating that each type of fume hood provided for the project has been successfully tested in the factory.
- D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Test Instruments:
 - 1. Balancing Contractor shall provide all necessary test instruments required to take readings including, but not limited to: Pressure gauges, thermometers, humidity instruments, sling psychrometers, flow meter read out instruments (differential pressure gauges, etc.), air flow hoods, pitot tubes, anemometers, ammeters, voltmeters, tachometers, sound level meters, vibration analyzers, chilled mirror, etc., as required to perform measurements required to perform the work of this section and applicable Commissioning specifications. These instruments are considered to be the property of the balancing contractor and required for usual performance of testing and balancing work. No allowance will be made for contractor's failure to provide adequate test instruments. The laboratories must be tested in operational and non occupied modes, adjust position of sashes on hoods, assure that the BMS is in occupied mode time of day to simulate these conditions. Testing of proximity sensors on hoods is a requirement. Refer to manufacturer's recommended function of operation of proximity sensors. Verify the room air flow entering and leaving flow rates at both modes and verify the room pressures relative to the corridors as designated by the Owner.
- B. Incidental Equipment and Materials:
 - 1. Balancing Contractor shall provide at his own expense incidental and/or temporary equipment required to make such readings as required for the performance of this work. Such incidentals include but are not limited to: pipe nipples, couplings, tees, elbows, plugs and caps, gauge valves, teflon tape, and other miscellaneous fittings required to make readings required for balancing work. Incidental materials and fittlings shall be removed and the facility restored to 'as found' condition after completion of readings and balancing activities.
- C. Tools and Labor:

1. Balancing Contractor shall provide all tools and labor required to effect necessary readings for balancing work, including but not limited to electric drill and bits, wrenches, pliers, screwdrivers, teflon tape, flashlights, rags, pocket knife or leatherman, pencils, pens, test forms, paper, and other minor tools required for work of this section.
2. Provide labor to alter minor piping and other systems to allow temporary installation of test gages and thermometers, etc., required to make necessary readings. This includes removal of plugs on pump castings and temporary installation of piping, valves, gauges and nipples required to attach pressure gauges for readings, drilling required holes in ductwork and subsequent installation of plugs to allow ductwork pitot tube traverses, connections to flow elements, including a reasonable effort to clear obstructions from test ports, etc. Remove temporary fittings, valves and gauges at completion of readings and restore equipment to 'as found' condition.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 4. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 2. Having minimum of three years documented experience.
 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Air coil fins are cleaned and combed.
 8. Access doors are closed and duct end caps are in place.
 9. Air outlets are installed and connected.
 10. Duct system leakage is minimized.
 11. Hydronic systems are flushed, filled, and vented.
 12. Pumps are rotating correctly.
 13. Proper strainer baskets are clean and in place.
 14. Service and balance valves are open.
 15. New air moving devices are cleaned and free of dust, dirt and oils on sheet metal panels.

- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations.
- B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 FUME HOOD TESTING (ON SITE)

- A. General: Test fume hoods as installed to assess airflow velocity, airflow visualization, and level of containment. Conform to tests per CCR Title 8 section 5154.1 NFPA 45 and ANSI / AIHA Z 9.5. Perform tests with static mode (set sash position) conditions. Conduct testing as outlined below for 100% of the hoods provided in the Project.
- B. Preparation: Visit the project site to confirm that construction activities related to the fume hood system(s) and equipment are complete. Review design documents and Contractor's submittals. Verify that mechanical ventilation systems serving the space are functioning and operating in the normal mode. Notify Owner in writing, if conditions exist which preclude proper fume hood testing. Starting of testing constitutes acceptance of site conditions.
- C. Testing Requirements:
 - 1. Perform the following tests, in order:
 - a. Airflow Velocity Test.
 - b. Airflow Visualization Test.
 - c. Tracer Gas Containment Test.
 - 2. If more than one test procedure is selected, proceed to the next test only if any unsafe condition discovered during current test has been successfully rectified.
 - 3. Airflow Velocity Test: Comply with Section 9 of NEBB (FHT) Fume Hood Testing Standard - current edition.
 - 4. Test all chemical hoods for hood face velocities against sash position, and at operational height, fully open and fully closed height.
 - 5. Tracer Gas Containment Test:
 - a. Conduct a static mode test of the hood and laboratory configuration. Conduct testing in accordance with ASHRAE Std 110, except as modified herein:
 - 1) Test hood with simulated scientific apparatus set-up within the hood. Apparatus to consist of: two (2) each 1 gal. round paint cans, one (1) 1' by 1' by 1' cardboard box, and three (3) each 6" by 6" by 12" high cardboard boxes.

Position these items from 6 to 10 inches behind the sash, randomly distributed, and supported off of the work surface by 2 inch by 2 inch by 2 inch block of any material.

- 2) 6 liters per minute release rate for tracer gas.
- 3) Conduct only at the center position for the manikin.
- 4) Each tracer gas test duration to be 5 minutes.
- 5) Acceptable test results will be 0.05 PPM or better.
- 6) At the conclusion of each 5-minute test there will be three rapid walk-by at 1' behind the manikin. Each walk-by to be spaced 30 seconds apart. If a rise in test gas concentration occurs, it cannot exceed 0.10 ppm and must return to 0.05 ppm within 15 seconds.
- 7) There must be a minimum of three and a maximum of five people in the space in which the fume hood is located during the test procedure.
- 8) Representatives of the Architect, Engineer, Owner, and Contractor must witness the tests.
- 9) Test of Alarm: Shut off the fume hood exhaust and verify that the individual fume hood alarm activates.
- 10) Test individual controls: Test any controls that are provided at the fume hood such as unoccupied cycle override, alarm override, etc.

3.07 AIR SYSTEM PROCEDURE

- A. After systems are balanced, work with the controls contractor to determine optimal final setpoint of fan system laboratory airflow offset. Final setpoint shall be determined by being able to maintain a supply / exhaust airflow differential sufficient to maintain the individual labs pressure differentials.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- E. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required, including sheaves and labor. Vary branch air quantities by damper regulation.
- F. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- H. Adjust outside air automatic dampers on strobic fan system and supply and exhaust air flow control valves in both design conditions. Dampers shall be adjusted to maintain the desired air flow differentials for each lab area and to assure that the required stack velocity is maintained at the discharge of the strobic fan.

3.08 WATER SYSTEM PROCEDURE

- A. After systems are balanced, work with the controls contractor to determine optimal final setpoint of pump system static pressure controls. Final setpoint shall be determined by supplying design water flow to all zones with no valves throttling.
- B. Adjust water systems to provide required or design quantities.
- C. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- D. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.09 SCOPE

- A. Test, adjust, and balance the following:
 - 1. HVAC Pumps.
 - 2. Air Cooled Water Chillers.
 - 3. Air Handling Units.
 - 4. Air Terminal Units.
 - 5. Air Inlets and Outlets.
 - 6. Strobic Exhaust Fans.
 - 7. Laboratory air flow valves, supply, exhaust and make up systems.
 - 8. Differential air flow into and out of each lab.
 - 9. Pressure differentials between adjacent rooms and corridors.

3.10 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
- B. Pumps:
 - 1. Identification/number.
 - 2. Manufacturer.
 - 3. Size/model.
 - 4. Impeller.
 - 5. Service.
 - 6. Design flow rate, pressure drop, BHP.
 - 7. Actual flow rate, pressure drop, BHP.
 - 8. Discharge pressure.
 - 9. Suction pressure.
 - 10. Total operating head pressure.
- C. Chillers:
 - 1. Identification/number.
 - 2. Manufacturer.
 - 3. Capacity.
 - 4. Model number.
 - 5. Serial number.
 - 6. Evaporator entering water temperature, design and actual.
 - 7. Evaporator leaving water temperature, design and actual.
 - 8. Evaporator pressure drop, design and actual.
 - 9. Evaporator water flow rate, design and actual.
- D. Cooling Coils:
 - 1. Identification/number.
 - 2. Location.
 - 3. Service.
 - 4. Manufacturer.
 - 5. Air flow, design and actual.
 - 6. Entering air DB temperature, design and actual.
 - 7. Entering air WB temperature, design and actual.
 - 8. Leaving air DB temperature, design and actual.
 - 9. Leaving air WB temperature, design and actual.
 - 10. Water flow, design and actual.

11. Water pressure drop, design and actual.
 12. Entering water temperature, design and actual.
 13. Leaving water temperature, design and actual.
 14. Air pressure drop, design and actual.
- E. Heating Coils:
1. Identification/number.
 2. Location.
 3. Service.
 4. Manufacturer.
 5. Air flow, design and actual.
 6. Water flow, design and actual.
 7. Water pressure drop, design and actual.
 8. Entering water temperature, design and actual.
 9. Leaving water temperature, design and actual.
 10. Entering air temperature, design and actual.
 11. Leaving air temperature, design and actual.
 12. Air pressure drop, design and actual.
- F. Exhaust Fans:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Air flow, specified and actual.
 6. Total static pressure (total external), specified and actual.
 7. Inlet pressure.
 8. Discharge velocity at a minimum of 5 laboratory flow rates.
 9. Fan RPM at tested flow rates.
- G. Duct Traverses:
1. System zone/branch.
 2. Duct size.
 3. Area.
 4. Design velocity.
 5. Design air flow.
 6. Test velocity.
 7. Test air flow.
 8. Duct static pressure.
 9. Air temperature.
- H. Terminal Unit Data:
1. Manufacturer.
 2. Type, constant, variable, single, dual duct.
 3. Identification/number.
 4. Location.
 5. Model number.
 6. Size.
 7. Minimum static pressure.
 8. Minimum design air flow.
 9. Maximum design air flow.
 10. Maximum actual air flow.
 11. Inlet static pressure.
 12. Reaction time of air control valves against hood sash positioning.

END OF SECTION

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Weather barrier coatings.
- C. Jacketing and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- E. ASTM C1775 - Standard Specification for Laminate Protective Jacket and Tape for Use over Thermal Insulation for Outdoor Applications; 2014.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Division 1 for submittal requirements.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.05 REGULATORY REQUIREMENTS

- A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E 84.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.
- B. Conform to California State CCR Title 24 Chapter 6 for minimum duct insulation requirements.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:

- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K value: .24 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

2.03 GLASS FIBER, RIGID

- A. Manufacturer:
 - 1. Johns Manville; www.jm.com/#sle.
 - 2. Substitutions: See Division 1.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
 - 1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 450 degrees F.
 - 3. Maximum Water Vapor Absorption: 5.0 percent.
 - 4. Minimum Noise Reduction Criteria: Per ASTM C423 0.7 for 1 inch thickness.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Secure with pressure-sensitive tape.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Install all ductwork insulation on exterior of duct. Interior lined ductwork is not permitted.
- D. Insulated Ducts Conveying Air Below Ambient Temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- E. Insulated Ducts Conveying Air Above Ambient Temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- F. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.03 SCHEDULES

- A. Required Thickness: Insulation thickness shall be selected to conform to California State CCR Title 24 Chapter 6 prescribed R-values:
 - 1. Ducts on exterior of building or other unconditioned spaces: R-8
 - a. For maximum K-values as specified herein:
 - 1) Glass Fiber, Rigid: K = 0.25; Minimum thickness = 2"
 - 2) Glass Fiber Round Duct Liner: K = 0.23; Minimum thickness = 2"
 - 2. Ducts interior to building, not in a directly conditioned space: R-4.2
 - a. For maximum K-values as specified herein:
 - 1) Glass Fiber, Flexible: K = 0.29; Minimum thickness = 1-1/2"
 - 2) Glass Fiber, Rigid: K = 0.24; Minimum thickness = 1"
 - 3) Glass Fiber Round Duct Liner: K = 0.23; Minimum thickness = 1"
 - 3. Ducts in directly conditioned space: None required.
- B. Insulation Types by Location:
 - 1. Exterior Ducts: Provide Glass Fiber, Rigid insulation on exterior of ductwork with galvanized sheet metal duct shield.
 - 2. Interior Ducts - not in conditioned space: Provide Glass Fiber Flexible wrap on exterior of ductwork .

END OF SECTION

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jacketing and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020a.
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.
- F. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.
- I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.
- J. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- L. California State CCR Title 24 Chapter 6.

1.03 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723. Conform to California State Title 24 for thermal resistance (R-value) of insulations.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturers:
 - 1. JP Lamborn Co; Thermal Sleeve MT: www.jpflex.com/#sle.
 - 2. Substitutions: See Division 1.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 1,200 degrees F.
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure-sensitive tape.
- D. Outdoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- E. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

2.03 GLASS FIBER, RIGID

- A. Manufacturers:
 - 1. Knauf Insulation; www.knaufinsulation.com
 - 2. Johns Manville; www.jm.com.
 - 3. Owens Corning Corp.; www.owenscorning.com.
 - 4. Substitutions: See Division 1.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION (CHW PIPE SYSTEMS)

- A. Manufacturers:
 - 1. Armacell LLC; www.armacell.us/#sle.
 - 2. Substitutions: See Division 1.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. 'K' value: ASTM C 177; 0.27 at 75 degrees F.
 - 2. Minimum Service Temperature: Minus 40 degrees F.
 - 3. Maximum Service Temperature: 180 degrees F.
 - 4. Water Vapor Permeability: 0.17 perm-inches, when tested in accordance with ASTM E 96.
 - 5. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
 - 1. Manufacturers:

- a. Armstrong 520 Adhesive.

2.05 JACKETING AND ACCESSORIES

- A. Aluminum Jacket:
 - 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 - 2. Thickness: 0.016 inch sheet.
 - 3. Type: Factory-applied, self-adhesive jacketing.
 - 4. Finish: Smooth.
 - 5. Joining: Longitudinal slip joints and 2 inch laps.
 - 6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate all components that have fluid flowing, including, but not necessarily limited to fittings, joints, unions, flanges, reducers, elbows, tees, branch fittings, strainers, flexible connections, pump bodies, air separators, air scoops, piping to air vents, thermometer and instrumentation wells, piping to pressure gages or other instrumentation, flow meter bodies, flow conditioners, expansion joints, expansion loops, expansion fittings, pipe guides and anchors, pipe supports, control valves and valves (including drain and vent valves), sample lines, heat exchangers and any other hot surface with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers. Any portion of piping or appurtenances conveying fluids over 140 degrees F shall be insulated (with jacket as required for weather protection). "These 'full insulation' requirements shall apply to all systems, regardless of location: interior, exterior, in manholes, accessible trenches, direct buried or any other location. For insulation systems to be used in manholes, trenches or direct buried, see Section 33 61 13 Underground Hydronic Energy Distribution."
- G. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

3.03 SCHEDULE

- A. Heating Systems: Glass fiber insulation with all service jacket:
 1. Required glass fiber insulation thickness for all heating system piping listed herein (based on 2022 Title 24):
 - a. 141 to 200 degrees F: Through 1-1/4" pipe size - 1-1/2" thickness; 1-1/2" and larger pipe size - 2" thickness.
- B. Cooling Systems (2022 Title 24):
 1. Chilled Water: Glass Fiber Insulation with all service jacket and vapor barrier:
 - a. 40 to 60 degrees F: smaller than 1-1/2" pipe size - 1"; 1-1/2" and larger pipe size – 1-1/2" thickness.

END OF SECTION

SECTION 23 09 13
BUILDING AUTOMATION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes control equipment and installation for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-furnished controls.
- B. The control system shall be extension of the existing Siemens Building Automation System and all controllers and software shall match existing or be the latest version of existing.
- C. This Section includes an Energy Reporting and Data Analytics software package.
- D. See "Sequences of Operation" for requirements that relate to this Section.

1.02 RELATED DOCUMENTS

- A. Drawings and Specification Sections of the Contract, including General and Supplementary Conditions, apply to this Section.
 - 1. Division 01 – General and Special Requirements
 - 2. Division 01 – Submittal Requirements
 - 3. Division 01 – Materials and Equipment
 - 4. Division 23 – Common Work Results for HVAC
 - 5. Section 23 – Laboratory Airflow Controls
 - 6. Section 23 – Variable Frequency Drives
 - 7. Division 23 – Testing, Adjusting, and Balancing for HVAC
 - 8. Division 26 – General Electrical Provisions for Electrical Work
 - 9. Division 26 – Common Work Results for Electrical
 - 10. Division 26 – Low Voltage Electrical Power Conductors and Cables
 - 11. Division 26 – Hangers and Supports for Electrical Systems
 - 12. Division 26 – Raceway and Boxes for Electrical Systems
 - 13. Division 26 – Identification for Electrical Systems
 - 14. Division 26 – Wiring Devices

1.03 ABBREVIATIONS

- A. AAC: Advanced Application Controller
- B. AHU: Air Handling Unit.
- C. ALN: Automation Level Network
- D. ASC: Application Specific Controller
- E. ASHRAE: American Society of Heating Refrigerating and Air-Conditioning Engineers
- F. BACnet SC: Building Automation Control Network Secure Connect
- G. BAS: Building Automation System
- H. BC: Building Controller
- I. BIBB: BACnet Interoperability Building Blocks
- J. BIM: Building Information Modeling
- K. BMS: Building Management System.
- L. CFM: Cubic Feet per Minute.
- M. DCIM: Data Center Infrastructure Management
- N. DCV: Demand Controlled Ventilation
- O. DDC: Direct digital controls
- P. EIA: Electronics Industries Alliance
- Q. EMI: Electro-Magnetic Interference

- R. EP: Electric-to-Pneumatic
- S. EPMS: Electrical Power Monitoring System
- T. FAS: Fire Alarm System.
- U. FLN: Floor Level Network
- V. FCU: Fan Coil Unit
- W. HMI: Human Machine Interface
- X. HVAC: Heating, Ventilating and Air Conditioning.
- Y. IEEE: Institute of Electrical and Electronic Engineers
- Z. I/O: Input/Output
- AA. IP: Internet Protocol
- AB. IT: Information Technology
- AC. LAN: Local area network.
- AD. LCD: Liquid Crystal Display
- AE. LED: Light Emitting Diode
- AF. MER: Mechanical Equipment Room.
- AG. MLN: Management Level Network
- AH. MS/TP: Master-slave/token-passing.
- AI. NEMA: National Electric Manufacturers' Association
- AJ. NFPA: National Fire Protection Association
- AK. OEM: Operator Equipment Manufacturer
- AL. PC: Personal Computer
- AM. PICS: Protocol Implementation Conformance Statement
- AN. PID: Proportional Integral Derivative.
- AO. POT: Portable Operators Terminal.
- AP. RAM: Random Access Memory
- AQ. RFI: Radio Frequency Interference
- AR. RTD: Resistance Temperature Device
- AS. SNMP: Simple Network Management Protocol
- AT. TAB: Testing and Balancing
- AU. TCP: Transfer Control Protocol
- AV. UDP: User Datagram Protocol
- AW. UL: Underwriters Laboratories
- AX. UPS: Uninterruptable Power Supply
- AY. VAV: Variable Air Volume
- AZ. VFD: Variable Frequency Drive.
- BA. WAN: Wide Area Network.

1.04 DEFINITIONS

- A. BACnet: An industry standard data communication protocol for Building Automation and Control Networks. Refer to the latest version of AHJRAE standard 135.
- B. BACnet Secure Connect: As an addendum to the BACnet protocol, it is a secure, encrypted datalink layer that is specifically designed to meet the requirements of managed IP infrastructures.

- C. Scope Terminology
 - 1. Provide = Furnish equipment, engineer, program and install
 - 2. Furnish = Furnish equipment, engineer and program
 - 3. Mount = securely fasten or pipe
 - 4. Install = mount and wire
 - 5. Wire = wire only

1.05 WORK INCLUDED

- A. The BAS Contractor shall provide a complete an operational system that will perform the sequences of operation as described on the drawings.
- B. Furnish a complete distributed direct digital control system in accordance with this specification section. This includes all system controllers, logic controllers, and all input/output devices. Items of work included are as follows:
 - 1. Provide a submittal that meets the requirements below for approval.
 - 2. Coordinate installation schedule with the mechanical contractor and general contractor.
 - 3. Provide installation of all panels and devices unless otherwise stated.
 - 4. Provide power for panels and control devices unless otherwise stated.
 - 5. Provide all low voltage control wiring for the DDC system.
 - 6. Provide miscellaneous control wiring for HVAC and related systems regardless of voltage.
 - 7. Provide engineering and technician labor to program and commission software for each system and operator interface. Submit commissioning reports for approval.
 - 8. Provide testing, demonstration and training as specified below.
- C. The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation, or identification number and sequence of operation all bearing the name of the manufacturer.
- D. Provide Energy Reporting and Data Analytics software package.

1.06 SUBMITTALS

- A. Provide submittals for fast track items that need to be approved and released to meet the schedule of the project. Provide submittals for the following items separately upon request:
 - 1. Valve schedule and product data
 - 2. Damper schedule and product data
 - 3. Mounting and wiring diagrams for factory-installed control components
 - 4. Thermostat locations
- B. Provide a complete submittal with all controls system information for approval before construction starts. Include the following:
 - 1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
 - 2. Wiring Diagrams: Power, signal, and control wiring. Detail the wiring of the control devices and the panels. Show point-to-point wiring from field devices to the control panel. Show point-to-point wiring of hardwired interlocks. Show a ladder diagram or schematic of wiring internal to the panels, including numbered terminals. Clearly designate wiring that is done at a factory, at a panel shop or in the field.
 - 3. Details of control panel faces, including sizes, controls, instruments, and labeling.
 - 4. Schedule of dampers and actuators including size, leakage, and flow characteristics. If dampers are furnished by others, submit a damper actuator schedule coordinating actuator sizes with the damper schedule.
 - 5. Schedule of valves including leakage and flow characteristics.
 - 6. Written description of the Sequence of Operations.
 - 7. Network riser diagram showing wiring types, network protocols, locations of floor penetrations and number of control panels. Label control panels with network addresses and BACnet device instance numbers. Show all routers, switches, hubs and repeaters.

8. Point list for each system controller including both inputs and outputs (I/O), point numbers, controlled device associated with each I/O point, and location of I/O device.
 9. Starter and variable frequency drive wiring details of all automatically controlled motors.
 10. Reduced size floor plan drawings showing locations of control panels, thermostats and any devices mounted in occupied space.
 11. Product Data: Include manufacturer's technical literature for each control device indicated, labeled with setting or adjustable range of control. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated. Submit a write-up of the application software that will be used on the operator workstation including revision level, functionality and software applications required to meet the specifications.
 12. Submit BACnet Protocol Implementation Conformance Statements (PICS) for all direct digital controllers, software and other system components that will communicate on the BAS utilizing BACnet.
- C. Submit a description of the application software that will be used on the operator workstation including revision level, functionality and software applications required to meet the specifications.
- D. Submit blank field check-out and commissioning test reports, customized for each panel or system, which will be filled out by the technician during start-up.
- E. Variance letter: Submit a letter detailing each item in the submission that varies from the contract specification or sequence of operation in any way.
- F. After the BAS system is approved for construction, submit sample operator workstation graphics for typical systems for approval. Print and submit the graphics that the operator will use to view the systems, change setpoints, modify parameters and issue manual commands. Programming shall not commence until typical graphics are approved.
- G. Operation and Maintenance Data: In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
1. Product data with installation details, maintenance instructions and lists of spare parts for each type of control device.
 2. Keyboard illustrations and step-by-step procedures indexed for each operator function.
 3. Inspection period, cleaning methods, cleaning materials recommended and calibration tolerances.
 4. Calibration records and list of set points.

1.07 PROJECT RECORD DOCUMENTS

- A. Project Record Documents: Submit three (3) copies of record (as-built) documents upon completion of installation. Submittal shall consist of:
1. Project Record Drawings. As-built versions of the submittal shop drawings provided as AutoCAD compatible files in electronic format and as 11 x 17 inch prints.
 2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements in the Control System Demonstration and Acceptance section of this specification.
 3. Operation and Maintenance (O & M) Manual.
 - a. As-built versions of the submittal product data.
 - b. Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems.
 - c. Operator's Manual with procedures for operating control systems, logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
 - d. Programming manual or set of manuals with description of programming language and of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
 - e. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform

- preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
 - f. Documentation of all programs created using custom programming language, including setpoints, tuning parameters, and object database.
 - g. Graphic files, programs, and database on electronic media.
 - h. List of recommended spare parts with part numbers and suppliers.
 - i. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware, including computer equipment and sensors.
 - j. Complete original original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
 - k. Licenses, guarantees, and warranty documents for equipment and systems.
- B. Operating manual to serve as training and reference manual for all aspects of day-to-day operation of the system. As a minimum include the following:
- 1. Sequence of operation for automatic and manual operating modes for all building systems. The sequences shall cross-reference the system point names.
 - 2. Description of manual override operation of all control points in system.
 - 3. BMS system manufacturers complete operating manuals.
- C. Provide maintenance manual to serve as training and reference manual for all aspects of day-to-day maintenance and major system repairs. As a minimum include the following:
- 1. Complete as-built installation drawings for each building system.
 - 2. Overall system electrical power supply schematic indicating source of electrical power for each system component. Indicate all battery backup provisions.
 - 3. Photographs and/or drawings showing installation details and locations of equipment.
 - 4. Routine preventive maintenance procedures, corrective diagnostics troubleshooting procedures, and calibration procedures.
 - 5. Parts list with manufacturer's catalog numbers and ordering information.
 - 6. Lists of ordinary and special tools, operating materials supplies and test equipment recommended for operation and servicing.
 - 7. Manufacturer's operation, set-up, maintenance and catalog literature for each piece of equipment.
 - 8. Maintenance and repair instructions.
 - 9. Recommended spare parts.
- D. Provide Programming Manual to serve as training and reference manual for all aspects of system programming. As a minimum include the following:
- 1. Complete programming manuals, and reference guides.
 - 2. Details of any custom software packages and compilers supplied with system.
 - 3. Information and access required for independent programming of system.

1.08 QUALITY ASSURANCE

- A. Codes
- 1. Perform all wiring in accordance with Division 26, NEC, local codes and Owner's requirements.
 - 2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 3. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."
 - 4. Comply with ASHRAE 135-2010 BACnet: A Data Communication Protocol for Building Automation and Control Networks.
 - 5. Comply with BACnet Secure Connect Communication: A secure, encrypted datalink layer that is specifically designed to meet the requirements of managed IP infrastructures.
 - 6. Comply with ASHRAE 90.1- Energy Standard for Buildings Except Low-Rise Residential Buildings.

7. Comply with current version of the State of California's Building Energy Efficiency Standards for Residential and Non-Residential Buildings (Title 24).
 8. All equipment shall be UL listed and approved and shall meet with all applicable NFPA standards, including UL 916 - PAZX Energy Management Systems,
 - a. Provide written approvals and certifications after installation has been completed.
 - b. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
 - c. The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.
- B. Qualifications
1. Installing contractor shall be in the business of installing and servicing DDC controls for mechanical systems, temperature and ventilation control, environmental control, lighting control, access and security, life safety and energy management as their primary business.
 2. Installer Qualifications: An experienced installer who is the authorized representative of the automatic control system manufacturer for both installation and maintenance of controls required for this Project.
 3. Engineering, drafting, programming, and graphics generation shall be performed by Siemens qualified engineers and technicians directly employed by the Building Automation System Contractor.
 4. Supervision, checkout and commissioning of the system shall be by the local branch engineers and technicians directly employed by the Building Automation System Contractor. They shall perform commissioning and complete testing of the BAS system.
- C. The BAS contractor shall maintain a service organization consisting of factory trained service personnel and provide a list of ten (10) projects, similar in size and scope to this project, completed within the last five years.
- D. Final determination of compliance with these specifications shall rest solely with the Engineers and Owner who will require proof of prior satisfactory performance.
- E. For any BAS system and equipment submitted for approval, the BAS contractor shall state what, if any, specific points of system operation differ from these specifications.
- F. All portions of the system must be designed, furnished, installed, commissioned and serviced by manufacturer approved, factory trained employees.
- G. The system shall have a documented history of compatibility by design for a minimum of 15 years. Future compatibility shall be supported for no less than 10 years. Compatibility shall be defined as the ability for any existing control system component including but not limited to building controllers, advanced application controllers, application specific, personal operator workstations and portable operator's terminals, to be connected and directly communicate with any new BAS system equipment without bridges, routers or protocol converters.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.
- B. Deliver, store, protect, and handle products to site under provisions of the contract Documents. Coordinate all site deliveries with Construction project Manager.
- C. Protect products from construction operations, dust, and debris, by storing materials inside, protected from weather in a conditioned space.

1.10 COORDINATION

- A. Coordinate IP drops, network connections, user interfaces, firewall, etc with Owner's IT representative. Coordinate and work with the TAB provider to establish controls sequences, room differential pressures and commissioning.
- B. Coordinate location of thermostats, humidistats, panels, and other exposed control components with plans and room details before installation.
- C. Coordinate equipment with Division 28 "Fire Alarm" to achieve compatibility with equipment that interfaces with that system.
- D. Coordinate power for control units and operator workstation with electrical contractor.
- E. Coordinate equipment with provider of starters and drives to achieve compatibility with motor starter control coils and VFD control wiring.
- F. Coordinate scheduling with the mechanical contractor and general contractor. Submit a schedule for approval based upon the installation schedule of the mechanical equipment.
- G. Coordinate installation of taps, valves, airflow stations, etc. with the mechanical contractor.
- H. Products Furnished but Not Installed Under This Section
 - 1. Hydronic and Refrigerant Piping accessories:
 - a. Control Valves
 - b. Temperature Sensor Wells and Sockets
 - c. Pressure Sensor Wells and Sockets
 - d. Flow Switches
 - e. Flow Meters
 - f. Differential Pressure Transmitters
 - g. Sheet metal accessories
 - 1) Dampers
 - 2) Airflow Stations
- I. Products Installed but Not Furnished Under This Section
 - 1. Rooftop Air Handling Equipment:
 - a. Thermostats
 - b. Duct Static Pressure Sensors
- J. Products Integrated to but Not Furnished or Installed Under This Section
 - 1. Laboratory Fume Hoods.

1.11 WARRANTY

- A. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of 12 months from completion of system demonstration.
- B. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours.
- C. During normal building occupied hours, failure of items that are critical for system operation shall be provided within 4 hours of notification from the Owner's Representative.
- D. This warranty shall apply equally to both hardware and software.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. The Building Automation System (BAS) contractor shall furnish and install a networked system of HVAC controls. The contractor shall incorporate direct digital control (DDC) for central plant equipment, building ventilation equipment, supplemental heating and cooling equipment, terminal units, laboratory air control and metering valves to room and to new chemical and type II hoods. Lab make-up air and general exhaust air valves are included.

- B. The control system for this project shall be an extension of the Owner's existing Siemens Building Automation System and all controllers and software shall match existing or be latest version of existing.
- C. Provide networking to new DDC equipment using industry accepted communication standards. System shall utilize BACnet communication according to ANSI/ASHRAE standard 135-2010 for interoperability with smart equipment, for the main IP communication trunk to the BAS Server and for peer-to-peer communication between DDC panels and devices. The system shall not be limited to only standard protocols, but shall also be able to integrate to a wide variety of third-party devices and applications via drivers and gateways.
- D. Provide standalone controls where called for on the drawings or sequences.
- E. Provide an Energy Reporting and Data Analytics packages described herein.
- F. The BAS shall be the Siemens APOGEE system as manufactured by Siemens Industry, Inc.

2.02 BUILDING AUTOMATION SYSTEM NETWORK

- A. All networked control products provided for this project shall be comprised of an industry standard open protocol internetwork. Communication involving control components (i.e. all types of controllers and operator interfaces) shall conform to ASHRAE 135-2010 BACnet standard. Networks and protocols proprietary to one company or distributed by one company are prohibited.
- B. Access to system data shall not be restricted by the hardware configuration of the building management system. The hardware configuration of the BMS network shall be totally transparent to the user when accessing data or developing control programs.
 - 1. Software applications, features, and functionality, including administrative configurations, shall not be separated into several network control engines working together.
- C. BAS Server shall be capable of simultaneous direct connection and communication with BACnet/SC, BACnet/IP, OPC and TCP/IP corporate level networks without the use of interposing devices.
- D. Any break in Ethernet communication from the server to the controllers on the Primary Network shall result in a notification at the server.
- E. Any break in Ethernet communication between the server and standard client workstations on the Primary Network shall result in a notification at each workstation.
- F. The network architecture shall consist of three levels of networks:
 - 1. The Management Level Network (MLN) shall utilize BACnet/IP over Ethernet along with other standardized protocol, such as web services, html, JAVA, SOAP, XML, etc., to transmit data to non-BAS software applications and databases. The BAS Server and Operator Workstations shall reside on this level of the network architecture.
 - 2. The Automation Level Network (ALN) shall utilize BACnet/IP over Ethernet. It shall connect BACnet Building Controllers to the BAS Server and Operator Workstations. Controllers for central plant equipment and large infrastructure air handlers shall reside on the ALN backbone BACnet/IP network. The building's Ethernet LAN shall be utilized for the ALN backbone and all ALN devices shall be connected to the building's LAN. Coordinate IP drops with Owner. All ALN devices shall support BACnet/SC or be BACnet/SC-ready at minimum.
 - 3. The Floor Level Network shall utilize BACnet/IP over Ethernet or BACnet MS/TP over RS-485 to connect all of the DDC-controlled terminal heating and cooling equipment on a floor or in a system that are controlled with BACnet Advanced Application Controllers or BACnet Application Specific Controllers. FLN devices are networked to a router that connects to the Automaton Level Network backbone.
- G. BAS controllers utilizing BACnet/SC and that reside on a BACnet/SC network shall support the following:

1. System controllers shall be native-BACnet/SC or shall be BACnet/SC-ready by future firmware upgrade to provide data encryption utilizing secure Websocket protocol with TLS V1.3 (WSS) functioning on TCP/IP.
2. System controllers shall be native-BACnet/SC or shall be BACnet/SC-ready by future firmware upgrade to provide device authentication of those BACnet/SC devices by utilizing the X.509 International Telecommunication Union standard defining the format of PKI certificates.
3. System controllers shall utilize two (2) BACnet/SC hubs per BACnet network for logical function. A primary hub is required for communication to occur on the BACnet/SC network. A secondary failover hub shall be required to ensure communication can resume in the case of primary hub failure.
 - a. BACnet/SC hubs shall be embedded devices on the BACnet/SC network.
 - b. BACnet/SC hub-capable controllers shall support routing between different BACnet data link types such as BACnet/SC-to-BACnet/IP routing.
 - c. BACnet/SC controllers with BACnet/SC hub functionality must support a minimum of 100 node connections per hub.
 - d. System controllers shall support BACnet/SC node, or BACnet/SC hub+node functionality (natively or with future firmware upgrade) for the system to function.
 - e. BACnet/SC must support Certificate Authority (CA) and Certificate Management
 - 1) BAS provider must provide software tools for Certificate Authority and Certificate Management.
 - 2) The software tool must be made available to interact with the customer's IT department infrastructure by exchanging certificates and CSR (certificate signing request) for certificate management of the BACnet/SC system for the life of the building automation system.
 - 3) The BACnet/SC solution must allow for an internal-to-the-organization Certificate Authority (self-signed certificates) utilizing a software tool method capable of generating, signing, and provisioning certificates to the BAS vendor's devices, and revoking certificates completely on its own.
 - 4) The BACnet/SC Certificate Management must allow for interaction with a trusted 3rd party Certificate Authority (CA) for customers. The BAS vendor provided software tool for generating certificates and provisioning them to the vendor's devices must be able to generate a CSR (Certificate Signing Request) and be able to export the required common Root Certificate (aka Issuer Certificate) on a file level to be signed by a trusted 3rd party certificate authority of the customer's preference as well as be able to import the signed certificate and provision it to the vendor's devices along with the required unique Operational Certificates (aka Client Certificates).
 - 5) Certificate Management must allow for interoperability with 3rd party vendor BACnet/SC certificate management methods and allow for CA migration (CA1 - > CA2).
 - 6) The certificates validity period shall be configurable in the vendor's certificate management tool to comply with customer security requirements. This shall be configurable for a minimum of 1 week or years to a maximum of 25 years.
 - 7) The vendor specific BACnet/SC configuration and management tool from each and every BACnet/SC vendor on the project as well as the corresponding project database containing the Root Certificate must be provided to the customer for ongoing certificate management as well as vendor coordination on the project.
- H. Provide a router for each RS-485 subnetwork to connect them to the base building backbone level network. The router shall connect BACnet MS/TP subnetworks to BACnet over Ethernet. Routers shall be capable of handling all of the BACnet BIBBs that are listed for the controller that reside on the subnetwork.
- I. The Building Level Controllers shall be able to support subnetwork protocols that may be needed depending on the type of equipment or application. Subnetworks shall be limited to :

1. BACnet MS/TP
 2. Apogee FLN
 3. Modbus
- J. BACnet MSTP Setup rules
1. Addressing for the MSTP devices shall start at 00 and continue sequentially for the number of devices on the subnetwork.
 2. No gaps shall be allowed in the addresses.
 3. Set the MaxMaster property to the highest address of the connected device.
 4. MaxMaster property shall be adjusted when devices are added to the subnetwork.
- K. Provide all communication media, connectors, repeaters, bridges, switches, and routers necessary for the internetwork.
- L. Controllers and software shall be BTL listed at the time of installation.
- M. The system shall meet 8peer-to-peer communication services such that the values in any one BACnet Building Controller or BACnet Advanced Application Controller can be read or changed from all other controllers without the need for intermediary devices. The software shall provide transparent transfer of all data, control programs, schedules, trends, and alarms from any one controller through the internetwork to any other controller, regardless of subnetwork routers.
- N. Systems that use variations of BACnet using Point-to-Point (PTP) between controllers, gateways, bridges or networks that are not peer-to-peer are not allowed.
- O. Remote Communications: Provide a TCP/IP compatible communication port for connection to the Owner's network for remote communications. Provide coordination with the Owner for addressing and router configuration on both ends of the remote network.
- P. The system shall be installed with a 10% spare capacity on each subnetwork for the addition of future controllers.
- Q. On each floor, wing or major mechanical room provide an Ethernet RJ45 connection that allows connection to the BACnet network. An open port shall always be available and shall not require any part of the network to be disconnected. The location shall be accessible to the base building personnel and not in a location where the tenant can restrict the access.
- R. Distributed Control Requirements:
1. The loss of any one DDC controller shall not affect the operation of other HVAC systems, only for the points connected to the DDC controller.
 2. The system shall be scalable in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, and operator devices.
 3. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.
 4. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller on the network without dependence upon a central processing device. DDC Controllers shall also be able to send alarms to multiple operator workstations without dependence upon a central or intermediate processing device.
 5. Operators shall have the ability to make database changes at the central system server while operator workstations are on-line without disrupting other system operations.
 6. The DDC control panel shall be mounted in the same mechanical room as the equipment being controlled, or an adjacent utility room. Location shall be approved by the Owner.
 7. Multiple systems can be programmed on the same controller as long as they are in the same room. Systems on separate floors shall have separate controllers.

8. VAV boxes subnetworks shall be connected to the AHU controller that feeds those boxes. If multiple subnetworks are needed, then the VAV shall be grouped into subnetworks in an orderly method, such as per floor, per wing, etc.
9. Remote sensors shall be wired to the control panel of the equipment it is controlling, not across the network.
10. Signals to remote motor control centers shall be hard wired to the control panel, not across the network.

2.03 BUILDING AUTOMATION SYSTEM SERVER HARDWARE

- A. BAS Server application and database shall be installed on an Owner-provided server.

2.04 BACNET ADVANCED WORKSTATION SOFTWARE

- A. Interface Description
 1. The software shall provide, as a minimum, the following functionality:
 - a. Real-time graphical viewing and control of the BMS environment.
 - b. Reporting of both real-time and historical information.
 - c. Scheduling and override of building operations and all laboratory and office functions. Including occupied and unoccupied lab timeframes and execution of appropriate air change rate in each lab during these occupancies.
 - d. Collection and analysis of historical data.
 - e. Point database editing, storage and downloading of controller databases.
 - f. Configuration of and navigation through default and personalized hierarchical "tree" views that include workstation and control system objects.
 - g. Event reporting, routing, messaging, and acknowledgment.
 - h. Definition and construction of dynamic color graphic displays.
 - i. Online, context-sensitive help, including an index, glossary of terms, and the capability to search help via keyword or phrase.
 - j. On-screen access to User Documentation, via online help or PDF-format electronic file.
 - k. Automatic database backup at the operator interface for database changes initiated at Building Controllers.
 - l. Display dynamic trend data graphical plot.
 - 1) Must be able to run multiple plots simultaneously.
 - 2) Each plot must be capable of supporting 10 pts/plot minimum.
 - 3) Must be able to command points from selection on dynamic trend plots.
 - 4) Must be able to plot real-time data without prior configuration.
 - 5) Must be able to plot both real-time and historical trend data simultaneously.
 - 6) Program editing
 - 7) Transfer trend data to third-party spreadsheet software
 - 8) Scheduling reports
 - 9) Operator Activity Log
 - m. Operator interface software shall minimize operator training through the use of user-friendly and interactive graphical applications.
 - n. Users must be able to build multiple, separate, personalized hierarchical "tree" views that represent the workstation, control systems, geographical facility layouts, and mechanical equipment relationships.
 - o. 256-character point identification (names) must be supported to provide clearly descriptive identification.
 - p. On-line help must be available.
 - q. The user interface shall display relevant information for a selection in multiple panes of a single window without the need for opening multiple overlapping windows on the desktop
 - r. Provide a graphical user interface that shall minimize the use of keyboard through the use of a mouse or similar pointing device, with a "point and click" approach to menu selection and a "drag and drop" approach to inter-application navigation.

- s. Software navigation shall be user friendly by utilizing “forward & back” capability between screens and embedded links to graphics, documents, drawings, trends, schedules, as well as external documents (.doc, .pdf, .xls, etc.) or web addresses that are related to any selected object.
 - t. Primary selection of objects in the operator interface software shall be available from user defined hierarchical Views, from graphics, or from events in an Event List.
 - u. Secondary selection of objects in the operator interface software shall be available from links to any objects or external documents related to the primary selection.
 - v. Links to information related to any selected objects shall be displayed in a consistent manner and automatically defined based on where an object is used in the system.
 - w. The operator workstation shall be capable of displaying web pages and common document formats (.doc, .xls, .pdf) within the operator workstation application.
 - x. The software shall provide a multi-tasking type environment that allows the user to run several applications simultaneously.
 - y. System database parameters shall be stored within an object-oriented database.
 - z. Standard Windows applications shall run simultaneously with the BMS software.
 - aa. The operator shall be able to work in Microsoft Word, Excel, and other Windows based software packages, while concurrently annunciating on-line BMS alarms and monitoring information.
 - ab. Provide automatic backup and restore of all Building Controller databases on the workstation hard disk.
 - ac. System configuration, programming, editing, graphics generation shall be performed on-line from the operator workstation software.
 - ad. User shall be able to edit point configuration of any configurable BACnet point that resides in a devices that supports external editing.
 - ae. The software shall also allow the user to configure the alarm management strategy for each point.
 - af. Users shall have the ability to view the program(s) that is currently running in a Building Controller. The display shall mark the program lines with the following: disabled, comment, unresolved, and trace bits.
- B. Certifications and Approvals
- 1. BAS software shall have been tested against the following norms and standards:
 - a. BACnet Revision 1.13, certified by BACnet Testing Laboratory as BACnet Advanced Workstation Software (BTL B-AWS)
 - b. IT security compliant with the ISA-99/IEC 62443 Security Level: SL1
 - c. OPC DA V2.05a and V3.0 Server, certified by the OPC Foundation certification program
 - d. UL-listed to UL864 9th edition Standard for Control Units and Accessories (when installed on a UL-approved computer)
- C. Client-Server Connectivity
- 1. Client sessions must be allowed to run on the server and on other devices connected to the server via Intranet, Extranet, or Internet connections.
 - 2. Internet connections, ISP services, as well as necessary firewalls or proxy servers shall be provided by the owner as required to support remote access features.
 - 3. The following client options must be supported
 - a. Installed Client.
 - 1) Software application installed from installation media on to the client machine.
 - 2) Installed client software must be configurable to allow it to run in a Closed Mode such that the BAS software can lock down the client machine and prevent users without permission from minimizing the application or running other Windows applications that might cover the BAS software interface.
 - 3) Communication between the server and Installed Clients must be monitored so that any break in communication between the server and an installed client results in notification at the Server and Installed Client machine

- 4) Installed client machines communicate directly with the BAS server
 - 5) Web Client.
 - (a) Software that runs in a browser on the client machine as a Full Trust client application.
 - (b) Connected to the BAS software server via Microsoft IIS Server.
 - 6) Windows App.
 - (a) Software application downloaded from the BAS server to run on the client machine like an installed application
 - (b) Application must be automatically updated whenever new apps are available at the server.
 - (c) Connected to the BAS software server via Microsoft IIS Server.
 - b. Each of the client options shall provide the same functionalities including operation and configuration capabilities.
- D. Access Rights and User Privileges
1. Access to any client user session must be password protected.
 2. Users shall be able to create local user accounts specific to the application software.
 3. Users shall be able to link application user accounts to Active Directory user accounts for consistent management with domain user accounts.
 4. Operator-specific password access protection shall be provided to allow the administrator/manager to limit users' workstation control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned user name and password.
 5. Operator privileges shall follow the operator to any workstation logged onto.
 6. The administrator or manager shall be able to further limit operator privileges based on which console an operator is logged on to.
 7. The administrator or manager shall be able to grant discrete levels of access and privileges, per user, for each point, graphic, report, schedule, and BMS workstation application.
- E. Activity Logging
1. The operator interface software shall maintain a log of the actions of each individual operator.
 2. The software shall provide an application that allows querying based on object name, operator, action, or time range.
 3. The software shall provide the ability to generate reports showing operator activity based on object name, operator, action, or time range.
- F. Graphics Application
1. All graphics shall be available with the same look and functionality whether they are displayed at an installed client console or in a browser.
 2. User shall be able to add/delete/modify system graphics for floor plan displays and system schematics for each piece of mechanical equipment (including, air handling units, chilled water systems, hot water boiler systems, and room level terminal units) from standard user interface without the need of any external or specialized tools.
 3. The software shall include all necessary tools and procedures for the user to create their own graphics.
 4. The software shall provide the user the ability to display real-time point values by animated motion or custom picture control visual representation.
 5. The software shall provide animation that depicts movement of mechanical equipment, or air or fluid flow.
 6. The software shall provide users the ability to depict various positions in relation to assigned point values or ranges.
 7. The software shall provide the ability to add custom gauges and charts to graphic pages.
 8. The software must include a library of at least 400 standard control application graphics and symbols for visualizing common mechanical systems, including fans, valves, motors, chillers, AHU systems, standard ductwork diagrams, piping, and laboratory symbols.

9. The Graphics application shall include a set of standard Terminal Equipment controller application-specific background graphic templates. Templates shall provide the automatic display of a selected Terminal Equipment controller's control values and parameters, without the need to create separate and individual graphic files for each controller.
 10. The Graphics application shall be capable of automatically assigning the appropriate symbol for an object (point) selected to be displayed on the graphic based on what the object represents (fan, duct sensor, damper, etc.) when the object is placed on a graphic.
 11. The Graphics application shall allow a user to manually override the automatically assigned symbol for an object when a different symbol is desired.
 12. The user shall have the ability to add custom symbols to the symbol library.
 13. The software shall permit the importing of AutoCAD or scanned pictures for use in graphics.
 14. Graphics must be automatically associated to any points or system objects that are rendered on the graphic, so that selection of a system object will allow a user to simply navigate to any associated graphic, without the need for manual association.
 15. The software must allow users to command points directly off graphics application.
 16. Graphic display shall include the ability to depict real-time point values dynamically with text or animation.
 17. Navigation through various graphic screens shall be optionally achieved through a hierarchical "tree" structure
 18. Graphics viewing shall include dynamic pan zoom capabilities.
 19. Graphics viewing shall include the ability to switch between multiple layers with different information on each layer.
 20. Graphics shall include a decluttering capability that allows layers to be programmatically hidden and displayed based on zoom level.
 21. Graphics shall be capable of displaying the status of points that have been overridden by a field HAND switch, for points that have been designed to provide a field HAND override capability.
 22. The software must provide the ability to create dashboard views consisting of gauges and charts that graphically display system and/ or energy performance.
- G. System Performance
1. Comply with the following performance requirements:
 - a. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 5 seconds.
 - b. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 5 seconds.
 - c. Object Command: Reaction time of less than 5 seconds between operator command of a binary object and device reaction.
 - d. Object Scan: Transmit change of state and change of analog values to control units or workstation within 5 seconds.
 - e. Alarm Response Time: Annunciate alarm at workstation within 2 seconds. Multiple workstations must receive alarms within five seconds of each other.
 - f. Program Execution Frequency: Programmable controllers shall execute DDC PI control loops, and scan and update process values and outputs at least once per second.
 - g. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
 - 1) Water Temperature: Plus or minus 1 deg F.
 - 2) Water Flow: Plus or minus 5 percent of full scale.
 - 3) Water Pressure: Plus or minus 2 percent of full scale.
 - 4) Space Temperature: Plus or minus 1 deg F.
 - 5) Ducted Air Temperature: Plus or minus 1 deg F.
 - 6) Outside Air Temperature: Plus or minus 2 deg F.
 - 7) Dew Point Temperature: Plus or minus 3 deg F.

- 8) Temperature Differential: Plus or minus 0.25 deg F.
- 9) Relative Humidity: Plus or minus 2 percent.
- 10) Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
- 11) Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
- 12) Airflow (Terminal): Plus or minus 10 percent of full scale.
- 13) Air Pressure (Space): Plus or minus 0.01-inch wg.
- 14) Air Pressure (Ducts): Plus or minus 0.1-inch wg.
- 15) Carbon Monoxide: Plus or minus 5 percent of reading.
- 16) Carbon Dioxide: Plus or minus 50 ppm.
- 17) Electrical: Plus or minus 5 percent of reading.

H. Reports

1. The software must allow reports shall be executed on demand.
2. The software must allow reports shall be executed via pre-defined schedule.
3. As a minimum, the system shall allow the user to easily obtain the following types of reports:
 - a. A general listing of all or selected points in the network
 - b. A status report showing present value and alarm status
 - c. List of all points currently in alarm
 - d. List of all points currently in override status
 - e. List of all disabled points
 - f. System diagnostic reports including, list of Building panels online and communicating, status of all Building terminal unit device points.
 - g. List of alarm strategy definitions
 - h. List of Building Control panels
 - i. Point totalization report
 - j. Point Trend data listings
 - k. Initial Values report
 - l. User activity report
 - m. Event history reports

I. Scheduling

1. The software shall provide a calendar type format for simplification of time and date scheduling and overrides of building operations.
2. The software shall support the definition of BACnet schedules that are defined at the workstation and are downloaded to Building Controller to ensure time equipment scheduling when PC is off-line, such that the operating software is not required to execute time scheduling. The software must provide the following capabilities for BACnet scheduling capabilities as a minimum:
 - a. Fully support all BACnet Schedule, Calendar, and Command objects.
 - b. Daily and Weekly schedules
 - c. Ability to combine multiple points into a logical Command Groups for ease of scheduling (e.g., all Building 1 lights)
 - d. Ability to schedule for a minimum of up to ten (10) years in advance.
 - e. The software shall support the definition of schedules that are configured and executed to run at the workstation, to support scheduling of workstation software activities and to support field systems that do not include internal scheduling mechanisms. The software must provide the following capabilities for BACnet scheduling capabilities as a minimum:
 - 1) Schedule predefined reports
 - 2) Schedule Trend collections
 - 3) Schedule automated system backups
 - 4) Schedule commands to be sent to field panels
 - 5) Daily and weekly schedules
 - 6) Setting up and executing Holiday schedules

- 7) Ability to combine multiple points into a logical Command Groups for ease of scheduling (e.g., all Building 1 lights)
 - 8) Ability to schedule for a minimum of up to ten (10) years in advance.
 - f. The software shall support the definition of Apogee Equipment Schedules Objects that are defined at the workstation and are downloaded to Building Controller to ensure time equipment scheduling when PC is off-line, such that the operating software is not required to execute time scheduling. The software must provide the following capabilities for BACnet scheduling capabilities as a minimum:
 - 1) Apogee equipment schedule Zones
 - 2) Apogee equipment schedule Events
 - 3) Configuration of Daily, Weekly, Monthly schedules
 - 4) Configuration of Replacement Days
 - g. The software shall provide the ability for users to override regular weekly schedules through menu selection, graphical mouse action or function key.
 - h. The software shall provide a timeline view, showing the results of any number of combined selected workstation and field panel controller schedules for an overview of facility operation.
- J. Trending
 - 1. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time.
 - 2. Any system point may be trended automatically at time-based intervals or change of value, both of which shall be user-definable.
 - 3. Trend data shall be collected and stored on hard disk for future diagnostics and reporting.
 - 4. Automatic Trend collection may be scheduled at regular intervals through the same scheduling interface as used for scheduling of equipment.
 - 5. System shall support trending in the same device as the monitor point or in an external device.
 - 6. The software must support configuration of panels that have a trending level threshold, above which the data will be automatically uploaded to the BMS server to prevent overwriting the data in the field panel. The trending level will be user defined in % of available space (e.g., automatically upload when the trend buffer is at 75% of allocated space).
 - 7. Trend data reports shall be provided to allow the user to view all trended point data.
 - 8. Trend data reports may be customized to include individual points or predefined groups of selected points.
 - 9. The software shall allow the user to view real-time trend data on trend graphical plot displays.
 - a. A minimum of ten points may be plotted
 - b. A combination of real-time and historical data may be plotted
 - c. Dynamic graphs shall continuously update point values
 - d. At any time the user may redefine sampling times or range scales for any point
 - e. The user may pause the display and take "snapshots" of plot screens to be stored on the workstation disk for future recall and analysis
 - f. Exact point values may be viewed on the Trend plot
 - g. Trend graphs may be printed
 - h. Operator shall be able to command points by selecting them on the trend plot. Operator shall be able to zoom in on a specific time range within a plot.
 - i. The Trend Viewer must allow users to configure separate left and right axis for easier differentiation of point values.
 - j. The Trend Viewer must allow users to display historical data for the same group of points at different times simultaneously for easy comparison of system behavior over time.
- K. Event Management

1. Event Notification shall be presented to each workstation in a tabular format application, and shall include the following information for each event: name, value, event time and date, event status, priority, acknowledgement information, and alarm count.
 2. Only events for which the logged on user has privileges to view shall be displayed on each workstation.
 3. The software shall provide the ability to users to limit the list of events displayed at each workstation (e.g. only show fire events at this workstation, no matter who is logged on)
 4. Each event shall have the ability to sound an audible notification based on the category of the event.
 5. Event List shall have the ability to list and sort the events based on event status, point name, ascending or descending activation time.
 6. Directly from the Event List, the user shall have the ability to acknowledge, silence the event sound, print, or erase each event.
 7. The interface shall provide the option to inhibit the erasing of active acknowledged events, until they have returned to normal status.
 8. The user shall have the ability to navigate to all information related to a selected point in order to command, launch an associated graphic or trended graphical plot, or run a report on a selected point directly from the Event List.
 9. Each event shall have a direct link from the Event List to further user-defined point informational data.
 10. The user shall have the ability to also associate real-time electronic annotations or notes to each event.
 11. Software shall provide the option to configure detailed operating procedures that guide a user through predetermined standard operating procedures for handling critical events. Users shall be able to log completion of each operating step as it is performed.
- L. Remote Notification (RENO)
1. Workstations shall be configured to send out messages to numeric pagers, alphanumeric pagers, SMS (Simple Messaging Service, text messaging) Devices, and email accounts based on a point's alarm condition.
 2. Email notification must support POP3, IMAP, and SMTP with SSL/TSL
 3. Communication with external software must be encrypted.
 4. There shall be no limit to the number of points that can be configured for remote notification of alarm conditions and no limit on the number of remote devices which can receive messages from the system.
 5. On a per point basis, system shall be configurable to send messages to an individual or group and shall be configurable to send different messages to different remote devices based on alarm message priority level.
 6. System must be configurable to send messages to an escalation list so that if the first device does not respond, the message is sent on to the next device after a configurable time has elapsed.
 7. Workstation shall have the ability to send manual messages allowing an operator to type in a message to be sent immediately.
 8. Workstation shall have a feature to send a heartbeat message to periodically notify users that they have communication with the system.
- M. External Data Access
1. The software shall provide the ability to expose configuration properties and real-time values through CSV files, OPC DA, OPC UA, or REST-based Web Services.
 2. The software shall provide the ability for external applications to change configuration and real-time values through OPC DA, OPC UA, or REST-based Web Services.
 3. The software shall provide the ability for external applications to access historical Trend data through CSV files or REST-based Web Services.
 4. External data access must be secured using the level of permissions configured for users and operator workstations.

5. Web service interfaces must allow for exchanging data (object's values, events and trend series) between workstation and external applications such as facility management systems, enterprise applications, mobile applications or other value-added services.
 6. Documentation describing web services interfaces must be included to allow external developers to write applications that leverage the data exchange.
- N. Licensing
1. Software licensing must be allowed to be bound to a dongle or to physical PC hardware.
 2. User licenses from all client types shall be from a common pool of client licenses. Licenses for installed and browser-based clients shall not be in separate pools.
 3. Provide the number of client licenses as called for here or in the Sequence of Operations.
- O. Data Security
1. The BAS software must allow that all communication paths between clients and the server are encrypted and protected against replay attacks as well as data manipulation.
 2. Any runtime data transfer between the system server and Web Server (IIS) must be allowed to be encrypted by Desigo CC.
 3. Communication between any Web Server (IIS) and the Web Clients must be allowed to be encrypted.
 4. Passwords must be handled with encrypted storage and transmission
 5. The software must support the use of public domain algorithms for cryptographic functions, including AES, DiffieHellmann, RSA, and SHA-2. No self-coded algorithms shall be allowed.
 6. All symmetrical encryption must use 256 bit AES or stronger.
 7. All asymmetrical encryption must use 2048 bit or stronger.
 8. The software must support the use of commercial certificates for securing client-server communications.
 9. The software must support the use of self-signed certificates to allow local deployments without the overhead of obtaining commercial certificates.
 10. When using self-signed certificates, the owner of the Desigo CC system is responsible for maintaining their validity status, and for manually adding them to and removing them from the list of trusted certificates.
 11. The BAS software shall be compatible with the following Virus Scanners:
 - a. Kaspersky
 - b. Avira
 - c. McAfee
 - d. Bitdefender
 - e. TrendMicro Office Scan
- P. Virtualization
1. The BAS software must be compatible with following Virtualization software packages:
 - a. VMware®:
 - 1) Virtualization platform: VSphere 6.0 or higher
 - 2) Fault-tolerant software: ESXi 6.0b managed by VCenter Server Appliance v6.0.0 or higher
 - 3) Stratus®:
 - (a) Virtualization platform: KVM for Linux CentOS v7.0 or higher
 - (b) Fault-tolerant software: everRun Enterprise 7.2 or higher
 - (c) Virtualization platform: Citrix XenServer 6.0.2 or higher
 - (d) Fault-tolerant software: everRun MX 6.2 or higher
- Q. Subsystem Connectivity
1. The BAS application software must be capable of connecting simultaneously to multiple control systems and data sources.
 2. Interface software shall simultaneously communicate with and share data between multiple Ethernet-connected building level networks.
 3. The BAS application software must support the following standard protocols:

- a. BACnet IP (standard Revision 1.13)
 - b. OPC (OLE for Process Control) OPC DA 2.05, 3.0
 - c. Modbus TCP
 - d. SNMP (Agent V1 and V2)
 - e. Siemens Apogee P2
 - f. Siemens XNET
 - g. Any break in system controller communication must result in a notification at the server.
- R. BACnet
- 1. The Operator Workstation Software shall be capable of BACnet IP communications.
 - 2. The Operator Workstation Software shall have demonstrated interoperability during at least one BTL Interoperability Workshop.
 - 3. The Operator Workstation Software shall have demonstrated compliance to BTL B-AWS device classification through BTL listing as specified in ANSI/ASHRAE 135 under revision 1.13 or higher.
 - 4. The BAS software shall meet the BACnet device profile of an Advanced Workstation Server (B-AWS) and Operator Workstation (B-OWS) and shall support the following BACnet BIBBs:
 - a. Data Sharing
 - 1) DS-RP-A Data Sharing-ReadProperty-A
 - 2) DS-RP-B Data Sharing-ReadProperty-B
 - 3) DS-RPM-A Data Sharing-ReadPropertyMultiple-A
 - 4) DS-RPM-B Data Sharing-ReadPropertyMultiple-B
 - 5) DS-WP-A Data Sharing-WriteProperty-A
 - 6) DS-WP-B Data Sharing-WriteProperty-B
 - 7) DS-WPM-A Data Sharing-WritePropertyMultiple-A
 - 8) DS-COV-A Data Sharing-ChangeofValue-A
 - 9) DS-COVP-A Data Sharing – ChangeofValueProperty-A
 - 10) DS-V-A Data Sharing - View - A
 - 11) DS-AV-A Data Sharing - Advanced View - A
 - 12) DS-M-A Data Sharing - Modify - A
 - 13) DS-AM-A Data Sharing - Advanced Modify - A
 - 14) Scheduling
 - (a) SCHED-VM-A Scheduling-View and Modify-A
 - (b) SCHED-AVM-A Scheduling-Advanced View and Modify-A
 - (c) SCHED-WS-A Scheduling-Weekly Schedule-A
 - 15) Alarm and Event Management
 - (a) AE-N-A Alarm and Event-Notification-A
 - (b) AE-ACK-A Alarm and Event-ACK-A
 - (c) AE-LS-A Alarm and Event-LifeSafety - A
 - (d) AE-VM-A Alarm and Event Management - View and Modify - A
 - (e) AE-AVM-A Alarm and Event Management - Advanced View and Modify - A
 - (f) AE-VN-A Alarm and Event Management - View Notifications - A
 - (g) AE-AVN-A Alarm and Event Management - Advanced View Notifications - A
 - 16) Trending
 - (a) T-V-A Trending-Viewing and Modifying Trends-A
 - (b) T-ATR-A Trending-Automated Trend Retrieval-A
 - (c) T-AVM-A Trending-Advanced View and Modify -A
 - 17) Network Management
 - (a) NM-CE-A Network Management-Connection Establishment-A
 - 18) Device Management
 - (a) DM-DDB-A Device Management-Dynamic Device Binding-A
 - (b) DM-DDB-B Device Management-Dynamic Device Binding-B

- (c) DM-DOB-A Device Management-Dynamic Object Binding-A
- (d) DM-DOB-B Device Management-Dynamic Object Binding-B
- (e) DM-DCC-A Device Management-DeviceCommunicationControl-A
- (f) DM-TM-A Device Management-Text Message-A
- (g) DM-MTS-A Device Management-Manual Time Synchronization-A
- (h) DM-ATS-A Device Management-Automatic Time Synchronization-A
- (i) DM-TS-A Device Management-TimeSynchronization-A
- (j) DM-UTC-A Device Management-UTCTimeSynchronization-A
- (k) DM-RD-A Device Management-ReinitializeDevice-A
- (l) DM-BR-A Device Management-Backup and Restore-A
- (m) DM-LM-A Device Management-List Manipulation-A
- (n) DM-LM-B Device Management-List Manipulation-B
- (o) DM-OCD-A Device Management-Object Creation and Deletion-A
- (p) DM-ANM-A Device Management-Automatic Network Mapping-A
- (q) DM-ADM-A Device Management-Automatic Device Mapping-A
- b. The BAS Server and Workstations shall support the following Data Link Layers:
 - 1) BACnet IP Annex J
 - 2) BACnet IP Annex J Foreign Device
 - 3) ISO 8802-3, Ethernet (Clause 7)
- c. The BAS Server and Workstations shall be able to interact with all of the BACnet objects in the controllers. In addition, the software shall be able to support the following objects as they relate to features in the workstation software:
 - 1) Calendar – Creatable, Deletable
 - 2) Command – Creatable, Deletable
 - 3) Event Enrollment – Creatable, Deletable
 - 4) Notification Class – Creatable, Deletable
 - 5) Schedule - Creatable, Deletable
- d. The BAS Server and Workstations shall support transmitting and receiving segmented messages.
- e. The BAS Server and Workstation shall have the capability to be the BACnet/IP Broadcast Management Device (BBMD) and support foreign devices.

2.05 ENERGY REPORTING AND DATA ANALYTICS SOFTWARE PLATFORM

- A. Acceptable Manufacturers
 - 1. Siemens Industry, Inc – Advantage Navigator Software
- B. Acceptable Installers
 - 1. Installer and programmers shall be factory trained representatives of the manufacturer of the software.
- C. Provide software to accumulate, log, compile and display energy consumption data and related parameters and measures.
- D. Provide an automated reporting software package which will allow utilization of data collected from a sub-metering system and data network. The system should address the following areas:
 - 1. Utility bill tracking
 - 2. Account tracking
 - 3. Savings and analysis
 - 4. Weather Data
 - 5. Weather Normalization
 - 6. Reporting
 - 7. Interval data tracking including meters and equipment data
 - 8. Automated Energy Star benchmarking and greenhouse gas emissions. Provides a portfolio Comparison and facility ratings trending. Ability to integrate with Energy Star Automated Benchmarking System and generate multi site Energy Star ranking reports as well as individual site trending of monthly Energy Star score.
 - 9. Web-based hosted solution

10. Customization and Interfaces

- E. The software shall integrate to devices provided in other sections of this specification. The contractor shall refer to other sections for the scope of the devices to be integrated into this software, including: [edit to match the project]
 - 1. Division 23 Building Automation System
 - 2. Division 23 Sequences of operations
 - 3. Division 26 Electrical panel boards (if specified with smart meters)
 - 4. Division 26 Electric meters
- F. Coordinate networking, security, and user access to the Web Server interface with the customer's IT representative. Internet connections, ISP services, firewalls or proxy servers shall be provided by the owner as required to support the Web access feature.
- G. Functionality Requirements
 - 1. User Functionality
 - a. The system shall support multiple user roles in which permissions and access to functions can be defined on a customer basis as described in User Setup.
 - b. The system shall support a user licensing system.
 - c. Reliability
 - 1) The system shall have measures in place to ensure reliability. This includes but is not limited to 99.x% uptime, a backup of all databases, and redundant servers.
 - 2) The system shall have a staging and quality control environment to ensure system reliability.
 - 3) The hosting servers shall be on UPS power supply for a minimum of 100 minutes.
 - 4) The hosting facility shall be monitored by personnel 24/7, including the facility, server hardware, and software applications.
 - 5) The hosting facility shall demonstrate strict security access.
 - 6) The hosting facility shall demonstrate that the servers operate in a well controlled and protected environment including temperature and humidity control, fire detection, water protection and server safe fire extinguishing.
 - d. Development
 - 1) The system shall have a continuous development process with ongoing version releases to support continual system enhancements and the addition of new features.
 - e. Data Quality and Import / Export
 - 1) The system must have measures in place to ensure the reliability and quality of data. This includes but is not limited to Automated Meter Reset Adjustment features.
 - 2) The system shall have the ability to normalize data for weather by meeting ASHRAE VBDD (Variable-Based Degree Day) method
 - 3) The system shall incorporate a staging environment and have a quality control process to ensure consistency and accuracy of data.
 - 4) The system shall be able to support the import of data from external sources. This includes Utility Bill data – which shall be disaggregated and normalized, manual entry of data, and any interval trend data including meters and BAS points.
 - 5) The system shall have the ability to receive and monitor data on a 1, 5, 15, 30, and 60 minute resolution.
 - 6) The system shall have the ability to import and prorate utility bill data by calendar month.
 - 7) The system shall have an interface allowing users to manually enter data.
 - 8) The system shall have the ability to import any interval trend data including but not limited to meters and BAS points.

- 9) The system shall provide external data accessibility through a REST (Representational State Transfer) API service.
- 10) The system shall allow users to export data from the system.
- 11) At the termination of the service, all data shall be owned by the customer
- f. General Functionality
 - 1) Data within the energy management system shall be owned by the customer.
 - 2) The system shall have supported at least 1000 buildings in order to prove the scalability of the system.
- H. Security
 1. The application and database servers shall operate in a “demilitarized zone” (DMZ), meaning that the application is protected by firewalls from the internet as well as general access by the provider, software maker and the host’s intranet.
 2. Passwords shall be disabled after 5 login attempts with incorrect password.
 3. Passwords shall require a minimum of 6 characters
 4. Data transfers between your PC / browser and Advantage Navigator shall be protected with 256-bit SSL encryption
 5. The system shall use e-mail validation to reset a forgotten password
 6. The system shall support the use of data validation certificates
 7. The system shall support strong authentication via SMS one-time passwords
- I. Reporting Requirements
 1. The system shall provide the following ad-hoc reporting capabilities
 - a. The system shall allow data to be displayed in multiple chart types. At a minimum it shall support the following charts:
 - 1) Line
 - 2) Bar
 - 3) Stepped Area
 - 4) Area
 - 5) Carpet Plot (Ability to show each day on the x axis and each hour of the day on the y axis. Each cell provides an automated color coding that indicates the intensity of energy usage of the data point)
 - 6) Stepped line
 - 7) The system shall allow multiple data points to be overlaid on a single chart.
 - 8) The system shall allow the user to save any pre-configured ad-hoc reporting view.
 - 9) The system shall allow the user to compare data sets between user selectable time frames using multiple meters including a rolling most recent period or a fixed period.
 - 10) Data Export
 - (a) The system shall allow the user to export charts in graphical formats including but not limited to PNG, JPG or PDF.
 - (b) The system shall allow the user to export charts in text format including but not limited to CSV.
 - 11) Chart manipulation
 - (a) The system shall allow the user to drag and drop data points.
 - (b) The system shall allow the user to zoom in and zoom out on charts.
 - (c) The system shall allow the user to view data in a tabular format.
 - (d) The system shall allow the user to view at least four charts simultaneously.
 - (e) The system shall allow multiple X or Y axis in a single chart.
 - (f) The system shall allow the user to show/hide the X or Y axis.
 - (g) The system shall allow the user to change the scale on the X or Y axis.
 - (h) The system shall allow the user to select colors displayed in each chart.
 - (i) The system shall allow the user to change the chart type.
 - (j) The system shall allow the user to stack bar and area chart types.
 - b. The system shall provide the following reporting delivery capabilities:

- 1) Report access via a web-based interface
 - 2) E-mailed delivery of standardized reports to the customer via a web-based scheduling interface
 - 3) Allow users to schedule recurring automated e-mail of standardized reports to an unlimited number of e-mail addresses
 - 4) Allow users to save report parameters for easy access of favorite reports
 - c. The system shall include the following report types and KPIs as listed in Report Types.
 - d. The system shall have Environmental Reporting including but not limited to EPA EGRID factors and manual entry of Emission Factors.
 - e. The system shall allow the user to export data and charts in HTML, XLS, CSV, PDF and PPT.
 - f. The system shall provide the ability to automate reporting on data quality issues
- J. Technical Requirements
1. Remote Access
 - a. The system shall provide secure remote access that is Certified ISO / IEC 27001.
 - b. Management Dashboard
 - 1) Google Maps with integrated Geo Pin functionality allowing the user to Toggle KPIs Geo Pin Location based on at least three color coded thresholds definable per individual location
 - 2) A site ranking system based on energy use index (EUI), energy cost index (ECI), CO2 per square foot, energy consumption versus prior year, cost versus prior year, CO2 versus prior year, energy consumption versus budget, energy star score ranking
 - 3) The dashboard shall provide the ability to trend data over time
 - c. User Interface
 - 1) The system shall be hosted in a centrally located data center.
 - 2) The system shall be accessible via a web browser.
 - 3) The system shall allow unlimited concurrent users.
 - 4) The system shall allow administrators to assign different security access by user role as specified in User Setup.
 - 5) The system shall provide a tree view system supporting multiple tree view structures and orientations.
 - 6) The system shall support a tree view system at least six levels deep.
 - 7) The system shall support property inheritance of tree node properties.
 - d. Language Requirements
 - 1) The system shall support at least 20 languages.
 - 2) The system shall support 2 bit (nvar) characters.
 - 3) The system shall support languages left to right and right to left as necessary.
 - e. Unit Requirements
 - 1) The system shall support both Imperial and Metric units.
 - 2) The system shall allow the user to toggle units for select reports.
 - f. General Technical Requirements
 - 1) The system shall allow the software setup and configuration process to be conducted all through a web based interface without any non-web based tools required.
 - 2) The system shall allow aggregation through property inheritance in tree structure for knowledge meters.
 - 3) The system shall support properties of a building showing both square feet and geo coordinates.
 - 4) The system shall support the ability to track consumption and cost budgets versus actual.

- 5) The system shall support the ability to track consumption and cost baseline versus actual. This provides the ability to compare energy consumption and cost against a baseline
 - 6) The system shall provide the ability to display on and off peak usage, day vs. night usage, demand charges, customer charges based on actual rate tariff.
 - 7) The system shall provide average cost of consumption.
- K. User Setup
1. The system shall provide capability to set up specific users with corresponding capabilities according to need or security. At minimum provide the following setup types:
 - a. Super User
 - 1) The Super User shall have all rights and access to all functions that are offered by the software application. Only one user per customer may have this role. However, the Super User will be able to Add Super User Substitutes who automatically have the same rights as the actual Super User.
 - 2) Partner User
 - (a) Super Users may Add Partners. The partner role enables Super Users to delegate entire branches (e.g. a building pool) of their tree view to a partner (e.g. to a regional manager within the same organization, or to an external facility management service provider). This gives the Partner User full access rights for the node assigned to him or her, including all of the lower-level nodes and meters it contains.
 - (b) The Partner User has the same rights as the Super User on the delegated node, but can only display the part of the tree view assigned to him or her. The Partner User has an own user management facility, and is therefore able to Add new users (of type Basic User and Advanced User, see next page) and assign nodes to them (within the given part of the tree view).
 - (c) Such Partner Users are invisible to Super Users outside of the partner company. Like the Super User, Partner Users can Add Super User Substitutes but they do not have the authorization to add additional Partners.
 - 3) Advanced User
 - (a) Each node in the tree view (site, building, etc.) can be assigned to an Advanced User who has the following rights:
 - (1) Reading rights - Example: generate and subscribe to reports, display meter lists
 - (2) Writing rights - Example: Add new buildings and meters, or enter metering data
 - (b) Deleting rights - Example: delete values, meters or nodes for which the user is the contact person. Note: When a User deletes a meter, the meter and all entered values are automatically moved to the "deleted meters" node (the Super User's "recycle bin"). Therefore, the Super User has the possibility to finally delete meters, or to restore them.
 - 4) Basic User
 - (a) Alternatively, each node can be assigned to a Basic User who has the following rights:
 - (1) Reading rights - Example: generate and subscribe to reports, display meter lists
 - (2) Writing rights - Enter and edit meter readings only (no meter exchange)
 - (3) Deleting rights - Delete individual meter readings only
- L. Report Types
1. The software shall support the following report types:
 - a. Load Profiles (Arrangement of all load levels over time)
 - 1) Daily Max kW

- 2) Monthly Max kW
- 3) # of Occ. Of peak load
- 4) Trend of a single KPI
- 5) Daily Avg kW
- 6) Demand
- 7) Monthly Avg kW
- 8) Daily Total kWh
- 9) Gas
- 10) Monthly Total kWh
- 11) Daily Avg kWh
- 12) Chilled Water
- 13) Flow
- 14) Frequency (Any trend data from a BAS System)
- 15) Operational Analysis
 - (a) Daily Max
 - (b) Daily Min
 - (c) Total usage
 - (d) Daily Avg Usage
- 16) Performance Indicators
 - (a) Opportunity Score - Ranked by opportunity to reduce energy use
 - (b) Target Energy Use Intensity
- 17) Consumption
 - (a) Daily Max
 - (b) Total portfolio energy usage
 - (c) Total portfolio emissions usage
 - (d) Electricity
 - (e) Absolute and pct breakdown of energy usage (electricity)
 - (f) Spikes
 - (g) Total and Average (electricity)
 - (h) Total
 - (i) Total portfolio cumulative energy usage
 - (j) Daily Min
 - (k) Energy Use Intensity
 - (l) Emissions Use Intensity
 - (m) Demand
 - (n) Average and r-value correlation (Electricity vs. outside air temp)
 - (o) Total usage
 - (p) Average energy usage
 - (q) Average emissions usage
 - (r) Steam
 - (s) Gaps and missing data
 - (t) Daily Avg Usage
 - (u) Chilled Water
 - (v) Flow
 - (w) Target Energy Use Intensity
 - (x) Yearly Energy use intensity
 - (y) Prior Yr Abs Deviation
 - (z) Prior Yr Abs Deviation
 - (aa) Prior Yr % Deviation
- 18) Emissions
 - (a) Total portfolio emissions usage
 - (b) Emissions Use Intensity
 - (c) Average emissions usage
- 19) Chilled Water Reports

- (a) Daily Max tons
- (b) Total usage
- (c) Daily Avg tons
- (d) Daily Total ton-hr
- (e) Daily Avg ton-hr
- (f) On Peak
- (g) Off Peak
- (h) % Breakdown by load
- 20) Energy Budgeting
 - (a) Electricity
 - (b) Demand
 - (c) Gas
 - (d) Temperatures
 - (e) Chilled Water
 - (f) Budget
- 21) Cost Analysis / Budgeting
 - (a) Total portfolio energy cost
 - (b) Energy cost Intensity
 - (c) Average energy cost
 - (d) Electricity
 - (e) Demand
 - (f) Chilled Water
 - (g) Budget

2.06 WEB BASED CONTROLLER SOFTWARE FOR CONFIGURATION, PROGRAMMING AND OPERATORS

- A. The purpose of this specification is to allow the Owner/Operator to have the same controller programming capabilities as the Controls Contractor Technician without additional software, tools, or licenses.
 - 1. The controller programming shall be accessible to any user via a Web Services application over an IP or Internet connection through port 80.
- B. The following types of controllers shall have this feature:
 - 1. All BACnet BC level controllers
 - 2. Network Engine Controllers
 - 3. Controllers on equipment or sequences customized for this job
- C. Manufacturer:
 - 1. Siemens Launch Pad™ (compatible with PXC controllers)
 - 2. Controllers from other manufacturers shall meet the capabilities of this specification
- D. The controller shall come with the software built-in and delivered with the controller as part of the controller purchase. It shall not require a separate software license to enable the software capability.
 - 1. The software shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher level computer or another controller for execution.
- E. The software application shall be accessible from a PC using Web Services, but shall use all of its own services and data files so as to not be susceptible to Microsoft Windows operating systems based viruses.
- F. Access to the controller software shall be username and password protected. User shall be authenticated by the controller.
- G. The embedded Web Services shall provide the following functionality to users, based on their access and privilege rights:
 - 1. Point Navigation – Provide a screen that allows users to see all of the points that are active in the system. The points shall include hardwired, software, schedules, trends, alarms and network setup.

- a. The point navigation shall display the point name, descriptor, command priority, alarm status, and current value.
 - b. The user shall be able to run and print a pre-configured point log report through a web interface client that shows the point name, descriptor, command priority, alarm status, and current value.
 - c. The interface and report shall allow selection filter such that the operator can select or deselect the types of point that are visible.
 - d. Alarm Display –displays current BAS alarms to which the user has access will be displayed. Users will be able to acknowledge active alarms, erase resolved alarms, and directly link to the Point Commanding feature.
 - 1) The alarm display must provide a filter that displays all alarms whether acknowledged or not.
 - 2) The alarm display must provide a filter that displays only alarms that have not yet been acknowledged.
 - 3) The alarm display must provide a persistent indication whenever there is one or more unacknowledged alarm in any connected field panel.
 - e. Point details – users will have access to point detail information including operational status, operational priority, physical address, and alarm limits, for point objects to which they have access rights.
 - f. Point Commanding – users will be able to override and command points they have access to via the Web browser interface.
 - g. Scheduling – allows operators, depending on their current user privileges, to override schedules selected by date, and to modify the properties of a selected schedule.
 - 1) The scheduler display must be able to represent facility mode schedules in a graphical format.
 - h. Trend Data Report – allows users to run and print a pre-configured trend data report for historical data reporting, including a representation of the alarm status of the each point for each Trend sample. The report shall allow selection of individual points or wildcard selection of points.
 - 1) Trend data shall be exportable to a data file, such as .csv or other comparable.
 - i. Network navigation - Provide a screen that allows users to navigate to the panels and terminal units via the network architecture.
- H. The web server shall be able to send SMTP text messages to notify users of alarm status. The owners shall provide a mail server and a connection port. SSL shall not be required.
- I. The operator shall be able to add modify and delete controller database program, including points, schedules, alarms, and trends.
 - 1. The operator shall be able to edit the custom program in the field panel that executes the sequences of operations, control loops and logic for the systems controlled.
 - 2. The operator shall be able to add terminal unit controllers that reside on field panel subnetworks.
- J. Internet connections, ISP services, as well as necessary firewalls or proxy servers shall be provided by the Owner as required to support the Web access feature.
- K. Coordinate with the Owner/Operator's IT representatives to setup and allow access to controllers via IP connections and Web Services through port 80.
 - 1. It shall be the responsibility of the Owner/IT to setup and maintain security for user access to the private networks.
 - 2. Coordinate IP addressing scheme.

2.07 DIRECT DIGITAL CONTROLLER SOFTWARE

- A. Provide a full capability user license to the owner for the operator to be able to see, modify, create, upload, download and save control programs to the DDC controllers.
- B. The software program shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher level computer or another controller for execution.

- C. The software shall be provided with an interactive HELP function to assist operators with syntax, abbreviations, commands and saving programs.
- D. Point naming and communication format:
 - 1. All points, panels, and programs shall be identified by a 30-character name. All points shall also be identified by a 16-character point descriptor. The same names shall be displayed at both Building Controller and the Operator Interface.
 - 2. All digital points shall have a consistent, user-defined, two-state status indication with 8 characters minimum (e.g., Summer, Enabled, Disabled, Abnormal).
 - 3. The Building Controller Software shall be capable of BACnet communications. The BACnet Building Controller (B-BC) shall have demonstrated interoperability during at least one BTL Interoperability Workshop, have demonstrated compliance to BTL through BTL listing and shall substantially conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2004, Annex L.
- E. System Security
 - 1. User access shall be secured using individual security passwords and user names.
 - 2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
 - 3. Building Controllers shall be able to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any Operator Interface or portable operator terminal) shall enable the operator to monitor, adjust and control only the points that the operator is authorized for. All other points shall not be displayed at the Operator Interface or portable terminal. Passwords and priorities for every point shall be fully programmable and adjustable.
 - 4. User Log On/Log Off attempts shall be recorded.
 - 5. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.
 - 6. Use of workstation resident security as the only means of access control is not an acceptable alternative to resident system security in the DDC controller software.
- F. User Defined Control Applications: The applications software shall program DDC routines to meet the sequences of operations.
 - 1. Building Controllers shall have the ability to perform energy management routines including but not limited to time of day scheduling, calendar-based scheduling, holiday scheduling, temporary schedule overrides, start stop time optimization, automatic daylight savings time switch over, night setback control, enthalpy switch over, peak demand limiting, temperature-compensated duty cycling, heating/cooling interlock, supply temperature reset, priority load shedding, and power failure restart.
 - 2. The Building Controllers shall have the ability to perform the following pre tested control algorithms:
 - a. Two position with differential control and time delays
 - b. Floating control
 - c. Proportional control
 - d. Proportional plus integral control
 - e. Proportional, integral, plus derivative control
 - f. Automatic tuning of control loops
 - g. Model-free adaptive control
 - h. Start Stop Time Optimization
 - i. Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
 - j. Each controller shall support plain language text comment lines in the operating program to allow for quick troubleshooting, documentation, and historical summaries of program development.
- G. Peer-to-peer access to other DDC controllers

1. It shall be possible to use any actual or virtual point data or status, any system calculated data, a result from any process, or any user-defined constant in any controller in the system.
 2. Any process shall be able to issue commands to points in any and all other controllers in the system.
 3. Processes shall be able to generate operator messages and advisories to other operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of an advanced annunciation feature, such as:
 - a. Generate a report
 - b. Annunciate an alarm
 - c. Issue a text message or email
- H. Alarm Management
1. Alarm management shall be provided within the controller software to monitor and direct alarm information to operator devices.
 2. Each Building Controller shall perform distributed, independent alarm analysis, minimize network traffic and prevent alarms from being lost. At no time shall the Building Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.
 3. Conditional alarming shall allow generation of alarms based upon user defined multiple criteria.
 4. An Alarm "shelving" feature shall be provided to disable alarms during testing. (Pull the Plug, etc.).
 5. Binary Alarms. Each binary alarm object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
 6. Analog Alarms. Each analog alarm object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.
 7. All alarm shall include the point's user-defined language description and the time and date of occurrence.
 8. Alarm reports and messages shall be routed to user-defined list of operator workstations, or other devices based on time and other conditions. An alarm shall be able to start programs, print reports, be logged in the event log, generate custom messages, and display graphics.
 9. The user shall be able to add a 200-character alarm message to each alarm point to more fully describe the alarm condition or direct operator response. Each Building Controller shall be capable of storing a library of at least 50 alarm messages. Each message may be assigned to any number of points in the Controller.
 10. Operator-selected alarms shall be capable of initiating a trigger to an advanced annunciation, such as text, email, etc.
 11. An alarm history log shall report the start of the alarm condition, acknowledgement by a user and return of the alarm to normal condition.
- I. Scheduling:
1. Provide a comprehensive menu driven program to automatically start and stop designated multiple objects or events in the system according to a stored time.
 2. Schedules shall reside in the building controller and shall not rely on external processing or network.
 3. It shall be possible to define a group of objects as a custom event (i.e., meeting, athletic activity, etc.). Events can then be scheduled to operate all necessary equipment automatically.
 4. For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start and/or stop within that group.
 5. The operator shall be able to define the following information:
 - a. Time, day
 - b. Commands such as on, off, auto, etc.
 - c. Time delays between successive commands.

- d. There shall be provisions for manual overriding of each schedule by an authorized operator.
- e. It shall be possible to schedule calendar-based events up to one year in advance based on the following:
 - 1) Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. When a group of objects are scheduled together as an Event, provide the capability to adjust the start and stop times for each member.
 - 2) Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.
- J. Peak Demand Limiting (PDL):
 - 1. The Peak Demand Limiting (PDL) program shall limit the consumption of electricity to prevent electrical peak demand charges.
 - 2. PDL shall continuously track the amount of electricity being consumed, by monitoring one or more electrical kilowatt-hour/demand meters. These meters may measure the electrical consumption (kWh), electrical demand (kW), or both.
 - 3. PDL shall sample the meter data to continuously forecast the demand likely to be used during successive time intervals.
 - 4. If the PDL forecasted demand indicates that electricity usage is likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads.
 - 5. Once the demand peak has passed, loads that have been shed shall be restored and returned to normal control.
- K. Temperature-compensated duty cycling
 - 1. User defined conditions shall be able to initiate a Duty Cycle Control Program.
 - 2. The Duty Cycle Control Program (DCCP) shall be configured to periodically stop and start loads according to various patterns.
 - 3. The loads shall be cycled such that there is a net reduction in both the electrical demands and the energy consumed.
- L. Automatic Daylight Savings Time Switchover. The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.
- M. Night setback control. The system shall provide the ability to automatically adjust setpoints for night control.
- N. Control Loop Algorithm
 - 1. Provide a PID (proportional-integral-derivative) closed-loop control algorithm with direct or reverse action and anti-windup. The algorithm shall calculate a time-varying analog value that is used to position an output or stage a series of outputs. The controlled variable, setpoint, and weighting parameters shall be accessible from the operator workstation.
- O. Adaptive Loop Tuning
 - 1. Building Controllers shall also provide high resolution sampling capability for verification of DDC control loop performance. Documented evidence of tuned control loop performance shall be provided on a monthly, seasonal, quarterly, annual period.
 - 2. For Model-Free Adaptive Control loops, evidence of tuned control loop performance shall be provided via graphical plots or trended data logs. Graphical plots shall minimally include depictions of setpoint, process variable (output), and control variable (e.g., temperature). Other parameters that may influence loop control shall also be included in the plot (e.g., fan on/off, mixed-air temp).
 - 3. For PID control loops, operator-initiated automatic and manual loop tuning algorithms shall be provided for all operator-selected PID control loops. Evidence of tuned control loop performance shall be provided via graphical plots or trended data logs for all loops.

- a. In automatic mode, the controller shall perform a step response test with a minimum one-second resolution, evaluate the trend data, calculate the new PID gains and input these values into the selected LOOP statement.
 - b. Loop tuning shall be capable of being initiated either locally at the Building Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.
- P. Logic programming: Provide a software routine that can build ladder logic to control using many conditional statements.
 - 1. The logic programming syntax shall be able to combine ladder logic with other software features, such as combining status, scheduling, PDL and alarm conditions into one conditional decision.
 - 2. Logic programming shall be able to reference conditions in any other controller in the system.
- Q. Staggered Start:
 - 1. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user definable in an application and shall not require written scripts or ladder logic.
 - 2. Upon the resumption of power, each Building Controller shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling and turn equipment on or off as necessary to resume normal operations.
- R. Totalization Features:
 - 1. Run-Time Totalization. Building Controllers shall automatically accumulate and store run-time hours for all digital input and output points. A high runtime alarm shall be assigned, if required, by the operator.
 - 2. Consumption totalization. Building Controllers shall automatically sample, calculate and store consumption totals on a daily, weekly or monthly basis for all analog and digital pulse input type points.
 - 3. Event totalization. Building Controllers shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly or monthly basis for all points. The event totalization feature shall be able to store the records associated with events before reset.
- S. Data Collection:
 - 1. A variety of historical data collection utilities shall be provided to manually or automatically sample, store, and display system data for all points.
 - 2. Building Controllers shall store point history data for selected analog and digital inputs and outputs.
 - 3. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each Building Controllers point group.
 - 4. Two methods of collection shall be allowed: either by up to four pre-defined time intervals or upon a pre-defined change of value. Sample intervals of 1 minute to 7 days shall be provided.
 - 5. Each Building Controller shall have a dedicated RAM-based buffer for trend data and shall be capable of storing a minimum of 10,000 data samples.
 - 6. Trend data shall be stored at the Building Controllers and uploaded to the workstation when retrieval is desired. Uploads shall occur based upon either user-defined interval, manual command or when the trend buffers are full. All trend data shall be available for use in third-party personal computer applications.

2.08 BACNET BUILDING CONTROLLERS

- A. Provide all necessary hardware for a complete operating system as required. The Building Controller shall be able to operate as a standalone panel and shall not be dependent upon any higher level computer or another controller for operation.
- B. Basis of design is Siemens PX Modular and Compact Controllers (PXC).
- C. This controller shall have the BTL listing and meet the BACnet device profile of a Building Controller (B-BC) and shall support the following BACnet BIBBs:
 - 1. Data Sharing
 - a. Data Sharing-Read Property-Initiate, Execute (DS-RP-A,B)
 - b. Data Sharing-Read Property Multiple- Initiate, Execute (DS-RPM-A,B)
 - c. Data Sharing-Write Property- Initiate, Execute (DS-WP-A,B)
 - d. Data Sharing-Write Property Multiple- Execute (DS-WPM-B)
 - e. Data Sharing-COV- Initiate, Execute (DS-COV-A,B)
 - f. Data Sharing-COV-Unsolicited- Initiate, Execute (DS-COVU-A,B)
 - g. Scheduling
 - 1) Scheduling-Internal- Execute (SCHED-I-B)
 - 2) Scheduling-External- Execute (SCHED-E-B)
 - h. Trending
 - 1) Trending-Viewing and Modifying Trends - Initiate (T-VMT-A)
 - 2) Trending-Viewing and Modifying Trends Internal- Execute (T-VMT-I-B)
 - 3) Trending-Viewing and Modifying Trends-External- Execute (T-VMT-E-B)
 - 4) Trending-Automated Trend Retrieval- Execute (T-ATR-B)
 - i. Network Management
 - 1) Network Management-Connection Establishment- Initiate (NM-CE-A)
 - j. Alarming
 - 1) Alarm and Event-Notification- Initiate (AE-N-A)
 - 2) Alarm and Event-Notification Internal- Execute (AE-N-E-B)
 - 3) Alarm and Event-Notification External- Execute (AE-N-E-B)
 - 4) Alarm and Event-ACK- Initiate, Execute (AE-ACK-A,B)
 - 5) Alarm and Event –Alarm Summary- Execute (AE-ASUM-B)
 - 6) Alarm and Event –Enrollment Summary- Execute (AE-ESUM-A,B)
 - 7) Alarm and Event –Information- Initiate, Execute (AE-ESUM-A,B)
 - k. Device Management
 - 1) Device Management-Dynamic Device Binding- Initiate, Execute (DM-DDB-A,B)
 - 2) Device Management-Dynamic Object Binding- Initiate, Execute (DM-DOB-A,B)
 - 3) Device Management-Device Communication Control- Execute (DM-DCC-B)
 - 4) Device Management-Private Transfer- Initiate, Execute (DM-PT-A,B)
 - 5) Device Management-Text Message- Initiate, Execute (DM-TM-A,B)
 - 6) Device Management-Time Synchronization- Execute (DM-TS-B)
 - 7) Device Management-Reinitialize Device- Execute (DM-RD-B)
 - 8) Device Management-Backup and Restore- Execute (DM-RD-B)
 - 9) Device Management-List Manipulation- Execute (DM-RD-B)
 - 10) Device Management-Object Creation and Deletion- Execute (DM-OCD-B)
 - l. The Building Level Controller shall support the following Data Link Layers:
 - 1) BACnet IP Annex J
 - 2) BACnet IP Annex J Foreign Device
 - 3) MS/TP Master (Claus 9)
 - m. The Building Level Controller shall be able to interact with all of the BACnet objects in the controllers. In addition, the software shall be able to support the following objects as they relate to features in the workstation software:
 - 1) Calendar – Creatable, Deletable
 - 2) Command – Creatable, Deletable
 - 3) Event Enrollment – Creatable, Deletable

- 4) Notification Class – Creatable, Deletable
 - 5) Schedule - Creatable, Deletable
- n. The Building Level Controller shall support transmitting and receiving segmented messages.
- o. The Building Level Controller shall have the capability to be the BACnet/IP Broadcast Management Device (BBMD) and support foreign devices.
- p. The Building Level Controller shall have the capability to act as a BACnet router between MS/TP subnetworks and BACnet/IP.
- D. This level of controller shall be used for the following types of systems:
 - 1. Chiller plant systems
 - 2. Heating plant systems
 - 3. Pumping systems
 - 4. Air handlers over 15,000 cfm
 - 5. Systems with over 24 input/output points
 - 6. Rooftop systems
- E. Computing power and memory minimum:
 - 1. A 32-bit, stand-alone, multi-tasking, multi-user, real-time 100MHz digital control microprocessor module.
 - 2. Inputs shall be 16-bit minimum analog-to-digital resolution
 - 3. Outputs shall be 10-bit minimum digital-to-analog resolution
 - 4. Memory module (24 Megabyte, minimum) to accommodate all Primary Control Panel software requirements, including but not limited to, its own operating system and databases (see Controllers Software section), including control processes, energy management applications, alarm management applications, historical/trend data for points specified, maintenance support applications, custom processes, operator I/O, dial-up communications.
 - 5. Real time clock and battery
 - 6. Data collection/ Data Trend module sized for 10,000 data samples.
 - 7. Flash Memory Firmware: Each Building Level Control Panel shall support firmware upgrades without the need to replace hardware.
- F. Onboard or Modular hardware and connections:
 - 1. Primary Network communication module, if needed for primary network communications.
 - 2. Secondary Network communication module, if needed for secondary network communications.
 - 3. RJ45 port 10/100Mbaud
 - 4. RS485 ports for subnetworks and point expansion
 - 5. Man to Machine Interface port (MMI)
 - 6. USB Port
 - 7. Local Controller Interface. A local user interface to the controller shall be provided. The interface shall be hot swappable, and may be mounted on any building controller and automatically read and initiate commands of local database points without further set-up or configuration. The Controller Interface shall be provided for interrogating and editing data, commanding point values at user defined priorities, viewing and acknowledging alarms, and viewing point monitoring reports. An optional system security password shall be available to prevent unauthorized use of the local controller interface and display.
- G. Input and Output Points Hardware
 - 1. Input/output point modules as required including spare capacity.
 - 2. Input/output point modules shall have removable terminal blocks.
 - 3. Monitoring of the status of all hand-off-auto switches.
 - 4. Monitoring of all industry standard types of analog and digital inputs and outputs, without the addition of equipment to the primary control panel.
 - 5. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Each primary control

- panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator workstation.
6. Graduated intensity LEDs or analog indication of value for each analog output.
 7. HOA (hand-off-auto module) with software configurability and LED status indicators.
- H. Code compliance
1. Approvals and standards: UL916; CE; FCC
 2. Provide UL864-UUKL where called for in the sequences of operations.
- I. Accessories:
1. Appropriate NEMA rated metal enclosure.
 2. Power supplies as required for all associated modules, sensors, actuators, etc.
- J. The operator shall have the ability to manually override automatic or centrally executed commands at the primary control panels via local, point discrete, on-board hand/off/auto operator override switches. If on board switches are not available, provide separate control panels with HOA switches. Mount panel adjacent to primary control panel. Provide hand/off/auto switch for each digital output, including spares.
- K. Each Building Level Control Panel shall continuously perform self-diagnostics on all hardware modules and network communications. The System Level Control Panel shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication with any system.
- L. Panel setup, point definitions and sequencing diagrams shall be backed up on EEPROM memory.
- M. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all Building Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 30 days.
- N. Building Level control panels shall provide at least two serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals. Primary control panels shall allow temporary use of portable devices without interrupting the normal communications, operation of permanently connected modems, printers or terminals.
- O. Building Level Controllers shall have the capability to serve as a gateway between Modbus subnetworks and BACnet objects. Provide software, drives and programming.
- P. Isolation shall be provided at all primary control panel terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.
- Q. Spare Capacity: Provide enough inputs and outputs to handle the equipment shown to be "future" on drawings and 10% more of each point type. Provide all hardware modules, software modules, processors, power supplies, communication controllers, etc. required to ensure adding a point to the spare point location only requires the addition of the appropriate sensor/actuator and field wiring/tubing.
- R. Environment.
1. Controller hardware shall be suitable for the anticipated ambient conditions.
 2. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).
 3. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).
 4. Controller hardware shall be optionally suitable for rooftop environments.
- S. Immunity to power and noise.
1. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.
 2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

3. Isolation shall be provided at all primary network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
 - a. RF-Conducted Immunity (RFCl) per ENV 50141 (IEC 1000-4-6) at 3V.
 - b. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact.
 - c. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500V signal, 1 kV power.
 - d. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max).
 - e. Isolation shall be provided at all Building Controller's AC input terminals to suppress induced voltage transients consistent with:
 - 1) IEEE Standard 587 1980
 - 2) UL 864 Supply Line Transients
 - 3) Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

2.09 BACNET ADVANCED APPLICATION CONTROLLERS

- A. Provide all necessary hardware for a complete operating system as required. The Advanced Application level control panel shall be able to operate as a standalone panel and shall not be dependent upon any higher level computer or another controller for operation.
- B. Basis of design is Unitary Equipment Controller (PXCxx-UCM).
- C. The Advanced Application Controller Software shall be capable of BACnet communications. The BACnet Advanced Application Controller (B-AAC) shall have demonstrated compliance to BTL through BTL listing and shall substantially conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2004 or ANSI/ASHRAE 135-2008. Supported BIBBS shall include:
 1. Data Sharing
 - a. Data Sharing-Read Property-Initiate, Execute (DS-RP-A,B)
 - b. Data Sharing-Read Property Multiple- Initiate, Execute (DS-RPM-A,B)
 - c. Data Sharing-Write Property- Initiate, Execute (DS-WP-A,B)
 - d. Data Sharing-Write Property Multiple- Execute (DS-WPM-B)
 - e. Data Sharing-COV- Initiate, Execute (DS-COV-A,B)
 - f. Scheduling
 - 1) Scheduling-Internal- Execute (SCHED-I-B)
 - g. Trending
 - 1) Trending-Viewing and Modifying Trends Internal- Execute (T-VMT-I-B)
 - 2) Trending-Automated Trend Retrieval- Execute (T-ATR-B)
 - h. Network Management
 - 1) Network Management-Connection Establishment- Initiate (NM-CE-A)
 - i. Alarming
 - 1) Alarm and Event-Notification Internal- Execute (AE-N-I-B)
 - 2) Alarm and Event-ACK- Initiate, Execute (AE-ACK-A,B)
 - 3) Alarm and Event –Enrollment Summary- Execute (AE-ESUM-B)
 - 4) Alarm and Event –Information- Execute (AE-INFO-B)
 - j. Device Management
 - 1) Device Management-Dynamic Device Binding- Initiate, Execute (DM-DDB-A,B)
 - 2) Device Management-Dynamic Object Binding- Initiate, Execute (DM-DOB-A,B)
 - 3) Device Management-Device Communication Control- Execute (DM-DCC-B)
 - 4) Device Management-Time Synchronization- Execute (DM-TS-B)
 - 5) Device Management-Reinitialize Device- Execute (DM-RD-B)
 - 6) Device Management-Backup and Restore- Execute (DM-BR-B)
 - 7) Device Management-List Manipulation- Execute (DM-LM-B)
 - 8) Device Management-Object Creation and Deletion- Execute (DM-OCD-B)
 - k. The Advanced Application Controller shall be able to interact with all of the BACnet objects in the controllers. In addition, the software shall be able to support the following objects as they relate to features in the workstation software:

- 1) Calendar – Creatable, Deletable
 - 2) Command – Creatable, Deletable
 - 3) Event Enrollment – Creatable, Deletable
 - 4) Notification Class – Creatable, Deletable
 - 5) Schedule - Creatable, Deletable
 - I. The Advanced Application Controller shall support transmitting and receiving segmented messages.
- D. Communication:
1. BAS Network: The Advanced Application Controller shall support the following Data Link Layers:
 - a. MS/TP Master
 - b. Serial Communication: Temporary use of portable devices shall not interrupt the BAS communication, nor the normal operation of permanently connected printers or terminals.
 - 1) Provide at least one EIA-232C serial data communication port for operation of operator I/O devices such as industry standard printers, operator terminals, and portable laptop operator's terminals.
 - 2) A USB port shall alternatively be available to support local HMI tools connection.
- E. Software
1. The software programs specified in this section shall be provided as an integral part of Advanced Application Controllers and shall not be dependent upon any higher level computer or another controller for execution.
 2. Advanced Application Controllers shall have the ability to perform energy management routines including but not limited to:
 - a. Scheduling, calendar-based scheduling, holiday scheduling, temporary schedule overrides.
 - b. Automatic daylight savings time switch over
 - c. Night setback control
 - d. Economizer switch over using enthalpy, dry bulb or a combination
 - e. Peak demand limiting,
 - f. Temperature-compensated duty cycling
 - g. Heating/cooling interlock
 - h. Supply temperature reset
 - i. Priority load shedding
 - j. Power failure restart
 3. The software shall have a routine for automatic tuning of control loops
 4. System Security in the Field Panel
 - a. User access shall be secured using individual security passwords and user names.
 - b. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
 - c. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.
 - d. Use of workstation resident security as the only means of access control is not an acceptable alternative to resident system security in the field panel.
 5. User Defined Control Applications:
 - a. Controllers shall be fully-programmable. Controllers shall execute custom, job-specific sequences to automatically perform calculations and special control routines. Factory installed or pre-configured sequences shall only be allowed if they exactly match the sequence specified herein.
 - b. Programs shall combine control logic, control loop algorithms, and energy management routines
 - c. Each controller shall support plain language text comment lines in the operating program to allow for quick troubleshooting, documentation, and historical summaries of program development.

- d. Controller shall provide a HELP function key, providing enhanced context sensitive on-line help with task oriented information from the user manual.
- F. Adaptive Loop Control.
 - 1. Each AAC controller shall come standard with an Adaptive Control Loop Algorithm
 - a. Tuning parameter shall automatically adjust for non-linear applications
 - 2. Model-Free Adaptive (MFA) algorithm
 - a. The algorithm shall not require modeling of the non-linear system in order to maintain control at all points of the non-linear load.
 - b. The controlled variable, setpoint, and weighting parameters shall be user-selectable.
 - 3. Output shall be analog or shall stage a series of outputs.
 - 4. Adaptive Control shall take the place of Proportional, Proportional + Integral, and PID type algorithms for non-linear applications. Adaptive Control routines shall :
 - a. Improve response time
 - b. Improve System efficiency
 - c. Improve Stability
 - d. Result in Consistent outputs
 - e. Reduce cycling and repositioning
 - f. Reduce wear and tear on actuators
 - 5. Adaptive control shall auto-adjust to compensate for
 - a. mode changes
 - b. load changes
 - c. seasonal changes
 - d. Heating and cooling changeover
 - e. Heating or cooling capacity changes on the primary side
 - f. Flow changes on the primary or secondary side
 - g. Airflow changes across coil
 - h. Flow across a heat exchanger
 - 6. Adaptive control shall auto-adjust to compensate for
 - a. Non-linear coils and heat exchangers
 - b. Hot water and chilled water reset routines
 - c. Water flow reset routines
 - d. Duct Static reset routines
 - 7. Auto-Tune PID loops are not acceptable substitutions.
 - 8. If Adaptive Loop Control is not available, then the BAS contractor shall provide re-tuning of the control loops for coils and heat exchangers for each of the following conditions:
 - a. Low heating supply water, high heating supply water
 - b. Chilled water coil, non dehumidification and condensing
 - c. Chilled water coil, low airflow, high airflow
 - d. Dual temperature systems tune for heating and cooling modes
 - e. Each of 4 seasons
- G. This level of controller shall be used for the following types of systems:
 - 1. Systems with custom sequences that meet all of the criteria below:
 - a. No primary pumping systems
 - b. Secondary Pumping systems that are remote from Central Plants
 - c. Air handlers up to 15,000 cfm
 - d. Systems up to 20 input/output points
 - e. Room control sequences that cannot be achieved with an application specific controller
 - f. BAS Network or Architecture or Sequences do not require the system to be on an IP network
 - g. No systems that require integration to meters, VFDs or other smart equipment
 - h. Integration to smart thermostats is allowed
- H. Input/Outputs

1. Inputs shall be 16-bit minimum digital resolution
2. Outputs shall be 10-bit minimum digital resolution
3. The following I/O port types shall be available on the controller
 - a. Universal Input (software configurable):
 - 1) Digital Input choices:
 - (a) Pulse Accumulator
 - (b) Contact Closure Sensing
 - (c) Dry Contact/Potential Free inputs only
 - (d) Digital Input (10 ms settling time)
 - (e) Counter inputs up to 20 Hz, minimum pulse duration 20 ms (open or closed)
 - 2) Analog Input Choices:
 - (a) 0-10 Vdc
 - (b) 4-20 mA
 - (c) 1K Ni RTD @ 32°F (Siemens, JCI, DIN Ni 1K)
 - (d) 1K Pt RTD (375 or 385 alpha) @ 32°F
 - (e) 10K NTC Type 2 or Type 3 Thermistor
 - (f) 100K NTC Type 2 Thermistor
 - b. Universal Input or Output (software configurable):
 - 1) All of the above input types
 - 2) Analog Output Types:
 - (a) 0 to 10 Vdc @ 1 mA max
 - c. Super Universal Input or Output (software configurable):
 - 1) All of the above input types
 - 2) All of the above output types
 - 3) Super digital output type:
 - (a) 0 to 24 Vdc, 22 mA max. (for controlling pilot relay)
 - 4) Super Analog Output Choices:
 - (a) 0 to 20 mA @ 650 Ω max.
4. Provide software configurable I/O ports such that a programmer make a port either an input or an output
- I. Each System Level Control Panel shall, at a minimum, be provided with:
 1. Appropriate NEMA rated metal enclosure.
 2. A 32-bit, multi-tasking, real-time 100 MHz digital control microprocessor with plug-in, enclosed processors.
 3. Each Advanced Application Controller shall have sufficient memory, a minimum of 24 megabyte, to support its own operating system and databases, including control processes, energy management applications, alarm management applications, historical/trend data for points specified, maintenance support applications, custom processes, and operator I/O.
 4. Real time clock and battery
 5. Data collection/ Data Trend module sized for 10,000 data samples.
 6. Power supplies as required for all associated modules, sensors, actuators, etc.
 7. Monitoring of all industry standard types of analog and digital inputs and outputs, without the addition of equipment to the primary control panel.
 8. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.
 9. Each control panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator workstation.
 10. Graduated intensity LEDs or analog indication of value for each analog output.
- J. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for the operating system software and firmware.

1. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.
 2. Brownout protection and power recovery circuitry protect the controller board from power fluctuations.
 3. Battery backup shall be provided to support the real-time clock for 10 years
 4. The program and database information stored SDRAM memory shall be battery backed for a minimum of 30 days and up to 60 days. This eliminates the need for time consuming program and database re-entry in the event of an extended power failure.
- K. Database Restore: Each AAC controller shall automatically save the latest programmed database. The controller shall be able to automatically restore a lost or corrupt database without involvement from the operator.
- L. Each System Level Control Panel shall continuously perform self-diagnostics on all hardware modules and network communications. The System Level Control Panel shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication with any system.
- M. Each Control Panel shall support firmware upgrades without the need to replace hardware.
- N. System Level control panels shall provide at least two RS-232C serial data communication ports for operation of operator I/O devices such as operator terminals, and additional memory. Control panels shall allow temporary use of portable operator interface devices without interrupting the normal communications.
- O. Immunity to noise.
1. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
 2. Isolation shall be provided at all primary network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
 - a. RF-Conducted Immunity (RFCl) per ENV 50141 (IEC 1000-4-6) at 3V.
 - b. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact.
 - c. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500V signal, 1 kV power.
 - d. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max).
 3. Isolation shall be provided at all Advanced Application Controller's AC input terminals to suppress induced voltage transients consistent with:
 - a. IEEE Standard 587 1980
 - b. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)
- P. Agency Compliance
1. UL UL916 PAZX (all models)
 2. UL916 PAZX7 (all models)
 3. FCC Compliance CFR47 Part 15, Subpart B, Class B
- Q. Spare Capacity: Provide enough inputs and outputs to handle the equipment shown to be "future" on drawings and 10% more of each point type. Provide all hardware modules, software modules, processors, power supplies, communication controllers, etc. required to ensure adding a point to the spare point location only requires the addition of the appropriate sensor/actuator and field wiring/tubing.
- R. Local Operator Interfaces
1. Controllers shall support an Operator Interface Module.
 2. Local user interface to the controller shall be hot swappable, and may be mounted on any building controller and automatically read and initiate commands of local database points without further set-up or configuration. The Controller Interface shall be provided for interrogating and editing data, commanding point values at user defined priorities, viewing and acknowledging alarms, and viewing point monitoring reports. An optional system

security password shall be available to prevent unauthorized use of the local controller interface and display.

2.10 CONTROL PANELS

- A. Controllers in mechanical rooms shall be mounted in NEMA 1 enclosures.
- B. Controllers in areas where moisture is a concern shall be mounted in NEMA 12 enclosures.
- C. Controllers installed outdoors shall be mounted in NEMA 4X enclosures. Provide heaters where freezing temperatures are normally experienced.
- D. Mount on walls at an approved location or provide a free standing rack.
- E. Panels shall be constructed of 16 gauge, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with ANSI 61 gray polyester-powder painted finish, UL listed. Provide common keying for all panels.
- F. Provide power supplies for control voltage power.
- G. Dedicate 1 power supply to the DDC controller. Other devices shall be on a separate power supply, unless the power for the control device is derived from the controller terminations.
- H. Power supplies for controllers shall be a transformer with a fuse or circuit breaker. Power supplies for other devices can be plain transformers.
- I. All power supplies for 24V low voltage wiring shall be class 2 rated and less than 100VA. If low voltage devices require more amps, then provide multiple power supplies. If a single device requires more amps, then provide a dedicated power supply in a separate enclosure and run a separate, non-class 2 conduit to the device.
- J. Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC Controllers and operator's workstations.
- K. All devices in a panel shall be permanently mounted, including network switches, modems, media converters, etc.
- L. Provide a pocket to hold documentation.

2.11 SENSORS

- A. General
 - 1. Provide mounting hardware for all devices, including actuator linkages, wells, installation kits for insertion devices, wall boxes and fudge plates, brackets, etc.
 - 2. If a special tool is required to mount a device, provide that tool.
- B. Terminal Unit Space Thermostats
 - 1. Each controller performing space temperature control shall be provided with a matching room temperature sensor.
 - a. Plain Space Temperature Sensors – Wired: Where called for in the sequences or on the drawings, provide sensors with plain covers.
 - b. The sensing element for the space temperature sensor shall be thermistor type providing the following.
 - 1) Element Accuracy: + /- 1.0°F
 - 2) Operating Range: 55 to 95°F
 - 3) Set Point Adjustment Range: 55 to 95°F
 - 4) Calibration Adjustments: None required
 - 5) Installation: Up to 100 ft. from controller
 - 6) Auxiliary Communications Port: as required
 - 7) Local LCD Temperature Display: as required
 - 8) Setpoint Adjustment Dial: as required
 - 9) Occupancy Override Switch: as required
 - c. Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall

- allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.
2. Digital Display temperature sensor specifications – Wired:
 - a. As called for in the sequences of operations or on the drawings, provide temperature sensors with digital displays.
 - b. The sensing element for the space temperature sensor must be IC-based and provide the following.
 - 1) Digitally communicating with the Application Specific Controller.
 - 2) Mountable to and fully covering a 2 x 4 electrical junction box without the need for an adapter wall plate.
 - 3) IC Element Accuracy: +/- 0.9°F
 - 4) Operating Range: 55 to 95°F
 - 5) Setpoint Adjustment Range: User limiting, selectable range between 55 and 95°F
 - 6) Display of temperature setpoint with numerical temperature values
 - 7) Display of temperature setpoint graphically, with a visual Hotter/Colder setpoint indication
 - 8) Calibration: Single point, field adjustable at the space sensor to +/- 5°F
 - 9) Installation: Up to 100 ft. from controller
 - 10) Auxiliary Communications Port: included
 - 11) Local OLED Temperature Display: included
 - 12) Display of Temperature to one decimal place
 - 13) Temperature Setpoint Adjustment: included
 - 14) Occupancy Override Function: included
 - c. Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.
 3. Provide the following options as they are called for in the sequences or on the drawings:
 - a. Setpoint Adjustment: The setpoint adjustment function shall allow for modification of the temperature by the building operators. Setpoint adjustment may be locked out, overridden, or limited as to time or temperature through software by an authorized operator at any central workstation, Building Controller, room sensor two-line display, or via the portable operator's terminal.
 - b. Override Switch: An override button shall initiate override of the night setback mode to normal (day) operation when activated by the occupant and enabled by building operators. The override shall be limited to two (2) hours (adjustable.) The override function may be locked out, overridden, or limited through software by an authorized operator at the operator interface, Building Controller, room sensor two-line display or via the portable operator's terminal.
 - c. Space Combination Temperature and Humidity Sensors: Each controller performing space temperature control shall be provided with a matching room temperature sensor, which also includes the ability to measure humidity for either monitoring or control purposes. The combination temperature and humidity sensors shall have the same appearance as the space temperature sensors. Humidity elements shall measure relative humidity with a +/- 2% accuracy over the range of 10 to 90% relative humidity. Humidity element shall be an IC (integrated circuit) sensing element. Humidity sensing elements shall be removable and field replaceable if needed.
- C. Temperature Sensors
1. All temperature sensors shall meet the following specifications:
 - a. Accuracy: Plus or minus 0.2 percent at calibration point.
 - b. Wire: Twisted, shielded-pair cable.

- c. Vibration and corrosion resistant
2. Space temperature sensors shall meet the following specifications:
 - a. 10k ohm type 2 thermistors
3. Insertion Elements in Ducts shall meet the following specifications:
 - a. Single point 10k ohm thermistor
 - b. Use where not affected by temperature stratification
 - c. The sensor shall reach more than 1/3 the distance from the duct wall
 - d. Junction box for wire splices
4. Averaging Elements in Ducts shall meet the following specifications:
 - a. 72 inches (183 cm) long
 - b. Flexible
 - c. Use where prone to temperature stratification, in front of coils, or where ducts are larger than 9 sq. ft.
 - d. Junction box for wire splices
5. Insertion Elements for Liquids shall meet the following specifications:
 - a. Platinum RTD with 4-20mA transmitter
 - b. Threaded mounting with matching well
 - c. Brass well with minimum insertion length of 2-1/2 inches for pipes up to 4" diameter
 - d. Brass well with insertion length of 6 inches for pipes up to 10" diameter
 - e. Junction box for wire splices
6. Outside-Air Sensors Platinum RTD with 4-20mA transmitter:
 - a. Watertight enclosure, shielded from direct sunlight
 - b. Circulation fan
 - c. Watertight conduit fitting
- D. Where called for in the sequences of operations, provide the following feature on space sensors and thermostats:
 1. Security Sensors: Stainless-steel cover plate with insulated back and security screws
 2. Space sensors with setpoint adjust: Plain white plastic cover with slide potentiometer to signal a setpoint adjustment to the DDC
 3. Space Sensors with LCD display:
 - a. Operator buttons for adjusting setpoints, setting fans speeds and overriding unit to on/off
 - b. Graphical LCD icons for signaling heating/cooling mode, fans speed, schedule mode, actual temperature and current setpoint
- E. Humidity Sensors shall meet the following specifications:
 1. Bulk polymer sensor element
 2. Accuracy: 2 percent full range with linear output
 3. Room Sensors: With locking cover matching room thermostats, span of 0 to 100 percent relative humidity
 4. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity
- F. Air Static Pressure Transmitter shall meet the following specifications:
 1. Non-directional sensor with suitable range for expected input, and temperature compensated.
 2. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
 3. Output: 4 to 20 mA.
 4. Building Static-Pressure Range: 0 to 0.25 inches wg.
 5. Duct Static-Pressure Range: 0 to 5 inches wg.
- G. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.
- H. Equipment operation sensors as follows:
 1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg.

2. Status Inputs for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psig.
 3. Status Inputs for direct drive electric motors: Current-sensing relay with current transformers, adjustable and sized for 175 percent of rated motor current.
 4. Status inputs for belt drive electric motors: Current sensing transmitter with linear 4-20mA output
- I. Electronic Valve/Damper Position indication: Visual scale indicating percent of travel and 0 to 10 V dc, feedback signal.
 - J. Water-Flow Switches: Pressure-flow switches of bellows-actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless-steel or bronze paddle. For chilled-water applications, provide vapor proof type.
 - K. Air Differential Pressure Switches: Diaphragm type air differential pressure switches with die cast aluminum housing, adjustable setpoint, minimum 5 amp switch rating at 120VAC, SPDT switches, and the switch pressure range shall be suited for the application. Provide Dwyer or equal. These switches shall be utilized for filter status.
 - L. Leak detectors: Provide spot leak detectors that can be secured to the floor or secured to a drain pan. The detection shall used a microchip controlled energized probes. The detector shall operate on 24V or less. Provide a way to adjust the height of the leak probes. The SPDT contacts shall be inside a watertight enclosure.

2.12 ELECTRO-MECHANICAL THERMOSTATS

- A. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point. Setpoint shall be adjustable.
 1. Bulb Length: Minimum 20 feet.
 2. Quantity: One thermostat for every 20 sq. ft. of coil surface.
- B. Electric space thermostats: Provide a charged element type stat with snap acting SPDT switch. The switch shall be rated for 16A or 1HP at 120V.
- C. Aquastat: Provide a charged element type stat with snap acting SPDT switch. The switch shall be rated for 16A or 1HP at 120V.

2.13 LABORATORY AIRFLOW CONTROL SYSTEM

- A. General
 1. Scope Details.
 - a. For areas indicated as requiring pressure control, furnish and install an Airflow Control System (ACS) in conjunction with the central Building Control System (BCS) to maintain room supply and exhaust airflows, room ventilation rates, room static pressurization, room ambient temperatures & humidity's and the associated exhaust system functionality as specified herein.
 - b. The ACS shall ensure that all VAV fume hood average face velocities and minimum exhaust airflows are maintained as indicated in the project plans.
 - c. The ACS shall ensure that all CAV fume hood exhaust airflows are maintained as indicated in the project plans.
 - d. The ACS shall ensure that all biological safety cabinets and/or other required exhaust airflows listed in the project plans are maintained.
 - e. The ACS shall provide the laboratory and environmental control modes as detailed in this specification and sequence of operations. This includes controls of any supply airflow, exhaust airflow, ventilation, etc. The use of separate and/or special controllers to operate this equipment is unacceptable.
 - f. The ACS shall comply with the functional requirements of U.S. OSHA 29 CFR (Canada Public Works MD 1580), NFPA 45, ANSI Z9.5, and all applicable Local and State (Provincial) codes.
 - g. All Building Controllers, Terminal Equipment Controller and Laboratory Terminal Box Controllers shall directly reside on the primary BACnet/IP Ethernet network such that

communications may be executed directly between Building Controllers, directly between server and Building Controllers on a peer-to-peer basis. The system shall be a complete Daisychain E3 BACnet IP Ethernet End to End Network. The use of MS/TP ARCnet, LON shall not be allowed. All controllers shall comply with ANSI/ASHRAE 135-2010 BACNet: A Data Communication Protocol for Building Automation and Control Networks.

- h. Actuation/Fail Safe Requirement
 - 1) All Supply and Exhaust Lab Terminal Boxes tracking a VAV fume hood shall be provided with fast acting actuation and shall fail in last position.
 - 2) All Fume Hood Lab Terminal Boxes shall be provided with fast acting actuators and shall fail open.
 - 3) All Supply and Exhaust Lab Terminal boxes in non-VAV fume hood spaces shall be provided with standard speed fail in last position actuators.
- 2. The ACS shall include all laboratory, isolation or critical room supply and exhaust airflow terminals, reheat coils, reheat coil valves, air terminal actuators, sensors, associated instrumentation and the control units and associated interconnecting wiring. Any and all associated components required to implement a fully functioning and integrated system as specified herein shall also be provided.
- 3. Unless indicated herein, the lab airflow control system shall use volumetric offset to maintain room pressurization as indicated on the drawings. Lab terminal boxes shall be provided with integral reheat coils.
- 4. All ACS data shall be capable of being accessed by authorized persons via the existing Siemens APOGEE facility BAS network to obtain ACS data in graphical form as well as in specific user defined and configured ACS summary and status reports.
- 5. Quality Assurance Requirements
 - a. ACS components shall be the standard catalogued products of the ACS supplier and shall be the most recent product design that complies with the specified requirements.
 - b. The manufacturer of the ACS shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.
 - c. The ACS supplier shall have a fully staffed support facility within 50 miles of the project site with fully qualified, factory trained technical support personnel, spare parts and all necessary test, diagnostic and service equipment.
 - d. The complete installation of the ACS shall be the responsibility of the ACS supplier and the checkout, startup and verification of specified performance of the ACS shall be by factory trained employees of the ACS supplier.
 - e. All electronic equipment shall conform to the requirements of FCC Regulation Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
- 6. ACS Specific Submittal Requirements
 - a. Refer to Division 1 for submittal procedures.
 - b. The submittal documentation shall include:
 - 1) ACS components include air terminals, sensors, actuators, reheat valves, control units, local monitors, etc. Where applicable the specifications shall include minimum and maximum flow rates, sound ratings, measurement device accuracies, operational ranges, etc.
 - 2) A tabulation of all air terminals including types, sizes, air capacities, sound ratings, reheat coil ratings, etc.
 - 3) A comprehensive list of all ACS input/output functions including all alarm and monitoring points.
 - 4) Detailed descriptions of all ACS operational sequences.

- 5) Shop drawings showing ACS control unit configuration and wiring connection diagrams covering all ACS input/output interconnections and termination details.
 - 6) Electrical characteristics indicating any field wiring which is to be performed by others, type of signal wiring, and installation methods including raceway type and grounding method.
 - 7) Control drawings with graphic representation of system components. Identify controlled devices as referenced on plans with unique valve and damper tag numbers.
- c. Provide submittals for fast track items that need to be approved and released to meet the schedule of the project separately.
- B. Manufacturers
1. Subject to complete compliance with the requirements listed above and below the following are approved ACS manufacturers:
 - a. Siemens Industry, Inc – Factory Branch Office
 2. The ACS shall be a completely digital system, with electric actuation, manufactured and provided by a single manufacturer.
- C. Lab Airflow Control Devices – Blade Terminals
1. Casing:
 - a. Lab exhaust serving fume hoods and snorkel arms (FEV) 20 gauge 316L stainless steel.
 - b. Lab supply, lab general exhaust (LSV & LEV): Minimum 22 gauge single wall galvanized steel.
 - c. Lab supply casing lining (LSV): $\frac{3}{4}$ " fiber free foam, 1.5pcf having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84. All exposed insulation edges shall be coated with NFPA 90A approved sealant.
 - d. Air Inlet: Round stub connection (LEV) or S-slip and drive connections for duct attachment.
 - e. Air Outlet: Round stub connection or S-Slip and drive connections, transition ductwork to size shown on drawings.
 - f. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
 - g. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1
 - h. Lab casing leakage (LSV, LEV & FEV)
 - 1) Shall not exceed 3cfm at 1 inch wg.
 - 2) Shall not exceed 6cfm at 3 inch wg.
 2. Damper:
 - a. Lab exhaust serving fume hoods and snorkel arms (FEV): 16 gauge 316L stainless steel on $\frac{1}{2}$ " 316L stainless steel shaft market with damper position, stainless steel fasteners, and Teflon bushing.
 - b. The damper shall incorporate a mechanical stop to prevent overstroking and a synthetic seal to limit close-off leakage to that listed above.
 - c. Lab supply and Lab general exhaust (LSV, LEV): galvanized steel with peripheral LDPE blade seal and self-lubricating bearings.
 - d. Maximum Damper Leakage: ARI 880 rated, 2% of nominal airflow at 3" w.g. inlet static pressure.
 - e. Damper position: Last position.
 - f. Lab exhaust damper leakage (LEV & FEV):
 - 1) Shall not exceed 1cfm at 1 inch w.g.
 - 2) Shall not exceed 3cfm at 3 inch w.g.
 - g. Lab supply damper leakage at 1.5" w.g. (LSV)
 - 1) 6-inch inlet size and smaller: 4cfm.
 - 2) 8-inch inlet size: 5cfm.

- 3) 10-inch inlet size: 6cfm.
 - 4) 12-inch inlet size: 8cfm.
 - 5) 14-inch inlet size: 10cfm.
 - 6) 16-inch inlet size: 13cfm
 - 7) 16x24 inch inlet size: 98cfm.
3. The room supply and room general exhaust shall include airflow measurement stations certified under AMCA 610 for 3% error over publish flow range. These shall be comprised of an averaging type airflow sensor. The fume hood exhaust airflow measurement stations shall also be comprised of an averaging type of sensor such as an orifice ring which is not subject to clogging by an accumulation of particulate or chemical deposits or is likely to catch debris such as tissues.
 4. All room supply, general exhaust and fume hood terminals shall have an airflow transmitter factory mounted and shall include the necessary signal conditioning/transmitter instrumentation to provide an output proportional to the velocity pressure. Transmitter shall have an accuracy of at least 1% of signal down to 0.001"w.c. Transmitter shall include ability to automatically re-zero in less than 1 second. Automatic re-calibration shall occur every (3, 6, 12, 24 selectable) hours without airflow disruption.
 5. Supply Terminal Integral Attenuator Section: 0.034-inch steel sheet.
 - a. Lining: Adhesive attached, ¾" thick, polyurethane foam insulation complying with UL 181 erosion requirements, and having a maximum flamespread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
 - b. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
 6. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220F. Include manual air vent and drain valve.
- D. VENTURI AIR VALVE – CLOSED LOOP
1. Air terminals shall consist of venturi type air valves with adequate operational maximum to minimum airflow turndown ratios to provide the full range of minimum to maximum airflows listed in the project control drawings. Terminal airflow shall be pressure independently controlled using actual airflow measurement feedback as well as a static pressure compensation spring as an integral part of the control process.
 2. The venturi air valve shall be capable of achieving maximum to minimum airflow and vice-versa within 2 seconds, with an 5:1 change in flow achieved in less than 1 second. Each venturi air valve shall be factory calibrated to provide a minimum airflow sensor measurement and control accuracy of +/-5% of actual airflow over the published range. Airflow measurement accuracy and response time substantiation by a qualified independent test agency shall be included with the submittal documentation. The spring and cone assembly shall be pressure independent over a 0.3 to 3.0 inches w.g. drop across the terminal at rated airflows.
 3. Provide a means for low air flow alarm under low flow condition and high airflow alarm under high flow conditions at each supply, general, and fume hood exhaust valve. This may consist of two independent flow pressure switches per valve indicating high and low flow conditions, or a single independent flow station per valve. All pressure switches, flow stations, and position feedback signals shall be made available to the BAS for monitoring for safety and energy purposes. Pressure switches shall meet the same drift requirements of airflow transmitters specified herein.
 4. The room supply and room general exhaust airflow measurement stations shall be comprised of an averaging type of airflow sensor. The fume hood exhaust airflow measurement stations shall also be comprised of an averaging type of sensor such as an orifice ring which is not subject to clogging by an accumulation of particulate or chemical deposits or is likely to catch debris such as tissues.
 5. Airflow transmitter shall be factory mounted on the venturi and shall include the necessary signal conditioning/transmitter instrumentation to provide an output proportional to the

velocity pressure. Transmitter shall have an accuracy of at least 1% of signal down to 0.001" w.c. Transmitter shall include ability to automatically re-zero in less than 1 second. Automatic recalibration shall occur every (3, 6, 12, 24 selectable) hours without airflow disruption.

6. Transmitters not meeting these drift requirements shall be provided with an auto-zero solenoid that connects to the air velocity pressure transducers inlet ports for enabling automatic periodic re-calibration to ensure drift-free airflow measurement. Automatic re-calibration shall occur at a minimum every 24 hours without airflow disruption.
7. Manufacturers not providing autozero modules responsible for self-calibration, without disruption of airflow to the space, nor meeting the specified transmitter drift requirements, shall be responsible to provide on-site recalibration service. This recalibration service consists of each terminal to be manually recalibrated by the manufacturer's technician on a quarterly basis to ensure stated accuracies are maintained. Provide this service in this contract throughout the warranty period. Include service contract pricing inclusive of this service as an attachment to the bid.
8. Room supply venturi air terminals shall be constructed with an aluminum body and cone. The cone control shaft, control arm, brackets, clips, screws, nuts and all fittings within the air stream shall be of type 316 stainless steel. Room supply venturi air valve terminals shall be provided with an orifice ring type of airflow sensor located upstream from all other terminal components.
9. Room general exhaust venturi air valve terminals shall be industrial grade and constructed with an aluminum body and cone. The cone control shaft, control arm, brackets, clips, screws, nuts and all fittings that are within the air stream shall be type 316 stainless steel. Room general exhaust venturi air valve terminals shall be provided with an orifice ring type of airflow sensor or orifice ring, if subject to particulate deposits, located upstream from all other air terminal components.
10. All fume hood exhaust venturi air valve terminals shall be industrial grade and constructed with an aluminum body and cone and shall have an epoxy-phenolic coating. The cone control shaft, control arm, brackets, clips, screws, nuts and all fittings that are within the air stream shall be of type 316 stainless steel. Fume hood exhaust venturi air valve terminals shall be provided with an orifice ring type of airflow sensor located upstream from all other terminal components. Airflow sensing techniques that are likely to become inoperative due to accumulation of particulate or chemical deposits or which can catch debris and obstruct exhaust airflow shall not be acceptable for fume hood exhaust applications. Unacceptable airflow measurement sensors for fume hood exhaust air terminals include pitot tubes and other devices that protrude into the center of the exhaust air stream.
11. All venturi air valves shall be factory calibrated to meet the specific airflow ranges indicated in the project airflow schedules. All venturi air valves shall also be factory tested to substantiate +/-5% airflow control accuracy at the minimum and maximum rated airflow as well as at least six intermediate airflows between the minimum and maximum. All calibration and pressure independent airflow measurements shall be obtained using certified NIST traceable airflow measurement instruments. Each venturi air valve shall be provided with an individual certificate that includes a valve tag number, serial number, model number, three point calibration verification data, data and the quality control inspection number. This information shall also be included with the as-built project documentation.
12. Discharge and radiated sound power level data shall be provided for each different size and type of air terminal as part of the submittal documentation. Sound power data shall be obtained in accordance with ANSI/ASHRAE 130-1995 Standard Methods of Testing for Rating Ducted Air Terminal Units, except that air terminal inlet velocity shall accommodate the inherent lower maximum rate of a venturi air terminals as compared to traditional blade damper type air terminals. Sound Power Data shall be presented in accordance with the ARI 880-2011 Standard for Air Terminals with the additional of an inlet airflow rate of 1000fpm and a 1.5" w.c. pressure drop. All sound data shall be obtained by a qualified, accredited and ARI approved testing laboratory.
13. Provide shutoff type venturi where indicated on drawings.

E. LAB TERMINAL ELECTRIC ACTUATORS

1. All actuators shall be UL 873 or UL 60730 listed and manufactured under ISO 9002 and ISO 14000 procedures.
2. All actuators shall be direct coupled type that requires no connecting linkage and shall provide a means of manual override in the absence of power.
3. All actuators shall provide stall protection throughout the full range of rotation with an easily visible position indicator.
4. High speed electronic actuators
 - a. Basis of Design: Siemens GNP/GAP Series
 - b. Provide high speed actuators for all terminal units serving rooms with VAV fume hoods and other areas as indicated. This shall include supply, general exhaust and fume hood exhaust.
 - c. Performance shall be no less than 53lb-in with 90 degrees stroke in 2 seconds.
 - d. Repositioning resolution shall be a minimum of 0.4%.
 - e. Actuators shall be fail-safe or fail-in-place as indicated on drawings and shall be direct coupled type that requires no connecting linkages. Feedback shall be standard on all models. Actuators shall be capable of performing all control signals (2-position, floating and modulating 0 to 10Vdc and 4 to 20 mA).
 - f. Power consumption shall be no greater than 25VA.
5. Standard speed electronic actuators:
 - a. Basis of design: Siemens GDE/GMA/GLB Series
 - b. Provide for all terminals not requiring high speed actuation. Actuators shall be failsafe or fail in place as indicated on drawings.
 - c. Spring return actuators shall be capable of both clockwise and counterclockwise spring return fail-safe operation that returns the actuator to a fail-safe position in <15 seconds in response to a loss of power. Power consumption shall be no greater than 7VA.
 - d. Actuators shall use either floating control or analog control, as needed by the control application the secondary network.

F. LABORATORY ROOM LEVEL CONTROLLERS

1. General: All room level controllers shall communicate directly on the primary BAS BACnet/IP Ethernet network (without gateways or protocol translators) for a complete Daisychain E3 BACnet IP Ethernet End to End Network. The use of MS/TP, ARCnet or LON shall not be allowed. Manufacturers providing controllers requiring gateways or protocol translators shall be responsible for all hardware and software interface devices as well as support labor to ensure proper communication. Any communication issues between the room level controls and the BAS will require onsite support from the manufacturer/vendor of the room level controller until all communication issues are resolved. In addition the manufacturer/vendor shall be responsible for providing documentation indicating which software points inherent in their system will and will not be available to the BAS via gateway/translator, prior to the bid.
2. General Lab and Pressurized Room Controllers
 - a. Basis of Design: Siemens Laboratory DXR Controller
 - b. Lab and pressurized room controllers shall provide closed loop pressure independent control of all laboratory room ventilation and ambient requirements. The room controller shall continuously monitor all the supply and auxiliary exhaust airflow devices including VAV fume hoods in the room.
 - c. Pressure control algorithm shall control supply and exhaust airflow devices in order to maintain a volumetric offset (either positive or negative). The offset shall be field adjustable and represents the volume of air which will enter (or exit) the room from the corridor or adjacent spaces. Offset shall be maintained regardless of any change in flow or static pressure. In particular, if the lead airflow device does not meet its setpoint, the controller shall adjust to recover room offset.
 - d. The controller shall be configurable through the BAS for either supply tracks exhaust (negative spaces) or exhaust tracks supply (positive spaces). In addition, the

- controllers shall be configurable to either track flow setpoints or actual measured airflows. In order to maximize pressure control reliability during compromised situations (ie actuator failure, insufficient duct static pressure), the controller shall automatically switch to flow tracking from setpoint tracking, if the lead device (supply or exhaust) fails to stay within (selectable, typically 3%) flow units of its own set point for (selectable, typically 5 minutes) period of time. Controllers relying on setpoint tracking only shall provide details of proposed alternative.
- e. Unless specifically indicated within the Sequence of Operation, volumetric offset shall be the only acceptable means of controlling room pressurization. Systems that rely on differential pressure as a means of control shall provide documentation that space pressurization can be maintained if fume hood sashes are changed at the same time a door to the space is opened.
 - f. Room ambient control (temperature, humidity, CO2, etc.) and any other room control functions (lighting, IAQ etc.) shall be maintained by the controller as indicated in Sequence of Operation.
 - g. All laboratory room controllers shall include all inputs and control outputs necessary to perform the specified control sequences. Each laboratory room controller shall operate as a standalone unit, performing its specified control responsibilities independently. All input point and control output point databases as well as the control programs shall be stored in non-volatile EEPROM, EPROM and PROM memory, or a minimum of 100-hour battery backup shall be provided.
 - h. Laboratory and Pressurized Room Controllers shall be able to override the minimum flow values of connected Fume Hood Controllers when additional flow is needed for cooling or room pressurization and there is insufficient or no general exhaust available.
 - i. Momentary or extended losses of power shall not change or affect any laboratory room controller setpoints or stored data. Upon resumption of power the controller shall resume full normal operation exactly as before without any need for manual intervention. Upon a power failure or operational failure within the controller, the air terminal shall automatically be positioned to the predetermined fully open or fully closed (failsafe) position as indicated on the air terminal schedules in the project plans and specifications.
 - j. All laboratory room controllers shall include the ability to accept a minimum of two dry contact closure inputs from an auxiliary source into the room control sequence for such purposes as occupied/unoccupied ventilation changeover, emergency mode sequences, etc.
 - k. Airflow tracking controllers shall be capable of having separate volumetric offset setpoints for occupied modes and unoccupied modes.
 - l. All laboratory and pressurized room controllers shall provide a general alarm output that may be used for auxiliary signaling or notification.
3. Fume Hood Face Velocity Controller for VAV and CAV Fume Hoods
- a. Basis of Design: Siemens Fume Hood BACnet IP DXR Controller
 - b. Furnish and install a UL 916 listed individual fume hood controller for each fume hood which shall maintain the required average face velocity at the setpoint independently of the sash position. Documentation verifying the UL 916 Listing for the fume hood controller shall be included in any proposal as well as the submittal. Also, furnish and install sash sensors on each fume hood to indicate the position of all fume hood sashes to the respective fume hood controller. Sash sensors shall provide an input signal to the fume hood controller that is linearly proportional to within one half inch of the actual sash position. All sash sensors shall be highly corrosion resistant. Sash sensor operational life shall allow a minimum of 1 million full sash travel cycles.
 - c. The fume hood face velocity control process shall maintain the average fume hood face velocity at the desired setpoint using a proportional, integral and derivative (PID) closed loop control algorithm. The fume hood face velocity control process shall be as follows:

- 1) The fume hood controller shall continually determine the fume hood's total open area by monitoring the fume hood sash position(s) by the sash sensor(s) as well as taking account of any fume hood fixed open areas and the bypass opening(s).
 - 2) The fume hood controller shall calculate the required fume hood exhaust airflow necessary to maintain the average face velocity setpoint over the total open area. The controller shall continuously perform the above exhaust airflow control calculations ten times per second to ensure detection of and a maximum of 1 second response to any change in sash position.
 - 3) The fume hood controller shall control the fume hood exhaust airflow at the rate necessary to maintain the average face velocity setpoint. The fume hood controller shall ensure that the required fume hood exhaust to maintain the average face velocity setpoint is always maintained independently of any variations in exhaust system static pressure or any laboratory room conditions such as the ventilation airflow or room static pressure that could otherwise affect the fume hood exhaust airflow.
- d. The fume hood face velocity control process shall accommodate the required fume hood maximum to minimum exhaust airflow rate. The fume hood controller shall always maintain the required minimum fume hood exhaust airflow recommended by laboratory safety standards whenever the total fume hood open area requires less than the calculated fume hood exhaust airflow necessary to maintain the average face velocity set point. The fume hood controller shall also be capable of limiting the maximum fume hood exhaust airflow regardless of the extent of the sash opening.
- e. The fume hood controller shall also interface to an Operator Display Panel (ODP) at the designated measurement location on the front of the fume hood as shown on the project plans. The ODP shall provide a continuous digital display of average fume hood face velocity whenever the fume hood sash open area requires more than the minimum fume hood exhaust airflow. The fume hood face velocity display shall be the true average face velocity as calculated by the fume hood controller based upon actual measured fume hood exhaust airflow and the total fume hood total open area. The Operator Display Panel shall have the ability to blank out display of face velocity based on owner's preference.
- f. The ODP shall also include separate colored pilot lights that shall illuminate to indicate fume hood operational status as:
- 1) Green for proper face velocity or flow.
 - 2) Yellow for marginal face velocity or flow.
 - 3) Red alarm conditions such as low face velocity, general failure or emergency purge.
- g. The ODP shall also sound an audible alarm device in response to face velocity alarm conditions and the ODP digital display shall change to "LOW FACE VELOCITY" or "HIGH FACE VELOCITY" appropriate to the alarm condition. A SILENCE pushbutton on the ODP shall allow the user to silence the audible alarm which shall then remain silent until a subsequent alarm occurs.
- h. The ODP shall also provide an EMERGENCY PURGE pushbutton which shall enable a user to increase fume hood exhaust airflow to the maximum amount for a designated period of time as required by laboratory safety standards. After the designated time has expired the fume hood exhaust shall automatically reset to a lower, but still elevated level to prevent excessive demand on the exhaust system. The emergency purge mode of operation shall also be able to be cancelled at any time by depressing the emergency purge button a second time. The ODP shall sound its audible alarm device whenever the emergency purge mode of operation is activated. The silence pushbutton on the ODP shall also allow the user to silence the audible alarm which shall then remain silent until either the emergency purge operational mode is again activated or a face velocity alarm occurs.

- i. The ODP shall also provide an audible SASH open ALERT feature that can be implemented to caution users whenever the fume hood sash opening exceeds a predetermined amount. The audible alert shall consist of one minute repeating cycles of a series of quick 'chirps' that continues until the sash opening is reduced to an allowable amount. There shall be two sash alert opening settings, based on whether hood is in use or unattended.
 - j. The ODP shall provide audible and visual indication whenever supervisory signal is lost from a fume hood sash sensor or the flow input transmitter, by turning on the Red light and the audible alarm device.
 - k. The ODP shall be provided with an intuitive visual effect, such as a green "leaf" light, for indicating safe, sustainable operation, such as keeping sash closed when not in use.
 - l. Provide a fume hood presence detector: A Fume Hood Presence detector shall be provided to detect the motion and presence of an operator working at the fume hood and index the fume hood controller from attended to un-attended and vice versa. The fume hood presence sensor shall be specifically designed for fume hood use. Occupancy sensors used for lighting controls shall not be utilized. If the sensor detects no operator, it shall index the fume hood controller to the un-attended mode. In this mode, if the sash sensor is left open above the minimum position for a predetermined amount of time, a local audible alarm shall signal. The audible alert shall consist of one minute repeating cycles of a series of quick 'chirps' that continue until the sash opening is reduced to an allowable amount. There shall be two sash alert opening settings, based on whether hood is in use or unattended. This information shall also be monitored and displayed at the BAS workstation. This information will be trended and used by the owner to determine who is using the fume hoods in a safe and energy efficient manner.
 - m. All fume hood control and ODP display and operational parameters shall be established and be changeable only by authorized personnel using a portable operator's terminal. These operational parameters shall include:
 - 1) Fume hood average face velocity setpoint.
 - 2) Fume hood minimum and maximum exhaust airflow.
 - 3) Face velocity high and low alarm limits and associated alarm time delay to avoid transient alarms.
 - 4) Face velocity high and low warning limits.
 - 5) Emergency purge time periods and exhaust levels.
 - 6) Allowable maximum attended and unattended sash openings associated with the sash alert feature.
 - n. The portable operator's terminal shall plug into the ODP as well as into the laboratory room controller. In addition, all laboratory fume hood and laboratory room control parameters along with all other facility control and monitoring functions shall be accessible to authorized personnel from designated terminals on the BAS control and monitoring network.
 - o. Momentary or extended losses of power shall not change or affect any VAV fume hood control setpoints, operational parameters or stored data. Upon resumption of power after a power failure, fume hood controllers shall resume full normal operation exactly as before the power failure and without any need for manual intervention. Upon a power failure or operational failure within the fume hood controller, the fume hood exhaust air terminal shall be automatically positioned to the fully open (failsafe) position as required by laboratory safety standards and defined herein.
 - p. Coordinate sash sensor requirements with the fume hood size and sash configuration defined in the Lab Furnishings documents.
- G. Terminal Unit Space Sensors (Temperature, Humidity, CO2)
- 1. Provide matching Room / Zone Sensors to the specification listed Field Devices Section of this specification.
- H. ROOM PRESSURE SENSORS

1. Basis of design: Setra model 264.
2. Ultra low differential pressure transmitter with the following minimum characteristics:
 - a. Pressure Range +/- 0.1w.c. (Coordinate with Owner / Engineer before material is released).
 - b. Accuracy +/- 0.25% of Full Scale Range.
- I. AIR HANDLER TEMPERATURE CONTROLS
 1. Air handling manufacturer shall factory install and wire all DDC Temperature Control related unit components including but not limited to temperature, humidity and pressure sensors, damper actuators and main DDC panel. All temperature control related described above shall be provided by the Temperature Control contractor and shipped to the air handling unit manufacturer for installation. Prior to sending any control parts to the ahu factory, the Temperature Control contractor shall provide the ahu manufacturer a complete list of all DDC parts to be installed, along with clear and detailed cut sheets and installation instructions and exact location of each DDC part inside the air handling unit. A controls coordination meeting shall take place between the Temperature Control contractor and the manufacturer's control expert(s) to insure proper installation and wiring of the Temperature Control system inside the air handling unit. Water coil valves and actuators shall be furnished and field installed and wired by the TC Contractor.
 2. Programming, start-up and commissioning of the DDC Temperature Control system shall be the responsibility of the Temperature Control contractor and shall be done in the field.
 3. Mounting the DDC sensors, actuators and DDC panel in the field is not an acceptable alternative.

PART 3 EXECUTION

3.01 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.
- B. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.
- C. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others.

3.02 INSTALLATION

- A. Provide all relays, switches, and all other auxiliaries, accessories and connections necessary to make a complete operable system in accordance with the sequences specified. All field wiring shall be by this contractor and where visible installed within conduits, according to Division 26.
- B. Install controls so that adjustments and calibrations can be readily made. Controls are to be installed by the control equipment manufacturer.
- C. Mount surface-mounted control devices on brackets to clear the final finished surface on insulation.
- D. Install equipment level and plumb.
- E. Install control valves horizontally with the power unit up.
- F. Unless otherwise noted, install wall mounted thermostats and humidistat 60" above the floor measured to the center line of the instrument, or as otherwise directed by the Architect.
- G. Install averaging elements in ducts and plenums in horizontal crossing or zigzag pattern.
- H. Install outdoor sensors in perforated tube and sunshield.

- I. Install damper motors on outside of duct in protected areas, not in locations exposed to outdoor temperatures.
- J. Install labels and nameplates on each control panel listing the name of the panel referenced in the graphics and a list of equipment numbers served by that panel.
- K. Furnish hydronic instrument wells, valves, and other accessories to the mechanical contractor for installation.
- L. Furnish automatic dampers not provided by equipment manufacturer to mechanical contractor for installation.
- M. The ACS/ BMS supplier shall install all control system equipment including controllers, sensors, damper actuators, reheat valves, fume hood sash sensors and fume hood operator display panels. This contractor shall install and terminate all low voltage control system wiring including wiring between each controller and between each controller and all control and sensing devices. This contractor shall also provide 24 VAC power where required by the control system and associated control devices. This contractor shall install pneumatic control tubing from the nearest building air main for all control devices that are pneumatically operated.
- N. The mechanical contractor shall install all supply air terminals, reheat coils, exhaust air terminals, air valves and interconnecting ductwork associated with the laboratory ventilation system.
- O. Air Terminal, Reheat Coils and Control Valves
 - 1. ACS contractor shall furnish to Mechanical Contractor for installation of air terminals, reheat coils and access doors. Mechanical Contractor shall install reheat coils, control valves, furnished by ACS contractor, and shall provide necessary ductwork transitions as required for mounting equipment provided by ACS contractor.
 - 2. Mount actuators on the same side of air terminal device as coil connections to ensure service access.
 - 3. Connect air terminals to ductwork with removable type joints as detailed.
 - 4. Transition from supply air terminal to reheat coil shall not exceed 15° per side.
 - 5. Fume Hood Controls:
 - a. Furnish to fume hood manufacturer templates for required hood mounted devices including vertical and horizontal sash sensors, interface boxes, and fume hood monitors required for complete installation of fume hood exhaust air control system. Fume hood manufacturer shall provide necessary cut outs with blank cover plates.
 - b. Fume hood size and sash configuration are called out on drawings. Verify with fume hood manufacturer fume hood sizes, sash configurations and installation requirements for each device.
 - c. ACS manufacturer shall field install, mount and wire required hood mounted devices.
 - 6. Control and Power Wiring:
 - a. ACS manufacturer shall provide control wiring from laboratory control panel to and between other laboratory control system components as required for complete and proper functioning, including but not limited to air terminals, control valves, sensors, transducers, controllers, panels and interface modules.
 - b. Electrical Contractor will provide one spare 20-amp circuit at each emergency power electrical panel, serving laboratory. ACS supplier shall provide required conduit, wire, junction boxes, disconnect switches and circuit breakers as required to wire electrical panel to each laboratory control panel per electrical drawings and specifications.
 - 7. Laboratory/Pressurized Space Control Panels and Power Supplies
 - a. Mount laboratory and pressurized space control panels and power supplies in accessible location within laboratory room as shown on plans.

3.03 GRAPHIC DISPLAY GENERATION

- A. All software shall be capable of providing color graphics. All software shall include a graphical viewing and control environment and definition and construction of dynamic color graphic displays.

- B. Provide a main default screen showing the basic layout of the building. Each color graphic screen shall have transfer links to allow the building operator to transfer between system associated screens (both forward and backward), as well as a transfer link back to the main default screen.
- C. Basic CAD floor plans with layers for walls, windows, low pressure ductwork only, supply diffusers and room numbers shall be provided for all CV and VAV. Floor plans shall show the location of each space temperature sensor with a dashed line to the associated terminal unit. Display in real time the difference between the space temperature and the current setpoint.
 - 1. Display the:
 - a. cooling %,
 - b. heating % (if applicable)
 - c. current CFM of each terminal unit.
 - 2. Provide a transfer link for each terminal unit to allow the operator to access the flow graphic for each individual terminal unit. Use a different color to shade the background area for each part of a floor plan graphic served by a different air handling unit.
- D. All control set points shall be easily adjustable from the system's color graphic screen by operators with the proper access level. Each controlled point on the BAS operator workstation color graphic screens shall have the set point indicated along with the actual controlled variable reading (preferred set point on top and actual reading on bottom). All points shall indicate the associated engineering unit. All analog outputs points shall indicate engineering units such as "%-open" or "%-closed" as required by the application. All normally-closed or normally-open points shall indicate the normal position (such as "N.C." or "N.O." next to the controlled device).
- E. Provide system color graphics for each HVAC system and for each electrical, plumbing and/or piping system that is monitored and/or controlled by the BMS. Provide scaled floor plans indicating equipment location, service, and system data as required.
- F. Provide color graphic floor plan displays and system schematics for each piece of mechanical equipment, including but not limited to air handling units, chilled water systems and hot water systems to optimize system performance analysis and speed alarm recognition.
- G. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection or text-based commands.
- H. Dynamic temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention.
- I. The windowing environment of the operator interface shall allow the user to simultaneously view several graphics at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.
 - 1. Provide libraries of pre-engineered screens and symbols depicting standard air handling unit components (e.g., fans, cooling coils, filters, dampers, etc.), complete mechanical systems (e.g., VAV, etc.) and electrical symbols.
 - 2. Graphical displays can be created to represent any logical grouping of system points or calculated data based upon building function, mechanical system, building layout or any other logical grouping of points which aids the operator in the analysis of the facility.
- J. Provide an automatically updated, dynamic display of the site-specific BMS architecture indicating the status of primary and secondary controllers.
- K. Provide a separate dynamic display page of each HVAC (AHU, AC, chillers, pumps, fans, fume hoods, etc.), electrical, and/or plumbing system connected to the BMS.
- L. Provide a separate dynamic display page of each piece of terminal equipment (VAV box, fan coil unit, etc.) connected to the BMS.
- M. Provide an additional dynamic, graphic display pages as required by the operating staff to further assist in daily system operations.

- N. Graphics shall incorporate all system integration points communicated via hardware or software gateways and/or interfaces. Origin of information shall be transparent to the operator and shall be controlled, displayed, trended, etc. as if the points were hardwired to the BMS.
- O. Each graphic shall have a "BACK" button and a "HOME" or "MAIN" button located in the same location on all graphics.
- P. The operator shall be able to clearly distinguish the difference between the following types of points on a graphic either by color, shape, icon or text label:
 - 1. Real-time sensor reading
 - 2. Setpoint
 - 3. Manually set vs. program set Setpoint
 - 4. Real-time output reading
 - 5. Manually Overridden or commanded output vs program set output
 - 6. Status feedback from a piece of equipment vs the output command
- Q. Make appear links to additional information associated with the system on the graphic, such as:
 - 1. Controls as-built schematics and wiring diagrams
 - 2. As-built Sequence of Operation
 - 3. Mechanical drawings
 - 4. Electrical drawings
- R. Integration graphics shall be representative of personnel standing in front of equipment. The graphics for equipment specified in the Building Systems Integration paragraph shall be representative of the manufacturers' local display panel and each shall be completely operable from the computer workstation.

3.04 ELECTRICAL WIRING SCOPE

- A. This contractor shall be responsible for power that is not shown on the electrical drawings, to controls furnished by this contractor including conduit per Division 26. If power circuits are shown on the electrical drawings, this contractor shall continue the power run to the control device. If power circuits are not shown, this contractor shall coordinate with the electrical contractor to provide breakers at distribution panels for power to controls. This contractor is then responsible for power from the distribution panel.
 - 1. Coordinate panel locations. If enclosures for panels are shown on the electrical drawings, furnish the enclosures according to the electrician's installation schedule.
- B. This contractor shall not be responsible for power to control panels and control devices that are furnished by others, unless it is part of the control interlock wiring.
- C. Refer to Coordination section for what devices this contractor is responsible to mount and which are turned over to others to mount.
- D. This contractor shall be responsible for wiring of any control device that is furnished as part of this section of specification.
- E. Interlock wiring shall be run in separate conduits from BAS associated wiring.
- F. Provide network wiring for equipment that is called to be integrated to the BAS.

3.05 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. All low voltage control wiring shall be class 2. Control wiring that is not class 2 shall be run in separate conduits from class 2 wiring.
- B. Floor level network wiring between terminal units can be combined with thermostat and other low voltage wiring in the same conduit. All other network wiring shall be in dedicated conduits.
- C. Install raceways, boxes, and cabinets according to Division 26 Section "Raceways and Boxes."
- D. Install building wire and cable according to Division 26 Section "Conductors and Cables."
- E. Installation shall meet the following requirements:
 - 1. Conceal cable and conduit, except in mechanical rooms and areas where other conduit and piping are exposed.

2. Install exposed cable in raceway or conduit.
 3. Install concealed cable using plenum rated cable.
 4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
 5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
 6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
 7. All wiring in lab areas shall be in conduit.
 8. All unsupported risers shall be rigid steel conduit. Supported risers shall be EMT.
- F. Rigid conduit shall be steel, hot dip galvanized, threaded with couplings, $\frac{3}{4}$ inch minimum size, manufactured in accordance with ANSI C-80-1. Electrical metallic tubing (EMT) with compression fittings or intermediate metallic conduit (IMC) may be used as conduit or raceway where permitted by the NEC.
- G. Concealed control conduit and wiring shall be provided in all spaces except in the Mechanical Equipment Rooms and in unfinished spaces. Install in parallel banks with all changes in directions made at 90 degree angles.
- H. Install conduit adjacent to machine to allow service and maintenance.
- I. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- J. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
- K. Ground equipment.

3.06 COMMUNICATION WIRING

- A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.
- B. Do not install communication wiring in raceway and enclosures containing Class 1 wiring.
- C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
- D. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.
- E. Cable bundling:
1. RS485 cabling run open air in accessible areas can be bundled with other class 2 low voltage cabling.
 2. RS485 cabling run between terminal units in conduits above ceilings or under floors or in inaccessible areas can be bundled with other class 2 low voltage cabling.
 3. RS485 cabling run between floors shall be in a communication only conduit.
 4. RS485 conduit run long distances between utility rooms or between buildings shall be in a communication only conduit.
 5. Ethernet cabling shall be in a communication only conduit.
 6. Ethernet and RS485 can be run together.
 7. Fiber optics can be run with Ethernet and RS485 cabling as long as the conduit is bent to fiber optic standards and junction boxes are sized for fiber optic use.
- F. RS485 Cabling
1. RS485 cabling shall be used for BACnet MS/TP networks.
 2. RS485 shall use low capacitance, 20-24 gauge, twisted shielded pair.
 3. The shields shall be tied together at each device.
 4. The shield shall be grounded at one end only and capped at the other end.
 5. Provide end of line (EOL) termination devices at each end of the RS485 network or subnetwork run, to match the impedance of the cable, 100 to 120ohm.

- G. Ethernet Cabling
 - 1. Ethernet shall not be run with any Class 1 or low voltage Class 2 wiring.
 - 2. CAT6, unshielded twisted pair (UTP) cable shall be used for BAS Ethernet.
 - 3. Solid wire shall be used for long runs, between mechanical rooms and between floors. Stranded cable can be used for patch cables and between panels in the same mechanical room up to 50 feet away.
 - 4. When the BAS Ethernet connects to an Owner's network switch, document the port number on the BAS As-builts.
- H. All runs of communication wiring shall be unspliced length when that length is commercially available.
- I. All communication wiring shall be labeled to indicate origination and destination data.
- J. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.07 IDENTIFICATION

- A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the DDC system.
 - 1. Labels shall use white lettering (12-point type or larger) on a red background.
 - 2. Warning labels shall read as follows: C A U T I O N This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.
- B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.
 - 1. Labels shall use white lettering (12-point type or larger) on a red background.
 - 2. Warning labels shall read as follows: C A U T I O N This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.
- C. Control Equipment and Device labeling:
 - 1. Labels and tags shall match the unique identifiers shown on the as-built drawings.
 - 2. All Enclosures shall be labeled to match the as-built drawing by either control panel name or the names of the DDC controllers inside.
 - 3. All sensors and actuators not in occupied areas shall be tagged.
 - 4. Airflow measurement arrays shall be tagged to show flow rate range for signal output range, duct size, and pitot tube AFMS flow coefficient.
 - 5. Duct static pressure taps shall be tagged at the location of the pressure tap.
 - 6. Each device inside enclosures shall be tagged.
 - 7. Terminal equipment need only have a tag for the unique terminal number, not for each device. Match the unique number on:
 - a. First, the design drawings, or
 - b. Second, the control as-builts, or
 - c. Third, the DDC addressing scheme
 - 8. Tags on the terminal units shall be displayed on the Operator Workstation Graphics.
- D. Tags shall be mechanically printed on permanent adhesive backed labeling strips, 12 point height minimum.
- E. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.
- F. Identification of Wires
 - 1. Tag each wire with a common identifier on each end of the wire, such as in the control panel and at the device termination.
 - 2. Tag each network wire with a common identifier on each end.
 - 3. Tag each 120V power source with the panel and breaker number it is fed by.
- G. Identification of Conduits:

1. Identify the low voltage conduit runs as BAS conduit, power feeds not included.
2. Identify each electric box, junction box, utility box and wiring tray with a blue paint mark or blue permanent adhesive sticker.
3. For conduit runs that run more than 8 ft between junction boxes in 1 room, place a blue identifier at least every 8 feet.
4. Place a blue identifier on each side of where a conduit passed through a wall or other inaccessible path.
5. Identify all BAS communication conduits the same as above.

3.08 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
 3. Calibration test controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
- B. Engage a factory-authorized service representative to perform startup service.
- C. Replace damaged or malfunctioning controls and equipment.
 1. Start, test, and adjust control systems.
 2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
 3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.09 SYSTEM CHECKOUT AND STARTUP

- A. Inspect each termination in the MER control panels and devices to make sure all wires are connected according to the wiring diagrams and all termination are tight.
- B. After the controls devices and panels are installed and power is available to the controls, perform a static checkout of all the points, including the following:
 1. Inspect the setup and reading on each temperature sensor against a thermometer to verify its accuracy.
 2. Inspect the setup and reading on each humidity sensor against a hygrometer to verify its accuracy.
 3. Inspect the reading of each status switch to verify the DDC reads the open and close correctly.
 4. Command each relay to open and close to verify its operation.
 5. Command each 2-position damper actuator to open and close to verify operation.
 6. Command each 2-position valve to open and close to verify operation.
 7. Ramp each modulating actuator to 0%, 25%, 50%, 75% and 100% to verify its operation.
 8. Ramp each modulating output signal, such as a VFD speed, to verify its operation.
 9. Test each safety device with a real life simulation, for instance check low temperature detectors with ice water, water detectors with water, etc.
- C. Document that each point was verified and operating correctly. Correct each failed point before proceeding to the dynamic startup.
- D. Verify that each DDC controller communicates on its respective network correctly.
- E. After all of the points are verified, and power is available to the mechanical system, coordinate a startup of each system with the mechanical contractor. Include the following tests:
 1. Start systems from DDC.
 2. Verify that each setpoint can be met by the system.
 3. Change setpoints and verify system response.

4. Change sensor readings to verify system response.
 5. Test safety shutdowns.
 6. Verify time delays.
 7. Verify mode changes.
 8. Adjust filter switches and current switches for proper reactions.
 9. Adjust proportional bands and integration times to stabilize control loops.
 10. Coordinate and participate as required to assure that the TAB Agency has support for laboratory room differential control.
- F. Perform all program changes and debugging of the system for a fully operational system.
- G. Verify that all graphics at the operator workstations correspond to the systems as installed. Verify that the points on the screens appear and react properly. Verify that all adjustable setpoints and manual commands operate from the operator workstations.
- H. After the sequence of operation is verified, setup the trends that are listed in the sequence of operations for logging and archiving for the commissioning procedure.
- I. Coordinate timing and start-up with mechanical contractor to confirm HVAC Systems are operating as specified.
- J. System startup shall be provided by factory branch office representative of system manufacturer. The use of a separate startup company or representative from the manufacturer shall not be acceptable. All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of operating control of the system. Start up shall include the following tasks:
1. Determine when the HVAC equipment and each room are ready for ventilation system operational testing.
 2. Furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
 3. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
 4. Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation and varying inputs and schedules.
 5. Alarms and interlocks:
 - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
 - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
 - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.
- K. Set up all room and specialty exhaust controllers and verify that all controlled parameters are being maintained at the required setpoint and that all associated operational aspects including measurement accuracies, alarm criteria, high-low limits, time delays, etc. are functioning in accordance with the specified performance. The Testing Adjusting and Balancing (TAB) agent shall verify that all airflows are within the specified requirements and any departure from the specified performance shall be corrected and verified by the ACS to ensure all aspects of the control system are in full conformance with these specifications. The setup and verification process shall cover as a minimum:
1. Fume hood face velocity and/or fume hood exhaust airflow rate control.
 2. Fume hood high and low alarms.
 3. Room supply and exhaust airflows and the room ventilation rate control.
 4. Room static pressurization control and associated operational criteria.
 5. Room ambient temperature control.
 6. Room/zone humidity control.
 7. Room emergency control sequences.
 8. Pressurized space centralized exhaust system static pressure, exhaust stack velocity and associated exhaust system functionality.

- L. All operational aspects of the ACS performance shall be formally recorded when verified and a copy of the recorded data shall be provided to the owner as part of the as-built documentation.

3.10 SYSTEM COMMISSIONING, DEMONSTRATION AND TURNOVER

- A. The BAS Contractor shall prepare and submit for approval a complete acceptance test procedure including submittal data relevant to point index, functions, sequence, inter-locks, and associated parameters, and other pertinent information for the operating system. Prior to acceptance of the BAS by the Owner and Engineer, the BAS contractor shall completely test the BAS using the approved test procedure.
- B. After the BAS contractor has completed the tests and certified the BAS is 100% complete, the Engineer shall be requested, in writing, to approve the satisfactory operation of the system, sub-systems and accessories. The BAS contractor shall submit Maintenance and Operating manuals at this time for approval. An acceptance test in the presence of the Engineer and Owner's representative shall be performed. The Owner will then shake down the system for a fixed period of time (30 days).
- C. The BAS contractor shall fix punch list items within 30 days of acceptance.
- D. When the system performance is deemed satisfactory in whole or in part by these observers, the system parts will be accepted for beneficial use and placed under warranty.
- E. Test and record data on performance of all laboratory pressure differentials, and performance of all laboratory chemical hoods, make-up air and general exhaust valves. Verifying time of full stroke operations and adjustments to attain control sequencing and CFM offset control of all labs.
- F. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
- G. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
- H. The demonstration process shall follow approved provided checklists and forms shall be completed for all systems as part of the demonstration.
- I. The ACS supplier shall provide a functional demonstration on the ACS operation to the owner and/or owner's designated representatives as well as other interested parties which may include: the architect, engineer, as well as the general and mechanical contractors. This demonstration shall include any ACS control sequences selected by the owner's representatives and may cover several laboratory rooms.
- J. ACS manufacturer shall provide a visual demonstration that the laboratory airflow systems are maintaining specified hood containment performance requirements. This demonstration shall be performed on 10% of the hoods. Coordinate with and work in conjunction with TAB contractor.
- K. ACS manufacturer shall demonstrate that, with specified room offset, system maintains proper room directional air flows under both static and dynamic operating conditions, and can recover to proper flow direction upon change in room/system conditions such as raising and lowering of any hood sashes or room occupancy conditions, temporary deficit of exhaust system capacity. Verification shall be provided by temporary visual indication, such as smoke wand. Coordinate with and work in conjunction with TAB contractor.
- L. Demonstration shall also include (but not limited to) exhaust system functionality, emergency functions and associated local monitoring provisions as well as required BAS monitoring and alarm reporting.
- M. The day for this demonstration shall be established by the owner's representative in conjunction with the other participants.

3.11 ACCEPTANCE

- A. All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.
- B. The system shall not be accepted until all forms and checklists are completed.

3.12 OPTIONAL SERVICE CONTRACT

- A. The System Contractor shall, within sixty days after installation of the system begins, present a three (3) year maintenance contract for the Owner's signature. The price is to be indicated for each year with all payment terms and conditions. The contract should state that the Owner has the option to accept or reject the second or third year contract price, given that notice of cancellation should be in writing and given not less than thirty (30) days prior to the anniversary date of the agreement.
- B. The contract should state that the Owner has the option to reject the First Year Service, accepting only the System Contractor's obligation as specified herein the warranty section. System Contractor shall provide a clear comparison of warranty coverage versus First Year Service.
- C. First, Second, and Third Year Service shall include the following provisions:
 - 1. On-Line Service - Diagnostic and troubleshooting services shall be provided via remote communications capabilities. Response time to Owner requests for this type of corrective maintenance shall be within two (2) hours.
 - 2. Software Maintenance and Consultation - The System Contractor shall review the need for software modifications to the existing database semi-annually and implement modifications. Backup of the database shall be made semi-annually and retained by the System Contractor.
 - 3. Software Maintenance - Software revisions shall be provided as they become available.
 - 4. Emergency Service - The System Contractor shall provide emergency service, between scheduled preventive maintenance calls, including overtime, necessary to keep equipment and components in proper operation. When a site visit is required to complete troubleshooting procedures, the System Contractor shall be on-site within 24 hours.
 - 5. The System Contractor shall guarantee future availability of continuous, twenty-four hour, seven days a week service for the systems through available maintenance contracts.
 - 6. Service shall be performed by factory trained and employed service representatives of the System Manufacturer.
 - 7. Provide a basic service contract from the manufacturer of the central workstation computer, providing uniform service and parts availability.
 - 8. Provide a basic service contract from the manufacturer of peripherals.
 - 9. Preventive Maintenance shall be performed in accordance with a program of standardized maintenance routines applied to the Owner's equipment. Each schedule shall list the equipment name, location, and appropriate preventive maintenance functions to be performed during that inspection.
 - 10. The System Contractor shall perform regular and systematic preventive maintenance during normal working hours six (6) times per year on approximately the schedule described below. Maintenance routines shall consist of:
 - a. Checking performance of equipment and components.
 - b. Diagnostic test, examination, cleaning, lubrication, adjustment and calibration of equipment and their components. Such components shall include but are not limited to: Central Processing Unit, disk memory, color graphic CRT, printer, direct digital control units, printed circuit boards, and associated sensors and controllers, including all electric and electronic devices on the systems.

- D. The service contract shall be renewable at the Owner's option and shall include provision for increased charges due to the expansion of the system changes, in service coverage and/or inflation.

3.13 TRAINING

- A. During System commissioning and at such time as acceptable performance of the Building Automation System hardware and software has been established, the BAS contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction during normal working hours shall be performed by a competent building automation contractor representative familiar with the Building Automation System's software, hardware and accessories.
- B. At a time mutually agreed upon, during System commissioning as stated above, the BAS contractor shall give 40 hours of onsite training on the operation of all BAS equipment. Describe its intended use with respect to the programmed functions specified. Operator orientation of the automation system shall include, but not be limited to:
 - 1. Explanation of drawings and operator's maintenance manuals.
 - 2. Walk-through of the job to locate all control components.
 - 3. Operator workstation and peripherals.
 - 4. DDC Controller and ASC operation/sequence.
 - 5. Operator control functions including scheduling, alarming, and trending.
 - 6. Explanation of adjustment, calibration and replacement procedures.
- C. Additional 8-hours of training shall be given after the 30 day shakedown period.
- D. Since the Owner may require personnel to have more comprehensive understanding of the hardware and software, additional training must be available from the Contractor. If the Owner requires such training, it will be contracted at a later date. Provide description of available local and factory customer training. Provide costs associated with performing training at an off-site classroom facility and detail what is included in the manufacturer's standard pricing such as transportation, meals, etc.
- E. The ACS system contractor shall provide on-site instruction for the owner designated personnel covering all aspects of the operation and use of the ACS including operator interface, control parameter setpoint adjustment, alarm limit and time delay adjustments, point trending, automatic startup, shutdown and changeover scheduling as well as the manipulation and utilization of all associated ACS monitoring control functions. The training shall be augmented an operational manual for each attendee and shall also include the recommended procedures to verify the proper functioning of the ACS. Instructors shall be highly qualified factory trained personnel who reside at the local branch office of the ACS supplier and who are thoroughly familiar with all aspects of the overall subject matter and this specific facility's ACS. All training shall be provided on weekdays during the normal daytime working hours of the facility operations personnel.
- F. Training shall consist of not less than 24 hours for designated personnel and shall include:
 - 1. A thorough walk-through of the facility to identify ACS controls and controlled equipment.
 - 2. Explanations of the ACS system, its operation and user interaction.
 - 3. Explanation of laboratory room and fume hood control sequences.
 - 4. Explanation of adjustment, inspection and test procedures.
- G. Additional specialized operational training courses shall be made available to facility personnel covering the ACS and its components.

SECTION 23 09 34

VARIABLE-FREQUENCY MOTOR CONTROLLERS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Variable-frequency motor controllers for low-voltage (600 V and less) AC motor applications.
- B. Overcurrent protective devices for motor controllers, including overload relays.

1.02 RELATED REQUIREMENTS

- A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- B. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
 - 1. Includes requirements for seismic qualification of equipment specified in this section.
- C. Section 23 05 53 - Identification for HVAC Piping and Equipment: Identification products and requirements.
- D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- E. Section 26 28 13 - Fuses.

1.03 REFERENCE STANDARDS

- A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 2013 (Corrigendum 2019).
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- E. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.
- F. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).
- G. NEMA ICS 7 - Industrial Control and Systems: Adjustable-Speed Drives; 2020.
- H. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems; 2014.
- I. NEMA ICS 7.2 - Application Guide for AC Adjustable Speed Drive Systems; 2021.
- J. NEMA ICS 61800-2 - Adjustable Speed Electrical Power Drive Systems, Part 2: General Requirements-Rating Specifications for Low Voltage Adjustable Frequency AC Power Drive Systems; 2005.
- K. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- L. NEMA MG 1 - Motors and Generators; 2018.
- M. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- P. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- Q. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- R. UL 61800-5-1 - Standard for Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements – Electrical, Thermal, and Energy; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate work to provide motor controllers suitable for use with actual motors to be installed.
 - 2. Coordinate work to provide controllers and associated wiring suitable for interface with control devices to be installed.
 - 3. Coordinate arrangement with dimensions and clearance requirements of actual equipment to be installed.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with conductors to be installed.
 - 5. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section Division 1 for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.
- C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of controllers and adjacent equipment with required clearances indicated.
 - 2. Include wiring diagrams showing factory and field connections.
 - 3. Identify mounting conditions required for equipment seismic qualification.
- D. Derating Calculations: Indicate ratings adjusted for applicable service conditions.
- E. Specimen Warranty: Submit sample of manufacturer's warranty.
- F. Manufacturer qualification statement.
- G. Installer qualification statement.
- H. Maintenance contractor qualification statement, if different entity from installer.
- I. Manufacturer's equipment seismic qualification certification.
- J. Manufacturer's certification that products meet or exceed specified requirements.
- K. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- L. Source quality control test reports.
- M. Manufacturer's detailed field testing procedures.
- N. Field quality control test reports.
- O. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
 - 1. Include contact information for entity providing contract maintenance and trouble call-back service.
- P. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- Q. Maintenance contracts.
- R. Project Record Documents: Record actual installed locations of controllers and final equipment settings.
 - 1. Include nameplate data of actual installed motors and associated overload relay selections and settings.

2. Motor Circuit Protectors: Include magnetic instantaneous trip settings.
- S. Maintenance Materials: Furnish following for Owner's use in maintenance of project.
 1. Electronic Trip Circuit Breakers: Provide one portable test set.
 2. Indicating Lights: Two of each different type.
 3. Air Filters: Two of each different type.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain copy of each referenced document that prescribes execution requirements at project site.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
 1. Authorized service facilities located within 200 miles of project site.
- D. Installer Qualifications: Company with minimum three years documented experience with variable-frequency motor control systems of similar size, type, and complexity; manufacturer's authorized installer.
- E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
 1. Contract maintenance office located within 200 miles of project site.
- F. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in clean, dry space. Maintain factory wrapping or provide additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

1.09 WARRANTY

- A. See Division 1 for additional warranty requirements.
- B. Provide minimum 18 month manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Danfoss: www.danfoss.com/#sle.
- B. Yaskawa America: www.yaskawa.com/#sle.
- C. Substitutions: See Division 1.
- D. Source Limitations: Furnish variable-frequency motor controllers and associated components produced by a single manufacturer and obtained from a single supplier.

2.02 VARIABLE-FREQUENCY MOTOR CONTROLLERS

- A. Provide variable-frequency motor control system consisting of required controller assemblies, operator interfaces, control power transformers, instrumentation and control wiring, sensors, accessories, system programming, etc. as necessary for complete operating system.
- B. Provide products listed, classified, and labeled as suitable for purpose intended.
- C. Variable-Frequency Motor Controller:
 1. Configuration: Packaged controller, nonbypass.
 2. Power Conversion System: Diode-based, 6-pulse type.

3. Control Method: Vector; open-loop, without feedback.
4. Filtering: Provide input/line reactor and output/load reactor.
5. Features:
 - a. Braking chopper/resistor.
 - b. PID control.
 - c. Firefighter's override.
 - d. Safety interlock.
 - e. Damper/valve control.
 - f. PTC motor thermistor input.
- D. Controller Assemblies: Comply with NEMA ICS 7, NEMA ICS 7.1, and NEMA ICS 61800-2; list and label as complying with UL 61800-5-1 or UL 508A as applicable.
- E. Provide controllers selected for actual installed motors and coupled mechanical loads in accordance with NEMA ICS 7.2, NEMA MG 1 Part 30, and recommendations of manufacturers of both controller and load, where not in conflict with specified requirements; considerations include, but are not limited to:
 1. Motor type (e.g., induction, reluctance, and permanent magnet); consider NEMA MG 1 design letter or inverter duty rating for induction motors.
 2. Motor load type (e.g., constant torque, variable torque, and constant horsepower); consider duty cycle, impact loads, and high inertia loads.
 3. Motor nameplate data.
 4. Requirements for speed control range, speed regulation, and braking.
 5. Motor suitability for bypass starting method, where applicable.
- F. Devices on Load Side of Controller: Suitable for application across full controller output frequency range.
- G. Operating Requirements:
 1. Input Voltage Tolerance: Plus/minus 10 percent of nominal.
 2. Input Frequency Tolerance: Plus/minus 5 percent of nominal.
 3. Efficiency: Minimum of 96 percent at full speed and load.
 4. Input Displacement Power Factor: Minimum of 0.96 throughout speed and load range.
 5. Overload Rating:
 - a. Variable Torque Loads: Minimum of 110 percent of nominal for 60 seconds.
 - b. Constant Torque Loads: Minimum of 150 percent of nominal for 60 seconds.
- H. Power Conversion System: Microprocessor-based, pulse width modulation type.
 1. Diode-based, 6-pulse type unless otherwise indicated.
- I. Control System:
 1. Provide microprocessor-based control system for automatic control, monitoring, and protection of motors. Include sensors, wiring, and connections necessary for functions and status/alarm indications specified.
 2. Provide integral operator interface for controller programming, display of status/alarm indications, fault reset, and local control functions including motor run/stop, motor forward/reverse selection, motor speed increase/decrease, and local/remote control selection.
 3. Control Functions:
 - a. Control Method: Selectable vector and scalar/volts per hertz unless otherwise indicated.
 - 1) Scalar/Volts per Hertz Control: Provide IR compensation for improved low-speed torque.
 - 2) Vector Control: Provide selectable autotuning function.
 - b. Adjustable acceleration and deceleration time; linear and S-curve ramps; selectable coast to stop.
 - c. Selectable braking control; DC injection or flux braking.

- 1) Dynamic Braking: Provide braking chopper circuit and appropriately sized braking resistor where indicated.
- d. Adjustable minimum/maximum speed limits.
- e. Adjustable pulse width modulation switching carrier frequency.
- f. Adjustable motor slip compensation.
- g. Selectable autorestart after noncritical fault; programmable number of time delay between restart attempts.
- h. Automatic response to loss of speed reference; selectable to run motor at last known speed, run motor at designated speed, or stop motor.
- i. PID Control: Provide integral PID controller employing feedback for closed-loop control where indicated or required.
- j. Selectable frequency-skipping; minimum of three independently adjustable bands.
- k. Automatic catching of rotating motor.
- l. Energy-saving algorithms.
4. Status Indications:
 - a. Motor run/stop status.
 - b. Motor forward/reverse status.
 - c. Local/remote control status.
 - d. Output voltage.
 - e. Output current.
 - f. Output frequency.
 - g. DC bus voltage.
 - h. Motor speed.
 - i. Speed reference.
 - j. Instantaneous power.
 - k. Energy.
 - l. Elapsed run time.
 - m. Controller temperature.
 - n. Discrete input/output status.
 - o. Analog input/output values.
5. Protective Functions/Alarm Indications:
 - a. Overcurrent.
 - b. Motor overload.
 - c. Undervoltage.
 - d. Overvoltage.
 - e. Controller overtemperature.
 - f. Input/output phase loss.
 - g. Output short circuit protection.
 - h. Output ground fault protection.
 - i. Motor stalled/overtorque.
 - j. Motor underload.
 - k. External fault.
6. Inputs:
 - a. Digital Input(s): Three.
 - b. Analog Input(s): Two.
 - c. PTC motor thermistor input where indicated.
7. Outputs:
 - a. Analog Output(s): One.
 - b. Relay Output(s): Two.
8. Communications: Compatible with connected systems. Provide accessories necessary for proper interface.
 - a. Serial Communications: RS-485; support for Modbus RTU protocol.
 - b. Ethernet Communications: Support for Modbus TCP protocol.
 - c. Remote Monitoring Capabilities:

- 1) Motor run/stop status.
 - 2) Hand-off-auto status.
 - 3) Fault information.
 - 4) Discrete input/output status.
 - 5) Analog input/output values.
 - d. Remote Control Capabilities:
 - 1) Motor run/stop command.
 - 2) Hand-off-auto selection.
 - 3) Speed adjustment.
 - 4) Fault reset.
9. Features:
 - a. Password-protected security access.
 - b. Event log.
 - c. Remote monitoring and programming capability via web browser.
- J. Power Conditioning/Filtering:
 1. Provide DC link choke or input/line reactor for each controller unless otherwise indicated or required.
 2. Provide LCL filter for IGBT-based active front end controllers.
 3. Provide input surge protection.
 4. Provide where indicated:
 - a. Input/line reactor.
 - b. Input tuned passive filter.
 - c. Output/load reactor.
 - d. Output dV/dt filter.
 - e. Output sine wave filter.
 5. Reactor Impedance: 3 percent, unless otherwise indicated or required.
- K. Packaged Controllers: Controllers factory-mounted in separate enclosure with externally operable disconnect and specified accessories.
 1. Disconnects: Circuit breaker or disconnect switch type.
 - a. Disconnect Switches: Fusible type or nonfusible type with separate input fuses.
 - b. Provide externally operable handle with means for locking in OFF position. Provide safety interlock to prevent opening cover with disconnect in ON position with capability of overriding interlock for testing purposes.
 - c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
 2. Provide door-mounted remote operator interface.
 3. Packaged Controllers with Bypass: Provide contactors and controls to enable removal of variable-frequency controller from circuit.
 - a. Bypass Method: Manual, unless otherwise indicated.
 - b. Bypass Configuration: 3-contactor type, with contactors for bypass, drive output, and drive input.
 - c. Bypass Motor Starting Method: Full-voltage (across-the-line) with overload relay, unless otherwise indicated or required.
 - d. Overload Relays: Solid state or bimetallic thermal type.
 4. Pilot Devices Required:
 - a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings, except where equivalent function is provided by remote operator interface.
 - b. Packaged Controllers with Bypass:
 - 1) Bypass Mode Selector Switch: DRIVE/OFF/BYPASS.
 - 2) Motor Control Selector Switch: HAND/OFF/AUTO.
 - 3) Indicating Lights: For drive/bypass mode status, drive/bypass run status, and drive/bypass fault status.

- 4) Speed potentiometer.
- L. Service Conditions:
 1. Provide controllers and associated components suitable for operation under following service conditions without derating:
 - a. Altitude: Less than 3,300 feet.
 - b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
 2. Provide controllers and associated components suitable for operation at indicated ratings under service conditions at installed location.
- M. Short Circuit Current Rating:
 1. Provide controllers with listed short circuit current rating not less than available fault current at installed location as indicated on drawings.
 2. Provide line/input reactors where specified by manufacturer for required short circuit current rating.
 3. Label equipment utilizing series ratings as required by NFPA 70.
- N. Conductor Terminations: Suitable for use with conductors to be installed.
- O. Enclosures:
 1. Comply with NEMA ICS 6.
 2. NEMA 250 Environment Type or Equivalent IEC 60529 Rating: Unless otherwise indicated, as specified for following installation locations:
 - a. Outdoor Locations: Type 3R or Type 4.
 3. Finish: Manufacturer's standard unless otherwise indicated.
 4. Cooling: Forced air or natural convection as determined by manufacturer.
- P. Instrument Transformers:
 1. Comply with IEEE C57.13.
 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 3. Current Transformers: Connect secondaries to shorting terminal blocks.
 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.
- Q. Interface with Other Work:
 1. Provide products compatible with other systems requiring interface with controllers.
- R. Products:
 1. Danfoss; VLT HVAC Drive FC 102: www.danfoss.com/#sle.
 2. Yaskawa America, Inc; HV600 Drive: www.yaskawa.com/#sle.
 3. Yaskawa America, Inc; HV600 Narrow Bypass: www.yaskawa.com/#sle.
 4. Yaskawa America, Inc; HV600 Enclosed Bypass: www.yaskawa.com/#sle.
 5. Yaskawa America, Inc; HV600 Narrow Configured: www.yaskawa.com/#sle.
 6. Yaskawa America, Inc; HV600 Enclosed Configured: www.yaskawa.com/#sle.
 7. Yaskawa America, Inc; Z1000U Matrix Drive: www.yaskawa.com/#sle.
 8. Yaskawa America, Inc; Z1000U Matrix Bypass: www.yaskawa.com/#sle.
 9. Yaskawa America, Inc; Z1000U Matrix Configured: www.yaskawa.com/#sle.
 10. Substitutions: See Division 1.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Overload Relays:
 1. Provide overload relays and, where applicable, associated current elements/heaters selected for actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
 2. Comply with NEMA ICS 2.
 3. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
 4. Trip-free operation.
 5. Visible trip indication.
 6. Resettable:

- a. Employ manual reset unless otherwise indicated.
 - b. Do not employ automatic reset with two-wire control.
- 7. Bimetallic Thermal Overload Relays:
 - a. Interchangeable current elements/heaters.
 - b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
 - c. Trip test function.
- 8. Solid State Overload Relays:
 - a. Adjustable full load current.
 - b. Phase loss protection.
 - c. Phase imbalance protection.
 - d. Ambient temperature insensitive.
 - e. Thermal memory.
 - f. Trip test function.
 - g. Provide isolated alarm contact.
- B. Fusible Disconnect Switches:
 - 1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated or as required.
 - 2. Fuse Clips: As required to accept indicated fuses.
 - a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
 - 3. Provide externally operable handle with means for locking in OFF position. Provide means for locking switch cover in closed position. Provide safety interlock to prevent opening of cover with switch in ON position with capability of overriding interlock for testing purposes.
- C. Circuit Breakers:
 - 1. Motor Circuit Protectors:
 - a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of listed combination motor controller with overload protection; ratings, configurations, and features as indicated or as required.
 - b. Provide field-adjustable magnetic instantaneous trip setting.
 - c. Provide following features and accessories where indicated or where required to complete installation:
 - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - 2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
 - 3) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - 4) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - 5) Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.
 - 2. Molded Case Circuit Breakers:
 - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated or as required.
 - b. Interrupting Capacity:
 - 1) Provide circuit breakers with interrupting capacity as required to provide short circuit current rating indicated, but not less than specified minimum requirements.
 - 2) Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than short circuit current rating indicated.

- 3) Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than short circuit current rating indicated.
- c. Provide following features and accessories where indicated or where required to complete installation:
 - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - 2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
 - 3) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - 4) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - 5) Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.04 ACCESSORIES

- A. Pilot Devices:
 1. Comply with NEMA ICS 5; heavy-duty type.
 2. Pushbuttons: Unless otherwise indicated, provide momentary, nonilluminated type with flush button operator; normally open or normally closed as indicated or as required.
 3. Selector Switches: Unless otherwise indicated, provide maintained, nonilluminated type with knob operator; number of switch positions as indicated or as required.
 4. Indicating Lights: Push-to-test type unless otherwise indicated.
 5. Provide LED lamp source for indicating lights and illuminated devices.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings of controllers are consistent with indicated requirements.
- C. Verify that mounting surfaces are ready to accept controllers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install in accordance with NEMA ICS 7.1 and manufacturer's instructions.
- C. Do not exceed manufacturer's recommended maximum cable length between controller and motor.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 23 05 29.
- F. Install controllers plumb and level.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Install field-installed devices, components, and accessories.
- I. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Set field-adjustable settings of controllers and associated components according to installed motor requirements, in accordance with recommendations of manufacturers of controller and load.

3.03 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.04 CLEANING

- A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

3.05 PROTECTION

- A. Protect installed controllers from subsequent construction operations.

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Chilled water piping, above grade.
- C. Equipment drains and overflows.
- D. Pipe hangers and supports.
- E. Unions, flanges, mechanical couplings, and dielectric connections.
- F. Valves:
 - 1. Butterfly valves.

1.02 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- D. ASME B31.9 - Building Services Piping; 2020.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.
- F. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.
- G. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- H. ASTM B32 - Standard Specification for Solder Metal; 2020.
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- K. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992, with Editorial Revision (2018).
- L. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).
- M. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2021).
- O. AWWA C606 - Grooved and Shouldered Joints; 2015.
- P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.03 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Shop Drawings: Submit complete shop drawings for piping system showing all fittings, elevations, pipe accessories, hanger locations and all connected equipment. Submit on reproducible velum, and compact disk. Drawings shall be produced in AutoCad 2018, or Revit 2018 or later releases.
- C. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
 - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
 - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
 - 3. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
 - 1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap; pipe to nearest floor drain.
 - 2. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.
 - 3. For throttling, bypass, or manual flow control services, use ball or butterfly valves.
 - 4. For throttling and isolation service in chilled and condenser water systems, use only butterfly valves.
 - 5. For shut-off and to isolate parts of systems or vertical risers, use ball or butterfly valves.
 - 6. Provide manual or automatic air relief valves on all high points in hydronic systems.

2.02 HEATING HOT WATER PIPING, ABOVE GRADE

- A. Steel Pipe sizes through 10" size: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
 - 1. Welded Joints: 2-1/2" NPS and above, ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: ASME B16.3, malleable iron fittings.
 - 3. Fittings: ASTM B 16.3, malleable iron threaded or ASTM A 234/A 234M, wrought steel welding type fittings.
 - 4. Joints: 2" NPS and below, Threaded, or AWS D1.1 welded..

2.03 CHILLED WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
 - 1. Welded Joints: 2-1/2" NPS and above, ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: 2" NPS and below, ASME B16.3, malleable iron fittings.
 - 3. Fittings: ASME B16.3, malleable iron or ASTM A 234/A 234M, forged steel welding type.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), hard drawn; using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
 - 2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
 - 3. Mechanical Press Sealed Fittings: 1" and below CPS, double pressed type complying with ASME B16.22, utilizing approved gasket materials, nontoxic sealing elements.

2.04 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
2. Mechanical Press Sealed Fittings: 1" and below CPS, double pressed type complying with ASME B16.22, utilizing approved gasket materials, nontoxic sealing elements.

2.05 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
- C. Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.
- D. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
- E. Hangers for Hot Pipe Sizes 6 Inches and Greater: Adjustable steel yoke, cast iron roll, double hanger.
- F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- G. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Greater: Steel channels with welded spacers and hanger rods, cast iron roll.
- H. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- I. Wall Support for Pipe Sizes 4 Inches and Greater: Welded steel bracket and wrought steel clamp.
- J. Wall Support for Hot Pipe Sizes 6 Inches and Greater: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
- K. Vertical Support: Steel riser clamp.
- L. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- M. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.06 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe of 2 Inches and Less:
 1. Ferrous Piping: 150 psi brass or malleable iron, threaded.
 2. Copper Pipe: Bronze, soldered joints.
- B. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 1. Dimensions and Testing: In accordance with AWWA C606.
 2. Mechanical Couplings: Comply with ASTM F1476.
 3. Housing Material: Ductile iron, galvanized complying with ASTM A536.
 4. Gasket Material: Chloramine Resistant EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
 5. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 6. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.07 BUTTERFLY VALVES

- A. Manufacturers:
 1. Nibco; www.nibco.com.
 2. Substitutions: See Division 1.
- B. Body: 150 or 200 lb, Cast or ductile iron with resilient replaceable Chloramine Resistant EPDM seat, lug ends, extended neck where insulated..
- C. Stem: Stainless steel , one piece through disc design. Provide valves with extnded stem when insulated.

- D. Disc (for general duty): Aluminum bronze.
- E. Manual Operators: 10 position lever handle up through 4", above 4", provide gear operator and handwheel. Where gear operator is mounted higher than 7' above floor, provide chain wheel and chain to 3' above floor, with provisions to keep chain out of walking areas, access areas.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. See Section 23 25 00 for additional requirements.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install heating water, glycol, chilled water, condenser water, and engine exhaust piping to ASME B31.9 requirements.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and to avoid interference with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls, and floors.
- G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in details.
- H. Slope piping and arrange to drain at low points.
- I. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
- J. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

- A. Hanger Spacing for Steel Piping.
 - 1. 2 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 2. 2-1/2 Inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
 - 3. 3 Inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 - 4. 4 Inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.

END OF SECTION

SECTION 23 21 14
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Expansion tanks.
- B. Air vents.
- C. Air separators.
- D. Strainers.
- E. Suction diffusers.
- F. Pump connectors.
- G. Pressure-temperature test plugs.
- H. Balancing valves.

1.02 RELATED REQUIREMENTS

- A. Section 23 21 13 - Hydronic Piping.

1.03 REFERENCE STANDARDS

- A. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

1.04 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.
- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Project Record Documents: Record actual locations of flow controls.
- E. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

- A. Manufacturers:
 - 1. Wessels Company, www.westank.com.
 - 2. Bell & Gossett, www.bellgossett.com.
 - 3. Substitutions: See Division 1.
- B. General: Pre-charged steel HVAC expansion tank with heavy-duty butyl bladder. Tank shall have multiple water-side connections to eliminate water within tank, a 0.302"-32 charging valve connection to facilitate the on-site charging of the tank to meet system requirements, a

pressure gauge, and bladder integrity monitor. The tank must be constructed in accordance with the most recent addendum of Section VIII Division 1 of the ASME Boiler and Pressure Vessel Code, rated for 125psig.

- C. Construction: Carbon steel shell & heads, Carbocoat 140 exterior, heavy duty butyl bladder.

2.02 AIR VENTS

- A. Manufacturers:
- B. Manual Air Vent: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- C. Maximum Fluid Pressure: 150 psi.
- D. Maximum Fluid Temperature: 250 degrees F.

2.03 AIR SEPARATORS

- A. Centrifugal Air Separators/Strainers:
 - 1. Manufacturers:
 - a. Bell & Gossett, a brand of Xylem, Inc; www.bellgossett.com/#sle.
 - b. Substitutions: See Division 1.
 - 2. Primed steel body, tested and stamped in accordance with ASME BPVC-VIII-1 and registered with the National Board of Boiler and Pressure Vessel Inspectors.
 - 3. Maximum Service Pressure: 125 psig @350F.
 - 4. The unit shall have the capability to direct accumulated air to an air vent via an NPT vent connection at top of air separator.

2.04 STRAINERS

- A. Manufacturers:
- B. Size 2-1/2 inch to 4 inch:
 - 1. Provide flanged iron body for up to 175 psi working pressure, up to 250 degrees F working temperature, Y-pattern strainer with 1/16 inch stainless steel perforated screen.
 - 2. Body Material by Fluid Service:
 - a. Cast Iron:
 - 1) Liquids: Up to 200 psi at 150 degrees F.

2.05 SUCTION DIFFUSERS

- A. Manufacturers:
 - 1. Bell & Gossett, a brand of Xylem, Inc; www.bellgossett.com/#sle
 - 2. Substitutions: See Division 1.
- B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh startup screen, and permanent magnet located in flow stream and removable for cleaning.
- C. Class 150, Size 1-1/2 to 4 inch:
 - 1. Angle-pattern flanged carbon steel fitted with integral vanes, removable strainer, and magnetic drain plugs for particle removal without disassembly.
 - 2. Maximum Operating Service:
 - a. Class 150: 150 psi at 450 degrees F.

2.06 PUMP CONNECTORS

- A. Manufacturers:
 - 1. The Metraflex Company; Vane Flex: www.metraflex.com/#sle.
- B. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
 - 1. Maximum Operating Service: 150 psi at 120 degrees F.
 - 2. End Connections: Same as specified for pipe jointing.
 - 3. Provide pump connector with integral vanes to reduce turbulent flow.

4. Provide necessary accessories including, but not limited to, swivel joints.

2.07 PRESSURE-TEMPERATURE TEST PLUGS

- A. Manufacturers:
 1. Peterson Equipment Company Inc; www.petesplug.com/#sle.
 2. Sisco Manufacturing Company Inc; www.siscomfg.com/#sle.
 3. Ferguson Enterprises Inc; www.fnw.com.
 4. Substitutions: See Division 1.
- B. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.
- C. Application: Use extended length plugs to clear insulated piping.

2.08 BALANCING VALVES

- A. Manufacturers:
 1. Bell & Gossett, a brand of Xylem, Inc; www.bellgossett.com/#sle.
 2. Substitutions: See Division 1.
- B. Size 2 inch and Smaller:
 1. Provide ball style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and female sweat, NPT threaded, press, or soldered connections.
 2. Maximum Service Operation: 300 psi at 250 degrees F.
- C. Size 2-1/2 inch and Larger:
 1. Provide butterfly style with flow balancing, shut-off capabilities, memory stops and minimum of two metering ports and flanged, grooved or weld-end connections.
 2. Maximum Service Operation: 175 psi at 250 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Provide manual air vents at system high points and as indicated.
- C. Support pump fittings with floor-mounted pipe and flange supports.
- D. Pipe relief valve outlet to nearest floor drain.

END OF SECTION

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 23 21 23
HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. In-line pumps.
- B. End-suction pumps.

1.02 RELATED REQUIREMENTS

- A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.
- B. Section 23 09 34 - Variable-Frequency Motor Controllers for HVAC.
- C. Section 23 21 13 - Hydronic Piping.
- D. Section 23 21 14 - Hydronic Specialties.

1.03 REFERENCE STANDARDS

- A. IEEE 802.11 - IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications; 2020, with Amendment (2021).
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.
- D. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Bell & Gossett, a Xylem Inc. brand; www.bellgossett.com/#sle. (Building A)
- B. Patterson Pump Company, A Gorman-Rupp Company; www.pattersonpumps.com. (Building T)
- C. Substitutions: See Division 1.

2.02 GENERAL

- A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Electrical Requirements:
 - 1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.
 - 2. Variable Frequency Drives (VFDs): Provide in accordance with Section 23 09 34, except for integral-VFDs.

3. Enclosures: Provide unspecified product(s) required to fit motor:

2.03 IN-LINE PUMPS

- A. Casing: Cast iron with seal flush connection, threaded suction, and discharge ports with gauge port and drain plug.
- B. Impeller: Stainless steel, fully enclosed, keyed directly to motor shaft or extension.
- C. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.
- D. Seal: Mechanical seal, 225 degrees F maximum continuous duty temperature.
- E. Electrical:
 1. Motor: 1800 rpm, TEFC enclosure.
 2. Integral Controls:
 - a. Variable Frequency Drive (VFD): Factory-fitted and tested with dedicated terminal box for power, instrumentation and related control wiring.
 - b. BAS, SCADA, or Other Integrated Automation Link: Wi-Fi in accordance with IEEE 802.11abgn.

2.04 END-SUCTION PUMPS

- A. Casing: Cast iron or ductile iron with renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction, and discharge flanged connections with gauge ports.
- B. Impeller: Stainless steel, balanced, fully enclosed, keyed to shaft.
- C. Bearings: Oil lubricated roller or ball bearings.
- D. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.
- E. Seal: Mechanical, 225 degrees F maximum continuous duty temperature.
- F. Drive: Flexible coupling with coupling guard.
- G. Baseplate: Cast iron or fabricated steel with integral drain rim.
- H. Electrical:
 1. Motor: 1,750 rpm, total-enclosed, fan-cooled (TEFC), VFD rated; see Section 23 05 13.
 2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
 3. Integral Controls:
 - a. Variable Frequency Drive (VFD): Factory-fitted and tested with dedicated terminal box for power, instrumentation and related control wiring.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ducts.
- B. Ducts for laboratory and industrial-grade applications.
- C. Metal ductwork.
- D. Laboratory exhaust ductwork.
- E. Duct cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.
- B. Section 23 07 13 - Duct Insulation: External insulation and duct liner.
- C. Section 23 33 00 - Duct Accessories.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2022.
- C. ASTM A 366/A 366M - Standard Specification for Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold Rolled; 1997.
- D. ASTM A 569/A 569M - Standard Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial; 1998.
- E. NFPA 45 - Standard on Fire Protection for Laboratories Using Chemicals; 2019.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2021.
- H. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids; 2020.
- I. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.
- J. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- K. SMACNA (RIDC) - Rectangular Industrial Duct Construction Standards; 2007.
- L. SMACNA (ROUND) - Round Industrial Duct Construction Standards; 2013.
- M. SMACNA Guidelines for Seismic Restraints of Mechanical Systems
- N. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.04 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Shop Drawings: Indicate duct fitting types, gauges, sizes, welds, and configuration.
- D. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.06 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated.
- C. Duct Sealing and Leakage in accordance with Static Pressure Class:
 - 1. Medium and High Pressure Service: Above 3 in-wc:
 - a. Seal: Class A, apply sealing of transverse joints, longitudinal seams, and duct wall penetrations.
 - b. Leakage:
 - 1) Rectangular: Class 6 or 6 cfm/100 sq ft.
 - 2) Round: Class 3 or 3 cfm/100 sq ft.
- D. Duct Fabrication Requirements:
 - 1. Round Duct and Fitting Fabrication and Support: SMACNA industrial duct constructions standards (IRDCS) including specifics for continuously welded round and oval duct fittings. Welded ductwork is not required throughout the laboratory - exhaust duct can be welded or be flanged with approved Gaskets and Van Stone flanges or approved manufacturer's flanged systems. Round supply or make-up ductwork can be van stone flanges. Round duct size 8" or smaller may use beaded inserts with approved sealer.
 - 2. Conform to SMACNA DUCT CONSTRUCTION STANDARDS for rectangular ductwork. Provide gasketed joints per SMACNA construction guidelines for rectangular ductwork 3" pressure class.
 - 3. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
 - 4. Construct tee's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
 - 5. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
 - 6. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 - 7. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
 - 8. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.
 - 9. Use of glass fiber lined ductwork is prohibited in laboratory ductwork.
- E. Regulatory Requirements: Construct ductwork to comply with SMACNA standards.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90 coating.
- B. Stainless Steel for Lab Exhaust Ducts: ASTM A312 Type 316L. No flexible ductwork allowed in laboratory fume exhaust ductwork systems. Duct systems employing prefabricated 316L stainless steel using gasketed Van Stone type flange (companion angle ring construction) with bolted joints shall be reviewed by District EH&S for acceptance.
- C. Joint Sealers and Sealants: Non-hardening, non-solvent, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 - 3. Stainless Steel Duct System: Joints between ductwork and fittings shall be butt welded or approved gasketed Van Stone bolted flanges using bolted connections and approved PTFE gaskets. For welded connections conform to table 14-1 in the SMACNA Round Industrial Duct Construction Standards, Second Edition. Welded joints and seams shall be welded using Tungsten Arc, Inert Gas welding process. Fittings and straight runs shall conform to Section 15.3 of the SMACNA Round Industrial Duct Construction Manual. Welded Stainless Steel ductwork shall be a minimum of 18 gage thickness.
 - 4. Connection from stainless steel fume hood exhaust duct to laboratory fume hoods shall be coordinated with the hood manufacturer's representative and may be done with approved transition provided by the hood manufacturer. The transition fitting shall be of the same material and thickness as the duct connections.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA Round Industrial (DCS).

2.04 METAL DUCTS

- A. Material Requirements:
 - 1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90 coating.
- B. Double Wall Insulated Rectangular Ducts: Rectangular spiral lockseam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Insulation:
 - a. Thickness: California CCR Title 6 Chapter 24 compliant.
 - b. Material: Fiberglass.
 - c. Duct lining for installed make-up air ductwork to laboratories shall not be lined with fiberglass materials. Insulation shall be exterior to the ductwork.

2.05 DUCTS FOR LABORATORY AND INDUSTRIAL-GRADE APPLICATIONS

- A. Duct Class:
 - 1. Class 5: Corrosive fumes in light concentrations at a minimum conveying velocity of 1,000 to 2,000 fpm. No fibrous duct liner allowed in laboratory ductwork.

- B. Sectional Shape and Material Requirements:
 - 1. Round Metal Duct:
 - a. Pressure Class: Plus or minus 3 in-wc.
 - b. Maximum Air Service Temperature:
 - 1) 800 degrees F: Stainless steel, type 304.
 - c. Minimum Duct Thickness: Duct Class 1, 2 and 5; 18 gauge, 0.048 inch.
 - d. Compliance: Provide ductwork, fittings, supports, hangers, and appurtenances:
 - 1) Round: SMACNA (ROUND) Industrial construction standard.
- C. Laboratory Exhaust Applications:
 - 1. Fume Hood Cabinet Exhaust: Conform to detail 3/M2.1a on plans.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products following the manufacturer's instructions.
- B. Comply with safety standards NFPA 90A and NFPA 90B.
- C. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Duct sizes indicated are inside precise dimensions. For lined ducts, maintain sizes inside lining.
- F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- G. Install ductwork in accordance with SMACNA Guidelines for Seismic Restraints of Mechanical Systems.

3.02 CLEANING

- A. Clean duct systems serving lab areas with high power vacuum machines, clean off all oil or other remnants of duct fabrication off ductwork prior to installing. Remove oil film coating on all newly installed ductwork. Protect equipment that could be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access to the ductwork for cleaning purposes.

END OF SECTION

SECTION 23 33 00
DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers - metal.
- C. Duct test holes.
- D. Flexible duct connections.
- E. Volume control dampers.

1.02 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.03 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
- D. Project Record Drawings: Record actual locations of access doors and test holes.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

- A. Manufacturers:
 - 1. Aero/Dyne Company; Model H.E.P: www.aero-dyne.net.
 - 2. Krueger-HVAC, Division of Air System Components; www.krueger-hvac.com/#sle.
 - 3. Ruskin Company; www.ruskin.com/#sle.
 - 4. Titus HVAC, a brand of Johnson Controls; www.titus-hvac.com/#sle.
 - 5. Substitutions: See Division 1.
 - 6. Substitutions: Proposed substitution shall include independent performance test data for pressure loss and generated sound power levels.
- B. Turning vanes shall be a true airfoil design; smoothly-rounded entry nose with extended trailing edge. Generated sound power level shall not exceed 54 decibels in band 4 at 2,000 FPM, with a duct size of 24 x 24.
- C. Assemblies shall be fabricated with side rails; vanes installed on design centers across the full diagonal dimension of the elbow.
- D. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.
- E. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.02 BACKDRAFT DAMPERS - METAL

- A. Manufacturers:
 - 1. Pottorff; www.pottorff.com/#sle.
 - 2. Ruskin Company; www.ruskin.com/#sle.
 - 3. Substitutions See Division 1.

- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.04 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
 - 1. Ductmate Industries, Inc., a DMI Company; www.ductmate.com/#sle.
 - 2. Substitutions: See Division 1.
- B. Fabricate in accordance with UL181 Class 1 and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip. Flex connections shall be constructed of ozone resistant materials.

2.05 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. Pottorff; www.pottorff.com/#sle.
 - 2. Ruskin Company; www.ruskin.com/#sle.
 - 3. Substitutions: See Division 1.
- B. Single Blade Dampers: Fabricate for duct sizes up to 6 by 30 inch.
 - 1. Blade: 24 gage, 0.0239 inch, minimum.
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 - 1. Blade: 18 gage, 0.0478 inch, minimum.
- D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Laboratory strobic exhaust fan system.

1.02 REFERENCE STANDARDS

- A. AMCA 99 - Standards Handbook; 2016.
- B. ANSI Z9.5 - Laboratory Ventilation; 2012.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate fan roof curbs and service utilities installation according to fan size.
- B. Sequencing: Ensure that utility connections are completed in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide shop drawings and product data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels and rated capacity, vibration levels, maintenance requirements, electrical characteristics, and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- E. Fan manufacturer shall furnish a certificate of guarantee stating that the fan, mixing plenum, outlet nozzle, acoustical silencer nozzle, and all related accessories specified herein and on the drawings, have been pre-tested at the factory and that performance curves, provided as part of the submitted product performance data, have been de-rated for any and all system effects created by the accessories.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

- A. Fan manufacturer shall provide a 7 year parts warranty from time of purchase to include fan, motor and drive mechanisms including pillow blocks, sheaves, shafts, couplings and belts. This warranty shall be held solely by the manufacturer. All warranty claims, as defined above, shall be the sole responsibility of the fan manufacturer.

PART 2 PRODUCTS

2.01 LABORATORY STROBIC EXHAUST FAN SYSTEM

- A. Manufacturers:
 - 1. Strobic Air Corporation; www.strobicair.com/#sle.
 - 2. Substitutions: See Division 1.
- B. Mixed-Flow Induction Dilution Fans:
 - 1. Impellers shall be mounted directly to the motor shaft to provide Arrangement 4 Direct Drive. Motors shall be isolated from the primary exhaust air stream. Motor maintenance shall be limited to greasing and accessible from the fan exterior. Motors that are not Arrangement #4 will be rejected.

2. Mixed flow impellers shall consist of combination axial/backward curved blades and shall be of welded steel construction unless scheduled AMCA B. The impellers shall have non-stall and non-overloading performance characteristics with aerodynamically stable operation at any point on the fan curves.
3. Fan Performance shall be as stated on the schedule. The Static Pressure stated on the schedule shall be at the inlet to the "Fan System" and does not include any losses of equipment provided by the fan manufacturer (i.e.: Filters, Silencers, etc.). All losses for the equipment provided by the fan manufacturer shall be detailed in the fan manufacturer's technical proposal and/or submittal.
4. Fan and all drive components, including motors, shall have a combined bearing life of a minimum of L10 = 150,000 hours. Belt driven fans that derate the motor bearing life to L10 = 50,000 hours are not acceptable.
5. Stationary discharge guide van sections shall be provided to increase fan efficiencies.
6. Fan dynamic balance shall not exceed 0.5mil, peak-to-peak for nominal 900RPM, 1200RPM, and 1800RPM fans, or 0.055in/sec-peak for 1800RPM, 0.035 in/sec - peak for 1200RPM, and 0.030in/sec-peak for 900RPM fans measured at the blade pass area when operating at fan frequency. Vibration isolation shall be limited to rubber-in-shear pad type isolators unless otherwise specified.
7. Factory test reports detailing vibration levels at the blade pass area shall be provided. Vibration levels shall be reported in both the axial and radial direction. If fan vibration is greater than 0.5mils peak-to-peak at the blade pass area, fan manufacturer shall be responsible for providing vibration isolators on each fan and flexible connection at each duct inlet. Manufacturer shall add 0.5" additional static pressure to the fan system to compensate for losses through the flexible connection. Vibration isolators, 2" deflection seismic rated spring, must be installed on each individual fan with a minimum of four per fan. In addition, fan manufacturer shall be responsible for providing a method to repair or replace flexible connection or vibration isolators without shut down of the fan system. This includes any engineering, additional ductwork, and isolation dampers required to perform repairs while the system is still fully operational. Fan manufacturer shall also provide labor to change out or repair flexible connection and vibration isolators for a seven (7) year period from shipment.
8. If a belt drive fan is supplied the fan manufacturer shall include a seven (7) year service contract for maintaining the belts, sheaves and drive mechanism. This is to include monthly inspections as noted in the ANSI Z9.5, 8.7.2 and any tensioning and belt replacement during the seven (7) year period. This contract shall be detailed in the proposal and included in its total value.
9. Discharges shall include twin FRP nozzles with passive third central stacks that are capable of generating aspiration. The FRP shall be chemically and UV resistant.
10. Entrainment windbands shall provide secondary induction of outside air. Induction shall take place downstream of the fan impeller and shall not influence BHP or static pressure requirements. Windbands shall discharge up to 270% of the design flow rates. The manufacturer shall publish discharge volumes for all fans at specified primary exhaust flow.
11. Fan shall be constructed to AMCA "C" standards per AMCA 99 with a non-ferrous inlet bell provided in order to reduce sparking in the event of a motor bearing failure.
12. Fans shall be modular construction and capable of being assembled on the roof.
13. Chemical resistant gaskets shall be provided at all companion flanged joints.
14. Fasteners shall be 316 stainless steel.
15. A bolted access door shall be provided for impeller inspection on each fan.
16. Fans and accessories shall have internal drain systems to prevent rainwater from entering building duct system.
17. Electric motors shall be TEFC Mill and Chemical duty with a 1.15 service factor and an L10 bearing life with 150,000 hours. Premium Efficient motors shall have regreasable bearings with grease relief fittings in every NEMA frame. Fan motors shall be C-Face and

- foot mounted. For motors driven by VFDs, shaft grounding kits shall be installed on motor below 400 frames and insulated bearings on motors frames 400 and above.
18. Extended motor lube lines of Teflon tubing covered with braided stainless steel shall be provided. Extended lube lines shall be mounted to a bracket located on the fan housing with grease relief fittings on each line.
 19. A NEMA 4X non-fused rotary disconnect switch shall be provided, mounted and wired to the motor.
 20. All steel and aluminum surfaces components must be coated with a high solids epoxy with low VOC chemical resistant barrier coating epoxy. The coating system, a total thickness of up to 12 mils, is not affected by the UV component of sunlight (does not chalk), and has superior corrosion resistance to acid, alkali, and solvents. Coating system shall exceed 7000 hour ASTM B117 Sal Spray Resistance. Standard finish color to be gray. All coating that include a zinc-rich epoxy primer are strictly prohibited. Zinc coatings react with alkalis and acids, thus causing premature failure of the coating system and should never be used for laboratory applications.
 21. The fan supplied must meet the system exhaust CFM and the motor BHP shall not be larger than that shown on the fan schedule. If the BHP is larger than that shown then the fan manufacturer shall provide money for the additional energy cost for a seven (7) year period. The cost shall be \$7,530.00 per BHP greater than that shown in the schedule. The fan manufacturer shall also provide any additional money required for wiring changes or any other changes required for installation of the equipment. These additional charges shall be detailed on the proposal and include in its total value.
 22. Fan and Mixing Box systems supplied by the manufacturer must have a footprint as shown on the drawings. Exhaust systems with larger footprints shall not be acceptable.
 23. The static pressure shown on the schedule is based on the static pressure requirements at the inlet to the mixing box. Any system deviating from the basis of design shall include and detail in their proposal additional losses for flexible connectors, fan losses, elbows, mixing box, etc. that are not included in their fan curves.
- C. Accessories
1. Inlet mixing plenums shall be provided by the fan manufacturer. Each plenum shall be sized to support the weight and performance requirement of the number of fans listed on the schedule. Multiple-fan plenums shall be insulated double wall construction with structural stiffeners. Double-wall plenums, except for fans over 3HP, shall have an overall minimum wall thickness of 1.5", and the insulation shall have a minimum R-value of 4.34. Outer skin of double wall plenums shall be coated Galvaneal steel or embossed aluminum. Inner skin shall be uncoated 304 stainless steel. Multiple-fan plenums shall be able to withstand a minimum of 12 in. w.g. of negative pressure. Plenums shall be capable of supporting the fans without guy wires or supports. Plenums shall include hinged access doors. The primary air inlets shall be located as shown on the construction drawings. Safety screens shall be supplied over inlet of fan.
 2. Bypass dampers: Bypass dampers shall be provided with all mixing plenums for outside air with primary exhaust. Bypass dampers shall be sized to bypass the airflow capacity of one fan at the required static pressure of the system. Dampers will be opposed blade low leakage airfoil control dampers with extended shaft for connection to an operator. The dampers shall be all aluminum construction unless otherwise specified. Rain hoods shall be provided with each damper. The dampers shall be controlled by electric proportional control damper actuators which require no crank arm nor linkage. Bypass damper actuators shall be warranted under the original part manufacturer's warranty term.
 3. An acoustic louver shall be provided at the inlet to the bypass dampers on systems requiring sound attenuation.
 4. Low leakage isolation dampers shall be constructed of aluminum airfoil extrusions and epoxy coated. Operators shall be 2-position, shall have On-Off electronic or spring return damper actuators that are direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft. Isolation damper actuators shall be warranted under the original part manufacturer's warranty term.

5. Vortex breakers shall be provided on all side inlet and multiple fan plenums.
 6. Acoustical Silencer Nozzle shall be designed as an integral component of the exhaust fan discharge nozzle and shall not increase the height of the overall assembly. Integral Acoustical Silencer Nozzle with a minimum of 12dBA insertion loss. Lining the interior of the windband is not an acceptable method of attenuation due to line of site sound in the free area between the nozzle and windband.
- D. Application:
1. Multiple Exhaust Loads including Fume Hoods and Lab Equipment:
 - a. Fan Type: Belt-driven, inverter-duty motor fan with vfd in compliance with Section 26 29 23 finished with electrostatic powder protective coating. Include fan-fitted air-mixing plenum box with side-mounted by-pass damper sized to handle 25 percent over minimum flow.
 - b. Exhaust Capacity: Select dual fan set for weekly lead-lag operation to handle combined peak hood-exhaust airflow rates, system static pressure loss with 20 percent load-capacity factor, and minimum discharge plume height of 30 feet above roof level.
- E. Fan Section Requirements:
1. Impeller:
 - a. Non-overloading, backward-inclined centrifugal.
 - b. Material: Aluminum.
 2. Fan Shaft:
 - a. Ground and polished steel with anticorrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
 - c. Enclosed over OSHA recommended safety-yellow painted guards.
 3. Bearings:
 - a. 100 percent factory tested surface-mounted bearings outside of the airstream.
 - b. Operate during a minimum L10 service life in excess of 100,000 hours at maximum cataloged operating speed.
 4. Belt-drive Assembly:
 - a. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
 - b. Belts: Static-free and oil resistant.
 - c. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
 - d. Motor pulley adjustable for final system balancing, readily accessible for maintenance.
 5. Housing:
 - a. Construct of heavy gauge aluminum with standard factory finish.
 - b. Mounting Base:
 - 1) One-piece fabricated or fully welded integral reinforced curb-cap base.
 - c. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
 - d. Minimum Assembly Height: 120 inches above the roof surface.
 6. Isolation Damper:
 - a. With parallel blade damper, constructed of matching materials and finish.
 - b. Provided by manufacturer, bolted to access drawer or panel for easy removal from contaminated airstream.
 - c. With two-position damper actuator:
 - 1) Provided by manufacturer.
 - 2) Operate interlocked with fan starter.
 - 3) With integral auxiliary switches to monitor blade position status.
 - 4) Rated for NEMA 250, Type 4 (IP66) environment within protective weather-housing out of contaminated airstream, connected through linkages.
 7. Fan Discharge Outlet-Nozzle:

- a. Constant Stack-velocity Discharge: Variable-volume shaped nozzle manufactured to facilitate attaining a required air-discharge velocity of reduced exhaust airflow.
 8. Fan Inlet Flow Sensor: Provide factory-mounted pitot tube-based differential pressure sensor probe ready for connection into differential pressure-based flow transmitter.
 - a. Transmitter Housing: Provide NEMA 250, Type 4 enclosure.
 9. Statically and dynamically balanced.
 10. Motors:
 - a. Open drip-proof (ODP).
 - b. Heavy duty ball bearing type.
 - c. Mount on vibration isolators or resilient cradle mounts, out of air stream.
 - d. Fully accessible for maintenance.
 11. Housing:
 - a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.
 - b. Rigid internal support structure.
 - c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
 - d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
 - e. Provide breather tube for fresh air motor cooling and wiring.
- F. Shafts and Bearings:
 1. Fan Shaft:
 - a. Ground and polished steel with anti-corrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
 2. Bearings:
 - a. Permanently sealed or pillow block type.
 - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - c. 100 percent factory tested.
- G. Drive Assembly:
 1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
 2. Belts: Static free and oil resistant.
 3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
 4. Motor pulley adjustable for final system balancing.
 5. Readily accessible for maintenance.
- H. Air-Mixing Plenum Box:
 1. Continuously welded insulated box using assembly matching material and finish on both interior and exterior sides.
 2. Provide factory-mounted box on heavy-duty roof curb with integral box-lifting lugs and skirt.
 3. Insulation: Water-resistant sound-absorbing material.
 4. Include bolted and gasketed access panels for servicing and maintenance.
 5. Locate exhaust intake opening on the bottom end fitted with matching duct connecting fitting and safety screen.
 6. Locate fan inlet opening on the upper end fitted with matching assembly-base and flow straightener.
 7. Air-bypass Intake:
 - a. With opposed blade damper, constructed of matching materials and finish.
 - b. With proportional damper actuator:
 - 1) Provided by manufacturer.
 - 2) Integral potentiometer to monitor blade position.
 - 3) Rated for NEMA 250, Type 4 (IP66) environment within protective weather-housing out of contaminated airstream, connected through linkages.
 - c. Covered by damper enclosing weatherhood with intake birdscreen.

8. Provide bottom intake mixing plenum box for attachment of building duct.
- I. Bypass Dampers:
 1. Provide modulating bypass damper to maintain fan discharge velocity.
 2. Provided opposed blade design, constructed of galvanized steel.
 3. Provide 24 volt-powered, modulating actuator, rated for NEMA 250, Type 2 (IP54) environment, to coordinate with fan operation.
- J. Options/Accessories:
 1. Birdscreen: Galvanized steel construction for fan discharge protection.
 - a. Provide galvanized steel construction.
 - b. Protects fan discharge.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend ducts to roof exhausters into roof curb. Counter flash duct to roof opening.

END OF SECTION

SECTION 23 64 13
ABSORPTION WATER CHILLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Low Temperature Hot Water Driven Vapor Absorption Chiller (Building T).

1.02 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide data on capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.
- C. Manufacturer's Performance Data: Indicate energy input versus cooling load output from 0 to 100 percent of full load at specified and minimum condenser water temperature.
- D. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for a complete system.
- E. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.
- F. Manufacturer's Certificate: Certify that components furnished but not produced by manufacturer meet or exceed manufacturer's requirements.
- G. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.
- H. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Provide certification of inspection in compliance with the requirements of Authority Having Jurisdiction.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturers installation instructions for rigging, unloading, and transporting units.

1.05 WARRANTY

- A. Provide a five year warranty to include coverage for complete package as delivered to site, including materials only.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Absorption Chillers:
 - 1. Thermax Limited, www.thermaxglobal.com.
- B. Substitutions: See Division 1.

2.02 LOW TEMPERATURE HOT WATER DRIVEN ABSORPTION CHILLER

- A. General: Factory assembled and leak tested, packaged, water-cooled absorption water chillers, consisting of absorber/evaporator assembly, condenser/generator assembly, solution heat exchangers, solution and refrigerant pumps and motor, purge system, rupture disk, control panel with machine status, diagnostic display and safeties, interconnecting piping, absorbent, inhibitor and refrigerant, auxiliary components and accessories.
- B. Refrigerant: Deionized or distilled water
- C. Absorbent: Lithium bromide solution with corrosion inhibitor

- D. Performance Enhancer: Octyl Alcohol
- E. Units should use two stage absorption and regeneration in series arrangement to maximize its performance.
- F. Units should be designated to operate without crystallizing even with cooling water - entering temperature of 60F.

2.03 HEAT EXCHANGERS

- A. The generator shall heat the weak solution by using spray type design. The tubes in generator shall be of seamless DLP copper, with plain or enhanced surfaces.
- B. A regenerative heat exchanger shall be an integral part of the machine to increase COP by pre-heating weak solution with strong solution. These shall be Copper brazed stainless steel plate type heat exchangers.
- C. Tubes in evaporator and absorber shall be of Titanium grade.
- D. Stainless steel eliminators shall be provided to separate absorber from evaporator and condenser from generator.

2.04 SOLUTION AND REFRIGERANT DISTRIBUTION MEANS

- A. Gravity feed distribution technology shall be applied to spray refrigerant in evaporator and lithium bromide solution in absorber and generator. Solution in spraying tubes shall spray downward to ensure good film thickness and better heat transfer.
- B. The system shall be of non-clogging design specifically designed for the intended duty, providing consistent spray throughout the life of the machine.
- C. The spray trays should be of stainless steel metallurgy.

2.05 WATER HEADERS

- A. The absorber and condenser water boxes shall be marine type on both sides to facilitate easier tube cleaning. Evaporator and Generator headers shall be of bonnet type on both sides.
- B. Maximum allowable working pressure in chilled water / cooling water / hot water circuit - 110 psig.
- C. Draining arrangement with valves provided in chilled water and cooling water headers, provision given for draining hot water headers.

2.06 CANNED MOTOR PUMPS

- A. Solution and refrigerant pumps shall be centrifugal, canned motor type. Isolation valves should be welded at inlet and outlet to enable easy maintenance of the pumps. Pumps shall not be hermetically sealed and bearings and filters should be removable for maintenance.

2.07 VALVES

- A. All valves used for adjusting the solution flow are fully welded to prevent leakage of air into the unit.
- B. All isolation and service valves shall have double seal arrangement with one seal having no moving parts.
- C. The hot water flow control valve shall be 3-way globe type, electrical, fail to close valve to the chiller side.
- D. Diaphragm valves shall be used in the purge system to isolate chiller and provide access to the vacuum pump. A non-return valve shall be provided for vacuum pump.

2.08 SIGHT GLASSES

- A. Unit shall be equipped with at least one sight glass in the evaporator, absorber and generator each to permit exact adjustment of solution and refrigerant levels for tuning and troubleshooting. Sight glass should be non-fused, removable type to permit maintenance.

2.09 INSULATION

- A. Insulation of hot and cold surface areas shall be carried out at the manufacturer's factory. However, for multi-sectional shipment this shall be provided by the installing contractor according to manufacturer's recommended thickness, installation instructions and material type and as required to meet code.
- B. Non-combustible insulation material of closed cell elastomeric rubber foam shall be used for cold surfaces and hot surfaces. Insulation for evaporator header, generator header, instruments on chilled water circuit shall be removable.

2.10 PURGE SYSTEM

- A. Purging system shall have a refrigerant based purge cooler for improved purging effectiveness.
- B. Purge tank purging to be carried out in Auto and in Manual option with tank pressure exceeds 40-75 mm Hg as the tank pressure to perform purging.

2.11 PIPING REQUIREMENTS

- A. Piping and instrumentation for the chilled water, cooling water, hot water supply and return shall be supplied and installed by the contractor.
- B. The supply and installation of the absorber to condenser piping shall be furnished by the chiller manufacturer.
- C. Chilled water flow switch and DP switch shall be factory supplied and factory installed in the chilled water nozzles.
- D. Piping from rupture disk shall be supplied and installed by the contractor. The piping shall be adequately supported to prevent any load coming on the rupture disk, and shall be piped according to manufacturer's instructions and any local jurisdictional requirements.
- E. All chilled water, hot water and condenser water connections are to be provided with factory welded ANSI flanges.

2.12 LITHIUM BROMIDE AND REFRIGERANT CHARGE

- A. Lithium Bromide should be packed separately outside the chiller main body so that during transportation it will not cause heavy movements to avoid shifting of center of gravity causing possibility of toppling. If the machine is tested at factory maximum possible solution should be taken out.
- B. Lithium bromide solution shall contain a corrosion inhibitor, to minimize the rate of copper and ferrous metal corrosion on the solution side of the unit. The corrosion inhibitor used shall be non-toxic and shall not generate ammonia in order to protect copper tubes in the chiller. Lithium bromide solutions containing chromates or arsenites or Nitrate based as corrosion inhibitors shall not be acceptable.

2.13 ELECTRICAL REQUIREMENTS

- A. Power supply to the unit shall be as specified on the equipment schedule and as indicated on the electrical drawings.
- B. Contractor shall supply and install all auxiliary electrical protection devices as per local code requirements and as indicated necessary by the chiller manufacturer.
- C. Contractor shall supply and install all electrical wiring (both low voltage and line voltage) and devices required to interface the chiller controls with the building control system.

2.14 CONTROLS

- A. The chiller shall be controlled by a skid mounted, stand-alone, Siemens Programmable Logic Control (PLC) based control system. The operator interface shall have touch screen type colour display, providing easy access to various performance parameters of the chiller. The chiller control panel will be factory mounted and shall monitor & control chiller operation by means of hot water control valve, temperature sensors, flow instruments, refrigerant level, various relays and switches.

- B. The Control Panel enclosure shall be of IP42 protection class and shall house the following components:
 - 1. Single point wiring connection for incoming power supply.
 - 2. Non-fused disconnect switch.
 - 3. Motor starters, complete with current overload protection, for solution pump(s), refrigerant pump, and purge pump (current overloads only).
 - 4. Multi-tap transformer to suit 3 phase, 480 V/60 Hz input power to the panel and secondary tap to give 115 VAC, 60 Hz as Control Power.
- C. Capacity control shall be achieved by means of PID control in PLC, thereby controlling the hot water control valve opening based on chilled water outlet temperature. During cold start, the hot water control valve shall be opened slowly to prevent thermal shock.
- D. The chiller control panel shall incorporate advanced motor protection to safeguard the motor throughout the starting and running cycles from the adverse effects of Motor overload.
- E. Since chilled water flow safety is extremely important to prevent ice formation, more than one device should be provided to sense low chilled water flow. Two different construction instruments are desirable.
- F. PT-100 type RTDs should be used to measure the required process temperatures. The thermowells shall be of stainless steel metallurgy. All thermowells on the vacuum side should be directly welded to the piping to avoid leakages. Flanged or threaded connections are not acceptable on vacuum side.
- G. Safety (Total) shutdowns – Panel shall be pre-programmed to shut the unit down and close “safety shutdown” contacts under any of the following conditions:
 - 1. Low/loss of chilled water flow.
 - 2. Chilled water pump trip.
 - 3. Leaving chilled water temperature sensor error.
 - 4. Low leaving chilled water temperature / antifreeze trip.
 - 5. Antifreeze thermostat trip.
 - 6. Solution pump trip / not responding.
- H. All safety shutdowns will require unit to be manually restarted.
- I. Whenever a safety shutdown occurs, except power failure, logging of last six alarms should take place in PLC. After any alarm, operator has to acknowledge the alarm & reset the alarm to start the machine again
- J. Warning Conditions – PLC Panel shall close warning contacts and generate a unique warning message whenever one of the following operating conditions is detected:
 - 1. Purge pump current overload.
 - 2. Faulty temperature sensor (in case of chilled water inlet, hot water inlet and hot water outlet temperature sensor error).
 - 3. Cooling water pump trip.
- K. Cycling (Dilution) Shutdowns – The Panel shall be pre-programmed to shut unit down whenever one of the following conditions is detected:
 - 1. Generator temperature high.
 - 2. Fault temperature sensor (in case of cooling water inlet, cooling water outlet or generator temperature sensor error).
 - 3. Low entering cooling water temperature.
 - 4. High entering cooling water temperature.
 - 5. Refrigerant pump trip / not responding.
 - 6. Power failure.
- L. Last six alarms will be logged in Operator Panel with date & time. After each normal / abnormal shutdown, only manual start is required.
- M. The chiller control panel shall be capable of displaying system data in the following formats:
 - 1. English or Metric units.

2. Display numerical as whole numbers or one digit right of decimal.
- N. The front of the chiller control panel shall be capable of displaying the following in clear language, without the use of codes, look-up tables, or gauges:
 1. Entering chilled water temperature.
 2. Leaving chilled water temperature.
 3. Entering cooling water temperature.
 4. Leaving cooling water temperature.
 5. Entering hot water temperature.
 6. Leaving hot water temperature.
 7. Strong solution temperature leaving generator.
 8. Dilute solution temperature leaving absorber.
 9. Refrigerant condensate temperature leaving condenser.
 10. Evaporator refrigerant temperature.
 11. Percentage opening of hot water control valve.
 12. Chiller running hours.
 13. Purge pump-out time last or current cycle.
 14. Total purge pump-out time.
 15. Time / date of last purge pump-out.
 16. Chilled water set point.
 17. Chiller status.
 18. Pump and instrument status.

2.15 LOW TEMPERATURE SAFETY

- A. If chilled water temperature goes low, refrigerant pump and the hot water supply should be stopped to avoid chilled water temperature reaching antifreeze setting thereby avoiding the tripping of the chiller. When chilled water temperature goes above set point value, refrigerant pump and hot water supply should commence automatically.
- B. The chiller control panel shall provide individual relay outputs for the following:
 1. Chilled water pump start / stop.
 2. Hot water pump start / stop.
- C. The chiller control panel shall take run / trip feedback from chilled water and cooling water pumps and generate alarm / take adequate safety action in case of trip.

2.16 BMS / DCS CONNECTIVITY

- A. Third party connectivity shall be through Siemens PLC and integrated into Desigo BMS software. The operating parameters, alarms and status of chiller mounted instruments shall be available for monitoring from the central control room.
- B. All necessary hardware and software required to connect chiller PLC to BMS/DCS system shall be supplied and installed by the contractor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that foundation and piping and electrical rough-ins are installed and in correct locations.
- B. Verify that concrete housekeeping base is at least 4 inches larger than chiller base.
- C. Do not start installation until conditions are satisfactory.
- D. Notify Engineer and Owner of unsatisfactory conditions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and applicable codes.
- B. Install chiller on concrete housekeeping base, align, level, and grout in place.
- C. Arrange piping for easy dismantling to permit tube cleaning.
- D. Pipe relief valves to nearest approved receptor.

- E. Make ready for connection to electrical service.

3.03 SYSTEM STARTUP

- A. Provide services of factory trained representative for minimum one day to supervise leak test, refrigerant pressure test, evacuate, dehydrate, charge, start-up, and calibrate controls.
- B. Install initial charge of refrigerant. Adjust concentration to recommended levels.

END OF SECTION

SECTION 23 64 23
SCROLL WATER CHILLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air-cooled scroll water chillers.
- B. Factory-assembled packaged chiller.
- C. Charge of refrigerant and oil.
- D. Controls and control connections.
- E. Chilled water connections.
- F. Electrical power connections.

1.02 REFERENCE STANDARDS

- A. AHRI 550/590 (I-P) - Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle; 2020.
- B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2019, with All Amendments and Errata.
- C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2021.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- F. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate physical size, weight and location of major pieces of equipment to be installed. Notify Engineer of any major deviations from the equipment originally specified prior to ordering equipment.

1.04 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.
- C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for complete system.
- D. Manufacturer's Performance Data: Indicate energy input versus cooling load output from 0 to 100 percent of full load at specified and minimum condenser water temperature for water-cooled chillers and at specified and minimum outdoor air temperature for air-cooled chillers.
- E. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.
- F. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.
- G. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories; include trouble-shooting guide.
- H. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written installation instructions for rigging, unloading, and transporting units.
- B. Deliver units to the job site completely assembled and charged with refrigerant and oil by manufacturer.

1.07 WARRANTY

- A. Manufacturer's Warranty: Provide minimum five year warranty to include coverage for materials and labor for compressor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Trane Technologies, PLC; www.trane.com/#sle.
- B. Substitutions: See Division 1.

2.02 AIR-COOLED SCROLL WATER CHILLERS

- A. Chillers: Factory assemble and test chiller consisting of compressor(s), compressor motor(s), evaporator, condenser, enclosure, refrigeration circuits(s) and specialties, interconnecting piping, starters, and microprocessor-based controls.
 - 1. Rating: AHRI 550/590 (I-P).
 - 2. Safety: UL 1995 and ASHRAE Std 15.
 - 3. Construction & Testing: ASME BPVC-VIII-1 as applicable for construction type.
 - 4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the Authority Having Jurisdiction as suitable for the purpose specified and indicated.
 - 5. Energy Efficiency: 1.
 - 6. Enclosures:
 - a. Frame:
 - 1) Heavy-gauge steel.
 - 2) Factory apply hot-dipped galvanized or air-dried paint finish.
 - b. Steel Chiller Cabinets:
 - 1) Factory apply baked-on enamel or baked-on powder paint finish.
 - c. Electrical Equipment: NEMA 250 or UL 1995 as applicable.
 - d. Provide corrosion resistant coil coating using dipped application on condenser coils and condenser fan blades.
 - e. Provide variable speed TEFC condenser fans.

2.03 COMPRESSORS AND EVAPORATOR

- A. Compressors: Hermetic scroll type.
 - 1. Unit: Fully hermetic type with multiple, direct-drive compressors with discharge and suction service valves.
 - 2. Vibration Control: Factory installed internal isolators or field installed external isolators.
 - 3. Oil Lubrication System: Initial oil charge, oil sump, heater, oil level, and sight glass.
 - 4. Capacity Reduction System: Compressor staging with control down to 12 percent of full load without the activation of hot gas by-pass.
 - 5. Motor: 3,600 or 3,500 rpm, suction gas-cooled, with thermal or current overload protection.
- B. Evaporator: Provide shell and tube or brazed plate type.
 - 1. Shell and Tube Type:
 - a. Shell, removable heads, and tube support sheets constructed of carbon steel.

- b. Tubes: Mechanically expand and fasten, seamless, externally or internally enhanced, copper tubes into intermediate tube support sheets along the length of shell to avoid contact and relative motion between tubes.
 - c. Refrigerant Working-Side Pressure Rating: 400 psig minimum.
 - d. Water Working-Side Pressure Rating: 150 psig minimum.
 - e. Provide with flanged or grooved connections.
 - f. Insulation for all cold surfaces.
 - 1) Insulation is factory or field installed on shell, connections, and suction piping.
 - 2) 0.75 inches minimum thickness, closed cell, expanded polyvinyl chloride, polyurethane, or vinyl nitrate polymer insulation with a maximum k value of 0.28.
 - g. Provide factory or field installed vents and water drain connections on evaporator or piping.
 - h. Provide factory or field installed fittings for temperature control sensors on evaporator or piping.
 - i. Freeze Protection for Outdoor Locations: Provide thermostatically controlled electric heater to protect from freezing at ambient temperatures down to minus 20 degrees F.
2. Brazed Plate Type:
- a. Plate Material: 316 stainless steel.
 - b. Refrigerant Working-Side Pressure Rating: 430 psig minimum.
 - c. Water Working-Side Pressure Rating: 150 psig minimum.
 - d. Provide with flanged or grooved connections.
 - e. Insulation for all cold surfaces.
 - 1) Insulation is factory or field installed on evaporator, connections, and suction piping.
 - 2) 0.75 inches minimum thickness, closed cell, expanded polyvinyl chloride, polyurethane, or Armaflex II insulation with a maximum k value of 0.28.
 - f. Provide factory or field installed vents and water drain connections on evaporator or piping.
 - g. Provide factory or field installed fittings for temperature control sensors on evaporator or piping.
 - h. Freeze Protection for Outdoor Locations: Provide thermostatically controlled electric heater to protect from freezing at ambient temperatures down to minus 20 degrees F.

2.04 REFRIGERATION CIRCUITS

- A. Provide multiple independent refrigeration circuit(s) with one or multiple compressor(s) per circuit.
- B. Provide liquid line shut-off valve, filter-drier, expansion valve, and refrigerant relief device for each independent circuit.

2.05 INTEGRATED MICROPROCESSOR BASED DDC CONTROLS PACKAGE

- A. Pre-wire, assemble, factory mount, and test operating and safety control system consisting of a digital display or gauges, on-auto-off switch, motor starters, disconnect switches, power and control wiring. Provide controls, monitoring, programmable set-points, alarms, and BAS as defined below:
 - 1. Automatic Adjustable Operating Controls:
 - a. Temperature of chilled water leaving chiller.
 - b. Chiller system capacity control based on set-points and system load.
 - c. Compressor short-cycling prevention.
 - d. Lead/lag for multiple compressors.
 - e. Automatic reset on power source failure.
 - f. Load limiting.
 - 2. Normal Operation Monitoring and Open Cover-less Displays:
 - a. Hours of operation.
 - b. Suction and discharge refrigerant pressures.
 - c. Automatic diagnostics.

- d. Number of starts.
- e. On/off compressor status.
- f. Entering and leaving chilled water temperatures.
- g. Status of operation.
- h. Weekly purge cycle totalization if applicable.
- i. Oil pressure.
- 3. Set-Points:
 - a. Leaving chilled water temperature.
 - b. Date/time.
- 4. Automatic Chiller Shut-Down Safety Controls and Alarm:
 - a. Automatic Reset:
 - 1) Chilled water flow interlock.
 - 2) Voltage protection (over/under).
 - 3) Phase reversal protection.
 - b. Manual Reset:
 - 1) Evaporator low pressure.
 - 2) High motor winding temperature.
 - 3) Low chilled water temperature.
 - 4) Low chilled water flow.
 - 5) High condenser refrigerant discharge pressure.
 - 6) Motor current overload and phase loss.
 - 7) Low oil flow.
 - c. Remote Alarm: Activate remote, audible bell upon safety shutdown of chiller.
- 5. Building Automation System (BAS) Communications via Shielded Cable:
 - a. Minimum Data Transmission to BAS:
 - 1) All system operating conditions.
 - 2) Capacity control information.
 - 3) Safety shutdown conditions.
 - b. Minimum Operating Commands from BAS:
 - 1) Remote unit start/stop.
 - 2) Remote chilled water reset.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Align chiller package on steel or concrete foundations.
- C. Install units on vibration isolators.
- D. Connect to electrical service.
- E. Connect to chilled water piping.
- F. Arrange piping for easy dismantling to permit tube cleaning and removal.
- G. Coordinate with controls contractor for integration in the EMS system. Provide direct connection to owner's EMS without gateway cards.

3.02 MANUFACTURER'S FIELD SERVICES

- A. Perform factory startup of the chiller by factory trained and authorized servicing technicians confirming equipment has been correctly installed prior to equipment becoming operational and covered under the manufacturer's warranty.
- B. Supply initial charge of refrigerant and oil if not completely factory charged.
- C. Demonstrate system operations and verify specified performance.

3.03 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate operation of system to Owner's personnel.

Dublin San Ramon Wastewater Treatment Plant - HVAC Replacements

1. Use operation and maintenance data as reference during demonstration.
 2. Briefly describe function, operation, and maintenance of each component.
- B. Training: Train Owner's personnel on operation and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 2. Provide minimum of two hours of training.

END OF SECTION

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 23 74 13

OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Constant air volume and variable-air-volume, single-duct, dual duct and multi-zone air-handling units.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Seismic-restraint details, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Casing panels shall be self-supporting and capable of withstanding 133 percent of internal static pressures indicated, without panel joints exceeding a deflection of L/200 where "L" is the unsupported span length within completed casings.

1.04 ACTION SUBMITTALS

- A. Product Data: For each air-handling unit indicated.
 - 1. Unit dimensions and weight.
 - 2. Cabinet material, metal thickness, finishes, insulation, and accessories.
 - 3. Fans:
 - a. Certified fan-performance curves with system operating conditions indicated.
 - b. Certified fan-sound power ratings.
 - c. Fan construction and accessories.
 - d. Motor ratings, electrical characteristics, and motor accessories.
 - 4. Certified coil-performance ratings with system operating conditions indicated.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Filters with performance characteristics.
- B. LEED Submittals:
 - 1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
- C. Delegated-Design Submittal: For seismic restraints indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Design Calculations: Calculate requirements for selecting seismic restraints.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
 - 2. Support location, type, and weight.
 - 3. Field measurements.
- B. Seismic Qualification Certificates: For air-handling units, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

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

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.07 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. Filters: One set for each air-handling unit.

1.08 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.
- C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- E. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- F. Comply with NFPA 70.

1.09 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Product: Provide product indicated on Drawings as manufactured by United Metal Products or below listed manufacturers subject to strict compliance with all provisions of these specifications requirements. Acceptable manufacturers are:
1. United Metal Products (basis of design). Contact representative, 818.637.2169.
 2. Naming of manufacturers does not imply that their standard construction is acceptable, nor does it imply that their products are automatically approved. A manufacturer who is not the basis of design is required, thirty days prior to bid, to submit to the mechanical engineer, proposed equipment, along with a comparison letter addressing each item in the specification and stating compliance with the specifications. This proposed submittal must be approved in writing by the mechanical engineer a minimum of ten days prior to bid date. Approval will be at the discretion of the mechanical engineer. There shall be no exceptions to this requirement, and submittals of manufacturers who have not obtained written approval prior to bid will be rejected without review and returned. Air handling units must be manufactured in the USA.

2.02 UNIT GENERAL: CONSTRUCTION, FRAMING & CASING

- A. All units shall be factory tested under UL standard 1995 and labeled with either UL, ETL or CSA.

Dublin San Ramon Wastewater Treatment Plant - HVAC Replacements

- B. Unit upper frame shall be constructed of vertical 1 x 2 galvanized welded tubular steel and a horizontal 2x4 14-gauge G90 galvanized steel welded frame around the top perimeter of the unit, all fully mig welded to form a unitized framework for support of all internal components, including but not limited to fans, coils, dampers, louvers and filter frames. All weld spots shall be coated with zinc oxide to prevent future corrosion.
- C. Unit casing – The construction of the air handling unit shall consist of a (1" x 2") upper welded tubular steel frame with formed 16 gauge G90 galvanized steel exterior casing panels. The exterior casing panels shall be attached to the gasketed (1 x 2) steel frame as well as to each other with corrosion resistant fasteners. All exterior panels shall have 4" deep standing seams on the unit floor to provide extra rigidity in addition to the upper welded tubular frame. All casing panels shall be completely removable from the unit exterior without affecting the unit's structural integrity. Casing panels attached to the unit frame only from the unit outside are not acceptable.
- D. Units without a 1x2 welded tubular upper framed construction shall be considered, provided the exterior casing panels are attached to each other with bolts and nuts, made from 12 gauge G90 galvanized steel, the internal liners are 14 gauge G90 galvanized steel, the maximum casing panel center lines are less than 20 inches and deflection is less than L/200 at 9" positive pressure), with floors to be 12 gauge galvanized steel with fully welded seams and underfloor liners to be 14 gauge G90 galvanized steel.
- E. Provide necessary support to limit casing deflection to L/200 of the narrowest panel dimension. If panels cannot meet this deflection, additional internal reinforcing is required. All panel seams shall be continuously gasketed with foam gasketing along the full contact joint between adjacent panels, as well as caulked and sealed between the panels on outside of units, for an airtight unit. Leakage rates shall be less than 1% at design static pressure of 8" W.C.
- F. Provide factory fabricated air handling units with capacity as indicated on the schedule. Units shall have overall dimensions as indicated and fit into the space available with adequate clearance for service as determined by the Engineer. All units shall come completely assembled. If required, multiple sectioned units shall be shipped as single factory assembled piece de-mountable into modular sections in the field and re-assembled by the installing contractor. If dimensional shipping restrictions require shipping in multiple sections, sections must be reassembled, caulked and air sealed by installing contractor. Units shall be furnished with sufficient gasket and bolts for reassembly in the field by the contractor.
- G. At roof seams, roof panels shall be double broken, caulked and mechanically fastened to each other and a continuous cap fastened down to the seam.
- H. Walkway bar grating shall be provided over all floor penetrations where access is provided. Bar gratings shall be manufactured by welding the cross bar/bearing bar intersection with automated forge welding machines to provide a strong secure, permanent connection. Welded grating shall be manufactured from ASTM A-569 carbon steel and shall have a serrated surface. Grating shall have bearing bars spaced at 1-1/8" c.c. and cross bars at 4" c.c. for spans up to 2'-6" only. Minimum free area shall be 78%. Gratings shall be manufactured from carbon steel and shall be painted.
- I. Casing Insulation:
 - 1. Insulation: (4" 1.5 pcf equivalent):
 - a. The insulation shall meet the Life Safety Standards as established by NFPA 90A and 90B, FHC 25/50 and Limited Combustibility. The insulation shall conform to the requirements of ASTM C 1071, with an NRC not less than .95 as tested per ASTM C 423 using a Type "A" mounting, and a thermal conductivity no higher than .24 Btu-in/(hr·ft²·°F) at 75°F [.35 W/m·°C at 24°C] mean temperature. R-value shall not be less than 8.33 (hr·ft²·°F).
 - b. All cut edges of the board insulation shall be completely enclosed by the unit exterior panels.
- J. Interior liners

Dublin San Ramon Wastewater Treatment Plant - HVAC Replacements

1. Each unit shall have double wall construction with solid 304 stainless steel solid interior liners in all sections. The entire double wall panel shall be removable from the outside of the unit without affecting the structural integrity of the unit.
 2. On units without an upper tubular welded framed construction, internal liners shall be 14 gauge G90 galvanized steel.
- K. Casing Finish
1. Casing panels on the outside and around all sheared edges shall be electrostatically coated with below-specified epoxy powder based paint, for maximum anti-corrosion protection. All parts and unit side and roof panels shall be sheared, formed and then coated to insure coating of all sheared edges and prevent stressing of the coating. After the coating process, all parts shall be baked at 325°F and 275°F, prior to assembly. The painting system shall meet or exceed the following standards:
 - a. Salt Spray Test: ASTM B-117-94. Passes 1500 hrs with 1/8" average creepage @ scribe.
 - b. Humidity 100% @ 100deg F: ASTM D-2247. Passes 1500 hrs with 0" average creepage @ scribe.
 2. Performance of casing finish shall be based on the final assembled air handling unit and not based on paint manufacturer's specifications of pre-painted metal.
 3. Provide independent test report validating compliance with above specified coating performance. Fan and motor cast iron bases shall be electrostatically coated with above mentioned epoxy powder based paint after all welding.
 4. Acrylic and polyurethane based painting systems are not acceptable.
- L. Access Doors:
1. Access Doors: The unit shall be equipped with 4-inch thick solid double wall insulated, hinged access doors as shown on the plans. The door frame shall be extruded aluminum, with ABS thermal break insert, double seal, with full perimeter 100% memory EPDM gaskets. The door hinge assembly shall be polished 304 stainless steel, with a stainless steel pivot mechanism. There shall be a minimum of two heavy duty cast aluminum alloy or steel-composite latch-handles per door. Door latch-handles shall be composite GSR with interior and exterior handles.
 2. Doors to be provided with dual seal high performance closed cell replaceable hollow neoprene EPDM bulb type gaskets seals around the entire perimeter of the door / frame. The inner liner shall press against the inner seal and the outer liner against the outer seal. Foam gaskets are not acceptable.
 3. Door used to access rotating equipment shall be provided with an ETL, UL and OSHA approved safety latching mechanism requiring a tool to open and shall also have a highly visible, permanently fixed, caution sign on the exterior of the door. Doors with access to moving parts must also have locking hardware and meet current UL mechanical protection guidelines. Standard door size shall be 24" wide by 72" high unless restricted by height or section width.
 4. Access doors shall open against pressure unless an internal component prevents the door from opening to the inside.
 5. Doors leading into fan sections shall be provided with 10" x 10" double thermal pane wired glass viewing windows.
 6. Access doors shall be furnished on the side of all sections, including fan sections, fan inlet sections, economizer sections, filter sections, OA intake sections, mixing sections, coil service sections, drain pan sections.
- M. Air-Handling-Unit Base Frame & Floor
1. Provide a full perimeter welded base frame manufactured with 6-inch high structural galvanized steel tubing and 4-inch C-Channel cross support members on close centers. Unit upper frame shall be from 1x2 galvanized tubular steel, mig welded to form a unitized assembly for support of all internal components, including coils, fans, dampers, louvers and filter frames. Base rails shall be fitted with lifting lugs at each corner of the unit and each corner of each demountable section. The base shall include a 4-inch thick insulated

“double bottom” floor with minimum 20 gauge G-90 galvanized outer and 14 gauge G-90 galvanized inner walk-on surface. All floor seams shall be gasketed, caulked and sealed with a 4” wide galvanized steel cap for airtight tight wash down duty floor. Single wall floors with glued and pinned insulation are not acceptable.

2. Floors shall be 14 gauge 304 stainless steel with a 2” wide continuous sealed cap over all floor seams. On units without an upper tubular welded framed construction, floors shall be 12 gauge 304 stainless steel with fully welded seams and underfloor liners to be 14 gauge G90 galvanized steel.
3. Structural steel cast iron C-channels shall be considered in lieu of the specified 2x6 structural steel tubular base, provided they are a minimum of 10-inch high.

N. FAN, DRIVE, AND MOTOR SECTION

1. Arrangement 4 Plenum fans: PF (Plenum Fan) SWSI fans shall be minimum Class II and shall have airfoil blades. Fan wheel shall be keyed directly to the motor shaft. Fan shall be IRD balanced at design RPM to a vibration velocity less than or equal to .157 inches per second. Fan wheels shall be fabricated of heavy gauge aluminum. Fan shall be certified to AMCA 210 standard for performance and AMCA 300 for sound and shall carry the AMCA label for “Air and Sound”. Fan tested in accordance with AMCA standards are not acceptable. Fans shall bear actual AMCA seal on them. Backward Inclined flat blades are not acceptable as a substitute for Backward Inclined airfoil blades. Submit individual fan selection with performance and sound information.
2. When twin plug fans are installed side by side, each fan shall have a backdraft damper at its intake, mechanically isolating the two wheels to prevent short-circuiting and allow automatic isolation when one fan is down. On twin fan applications, a 4” thick perforated wall shall be furnished between the two fan wheels. The wall shall extend to the downstream edge of the fan frame and 6” above the top edge of the fan frame.
3. Fans, motors and drives shall be internally spring isolated by the unit manufacturer on a fully welded 2x4 or 2x6 structural channel or structural tubular steel base, complete with fan flex connections. Provide seismically restrained isolators with 1-inch or 2-inch deflection. Isolators shall have certified and stamped calculations by a California seismic-structural engineer, for California Seismic Zone Code Level 4.
4. Fan types and sizes shall be minimum as indicated in the equipment schedule.

O. Motors:

1. NEMA Design B T-frame motors shall be mounted on an adjustable base. Motors shall be tested to IEEE standard 112 test method B and NEMA 12.58.2 and 12.59 table 12-10. Motors shall be inverter duty and shall have Inverter Spike Resistant™ (ISR) wire.
2. Motors shall be NEMA Design B, TEFC cast iron casing.
3. Motors on direct drive fans shall have integral AEGIS shaft grounding systems.
4. Motors shall be mounted on adjustable heavy steel slide bases.
5. All motors shall meet the energy policy act (EPA) regulations and shall have Class F insulation. Motors shall be Premium Efficiency “Super-E” as manufactured by Baldor. Motors shall meet the electrical characteristics as specified for voltage, rpm.
6. Motors shall be manufactured in the USA.

P. Drives

1. On Arrangement 3 belt drive fans, VP “Variable Pitch” drives shall be furnished on motors up to 10 HP and fixed pitch on 15 HP and above. V-belt drives shall be selected at 150% of motor nameplate horsepower. Drive manufacturer shall be Browning or equal.

Q. Variable Frequency Drive

1. Each fan motor shall be factory wired to its own variable frequency drive (VFD), Allen Bradley PowerFlex 753 with ethernet card for DDC integration.
2. VFD's shall each be wired to a factory furnished circuit breaker disconnect. When multiple Variable frequency drives are furnished on an air handling unit, a single point power non-fused disconnect shall be factory furnished and wired to the all VFD's.

3. Variable frequency drives shall be mounted in a dedicated enclosure, recessed inside the air handling, ventilated from the air handling unit positive and negative air sections and accessible from outside the unit, for connection to single point power.
4. Provide three phase power distribution wiring and control wiring as required. All 3-phase power components shall have a rating listed for Short Circuit Current Rating. Provide control wiring and components required for complete operation of the fan motors. System controls, controls components and control wiring shall include but is not limited to manual mode or BMS control mode. Controls and control wiring shall include auto start/stop, auto speed control, life safety shutdown, and smoke shutdown. All control wiring shall be included in VFD enclosure provided with system.

2.03 COIL SECTION

A. General Requirements for Coil Section:

1. Comply with ARI 410.
2. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. Coils shall be bolted to the upper welded tubular steel framing of the air handling unit. Coils shall be attached to the unit casing directly.
4. Coils shall not act as structural component of unit.
5. Seismic Fabrication Requirements: Fabricate coil section, internal mounting frame and attachment to coils, and other coil section components with reinforcement strong enough to withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" when coil-mounting frame and air-handling-unit mounting frame are anchored to building structure.
6. Coils shall be of 0.0075" aluminum fin thickness extended surface rated in accordance with ARI 410. The tubes shall have a minimum 0.020-wall thickness of seamless copper expanded into the fin collars to provide a permanent mechanical bond. No metallic or thermal bonding materials are acceptable. Return Bends shall be a minimum of one tube thickness greater than the main tubes .025 brazed replaceable copper. Coil headers shall be non-ferrous seamless copper (cast iron headers are not acceptable) and provided with brass or copper male pipe connections. Pipe connections shall be same end connections. Each Coils supply & return connections shall be raised / lowered a minimum 6" from the bottom / top of the coil to allow room for piping connection hookup especially between stacked coils, coils near floors & coils near roofs. All coils shall be fully drainable with no trapped tubes. Coils shall be counter flow design with connections either left or right hand as specified.
7. Coil fins shall be "E-Coat" coated.
8. Coil casings shall be formed 3/4" flanges on all sides of the coil with the tube sheets having pressed or extruded tube holes. The coil casing shall be reinforced so that the maximum unsupported length is 60". The reinforcements shall be of the same material as the casing. Both ends of the coil to be sealed off from the main air stream by full height blank-off's on both the entering air and leaving air sides. Blankoff's to be the same material as the coil casing.
9. Cooling coil casings shall be minimum 16 gauge Type 304 stainless steel and heating coil casings shall be minimum 16 gauge G90 galvanized steel.
10. All coils are tested and rated in accordance with the Air Conditioning and Refrigeration Institute (ARI) Standard 410 and certified in accordance with the ARI certification program. All tubes shall be tested at a minimum 1500 PSIG and all assemblies tested under water at 350 PSIG and rated for 250 PSIG working pressures. Individual tube and core tests before installation of header are not considered satisfactory. Hydrostatic tests alone will not be acceptable.
11. Air handling unit casing outside shall be furnished with a galvanized steel epoxy coated escutcheon plate at each coil connection.
12. Stacked coils to be mounted in racks to allow individual coil removal without interference to other coils. All coils to be removable from either side of the unit by easily removable end

panels. Individual end panels to be supplied for each coil on the Supply & Return side of the cabinet to allow single coil piping breakdown for coil removal.

13. Coil rows, fins per inch and capacities shall be minimum as indicated in the schedule. Coil face velocities shall maximum as indicated in the schedule.

B. Condensate Drain Pans

1. Drain pans shall have 16 gauge 304 Stainless Steel inner liner and 20 gauge galvanized steel under liner, with solid welded seams for complete water capture and containment. Pans under cooling coils shall extend a minimum half the lower coil fin height passed the leaving face of the coil, in direction of airflow. Drain Pans shall be fully recessed in the unit floor and all headers and return bends shall be located over the drain pan for collection of all condensate forming on headers and return bends. All coils shall be easily removable without cutting or removing any portion of the drain pan. Pans shall be insulated between the liner and the main pan. Pans shall be IAQ Double Sloping to a single drain. Drain connection shall be a minimum 1-1/2" diameter MPT stainless steel at the lowest point of the pan and extending out through the tubular base the same side as the coil connections unless otherwise indicated on the drawings. Pans shall be provided under cooling coils, humidifiers and moisture eliminators. Mastic coated drain pans are not acceptable.

2.04 AIR FILTRATION SECTION

A. General Requirements for Air Filtration Section:

1. Comply with NFPA 90A.
2. Provide filters of the type, size and quantity indicated on the schedule. Factory fabricated filter sections shall be of the same construction and finish as the unit. Face loaded filters shall have Type 8 frames as manufactured by FARR. Filter frames shall be galvanized steel with galvanized steel internal blank-offs as necessary, provided by the air unit manufacturer as required to prevent air bypass around the filters. The filters shall be as manufactured by Farr, Flanders, AFF, Airguard or equal. Filters shall be in compliance with ANSI/UL 900 – test Performance of air filters.
3. Filters as listed in the equipment schedule.
4. Filter gage: Each filter bank shall be furnished with a Dwyer Series 2000 magnehelic gage. Filter gauges on outdoor units shall be protective weather hoods.

2.05 HOODS

- A. Hoods shall be constructed of the same material as the air handling unit casing.

2.06 ELECTRICAL & LIGHTS

- A. Provide vapor proof marine type light fixtures with LED lights in each accessible section complete with a protective metal cage and sealed glass enclosure. Lights to be wired to a common switch mounted in a weatherproof box adjacent to the fan access door complete with a convenience outlet. Outlet shall have an indicator light. Power shall be by a separate 120v/1/60 source.
- B. All wiring inside the unit shall be run inside 2x4 easily serviceable wire troughs, located along the perimeter of the unit, with the one side for low voltage (24V – 115V) and the opposite side for high voltage (480V/3ph). Wiring to individual components such as motors, VFD's and lights shall be run by metal conduits between the wire troughs and the specific components.
1. All outdoor conduit shall be ocal or PVC coated rigid conduit.
- C. If the unit requires splitting, junction boxes shall be furnished at each section as needed, to allow the electrical contractor to make final connections in the field. Wiring to be clearly labeled at junction points to facilitate reconnection.
1. All outdoor enclosures shall be rated NEMA 4X.
- D. Provide single source power panels (SSPP's) that are constructed according to NEC regulations and carry a U.L.508 listing and label. The panel shall include a non-fused main disconnect switch, powering all fan motor VFD's in the air handling unit, a step-down transformer to power the lights and a separate step-down transformer to power the DDC

controls. The single source power panels shall be factory wired to all factory furnished devices such as motors and interlocks.

- E. The air handling unit manufacturer, for the purpose of sole source responsibility, shall manufacture all electrical panel assemblies supplied for the air handlers. The air handling unit manufacturer shall be a U.L. 508 listed panel shop.
- F. The main electrical panel shall be single source power, shall have access door(s) for direct access to the controls. The panel shall be NEMA type 3R (rainproof) on outdoor units, and shall contain a single externally operated, non-fused disconnect, suitable for copper wire up to and including 3" conduit. The electrical contractor shall bring separate 460/3/60 power to the single source power panel.
- G. All factory furnished and mounted electrical panels, including SPPP's, panels containing VFD's as well DDC enclosures, shall be recessed inside the air handling units, on both indoor and outdoor units unless inside space does not allow.
- H. All AHU and electrical panel wiring shall be performed in a UL 508 listed shop.

2.07 TEMPERATURE CONTROLS

- A. Air handling manufacturer shall factory install and wire all DDC Temperature Control related unit components including but not limited to temperature, humidity and pressure sensors, damper actuators and main DDC panel. All temperature control related described above shall be provided by the Temperature Control contractor and shipped to the air handling unit manufacturer for installation. Prior to sending any control parts to the ahu factory, the Temperature Control contractor shall provide the ahu manufacturer a complete list of all DDC parts to be installed, along with clear and detailed cut sheets and installation instructions and exact location of each DDC part inside the air handling unit. A controls coordination meeting shall take place between the Temperature Control contractor and the manufacturer's control expert(s) to insure proper installation and wiring of the Temperature Control system inside the air handling unit. Water coil valves and actuators shall be furnished and field installed and wired by the TC Contractor.
- B. Programming, start-up and commissioning of the DDC Temperature Control system shall be the responsibility of the Temperature Control contractor and shall be done in the field.
- C. Mounting the DDC sensors, actuators and DDC panel in the field is not an acceptable alternative.

2.08 SOUND POWER LEVELS

- A. The sound power level at the air handling unit discharge, air intake and OSA intake, and casing radiated shall be submitted to the engineer for review.
- B. It shall be the option of the contractor to provide a quieter fan, acoustical lining, sound traps or other sound attenuating devices within the air handling unit to supplement the design in order to meet the specified levels above without increasing the size (length) of the unit.

2.09 CLEANING AND WRAPPING FOR SHIPMENT

- A. Unit shall be cleaned swept & vacuumed clean.

2.10 SOURCE QUALITY CONTROL

- A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified performance and sound ratings seal.
- B. Water Coils: Factory tested to 300 psig according to ARI 410 and ASHRAE 33.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine casing insulation materials and filter media before air-handling unit installation. Reject filter media that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Equipment Mounting: Install air-handling units on concrete pads, roof curbs, structural steel beams, as shown on plans.
- B. Arrange installation of units to provide access space around air-handling units for service and maintenance.
- C. Do not operate fan system until filters permanent are in place. Replace filters used during construction and testing, with new, clean filters.
- D. Install filter-gage, static-pressure taps upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum in accessible position. Provide filter gages on filter banks, installed with separate static-pressure taps upstream and downstream of filters.

3.03 CONNECTIONS

- A. Comply with requirements for piping specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to air-handling unit to allow service and maintenance.
- C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.
- D. Connect condensate drain pans using NPS 1-1/4, ASTM B 88, Type M copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- E. Hot- and Chilled-Water Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.
- F. Connect duct to air-handling units with flexible connections. Comply with requirements in Section 233300 "Air Duct Accessories."

3.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, fill water coils with water, and test coils and connections for leaks.
 - 2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.05 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Verify that shipping, blocking, and bracing are removed.

3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
 4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations.
 5. Verify that bearings and other moving parts are lubricated with factory-recommended lubricants.
 6. Verify that outdoor-air dampers open and close, and maintain minimum outdoor-air setting.
 7. Comb coil fins for parallel orientation.
 8. Install new, clean filters.
 9. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.
- B. Starting procedures for air-handling units include the following:
1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm.
 2. Measure and record motor electrical values for voltage and amperage.
 3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.06 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.07 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.08 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF SECTION

SECTION 23 74 14
ROOF TOP AIR CONDITIONING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged roof top unit. (Bldg C & H).

1.02 REFERENCES

- A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning and Refrigeration Institute; 1994.
- B. ARI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning and Refrigeration Institute; 1995.
- C. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilation Systems; National Fire Protection Association; 1996.

1.03 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum of 5 years documented experience.
- B. The management system governing the manufacture of this product is ISO (International Organization for Standardization) 9001:2015 certified.
- C. Air-handling unit assembly shall have UL (Underwriters Laboratories) 1995 certification for safety, including use with electric heat.
- D. Products requiring electric connection shall be listed and classified by ETL and CSA (Canadian Standards Association) as suitable for the purpose specified and indicated.
- E. Unit performance shall be rated in accordance with AHRI Standard 430 for Central Station Air Handling Unit Supply Fans and subject to verification of rating accuracy by AHRI-sponsored, third-party testing.
- F. Units shall meet NFPA (National Fire Protection Association) 90A requirements.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. All outdoor units shall be completely shrink-wrapped from the factory for protection during shipment. Tarping of bare units is unacceptable.
- B. Inspect for transportation damage and store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.06 WARRANTY

- A. Provide minimum warranty as noted herein for each component. Where not noted, all parts shall carry a minimum 12 month warranty from date of start-up or 18 months from date received at job site, whichever is shorter.

1.07 START-UP REQUIREMENTS

- A. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, condensate properly trapped, piping connections verified and leak tested, belts aligned and tensioned, all shipping braces have been removed, and fan has been test run under observation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The Carrier Corporation; Model 39MW.
- B. Substitutions: See Division 1.

2.02 GENERAL

- A. Units shall ship in the number of sections necessary to meet project requirements and shall ship in as many splits as specified in selection software. Split options as follows:
 - 1. Shipped assembled - solid base rail.
- B. Unit shall be factory-supplied, factory-assembled, outdoor, central station air handler. The air handling unit may consist of a fan with the following factory-installed components as indicated on the equipment schedule.
 - 1. Plenum Section:
 - a. No drain pan.
 - 2. Filter Section:
 - a. 4" angle filters.
 - 3. Fan Section
 - a. Horizontal draw-thru.

2.03 CONSTRUCTION

- A. Unit shall be constructed of a complete frame with easily removable panels. Removal of any panel shall not affect the structural integrity of the unit.
- B. All units shall be supplied with a perimeter, 14-gauge or heavier, G-90 galvanized, high tensile steel base rail with a pocket to accommodate roof curb. Perimeter lifting lugs for overhead lifting shall be provided on each shipping section. Sliding units in place of lifting lugs shall not be acceptable.
- C. Unit shall be thermally broken to minimize the conduction path from the inside of the casing to the outside.
- D. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have the following exterior finish as specified:
 - 1. Pre-painted with a baked enamel finish passing 500-hour salt spray test (ASTM B-117) for pre-painted steel and 125-hour marine level 1 adhesion test (ASTM G-85.A5) for pre-painted steel.
- E. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have the following interior finish as specified:
 - 1. Unpainted 304 stainless steel.
- F. Unit roof shall be double-wall, pitched in four directions at a minimum roof slope of 1/4" per foot across the width of the unit. No penetrations shall be made in pressure sensitive panels. Roof shall incorporate a standing top seam. All seams in the roof shall be gasketed and capped to prevent water infiltration into the unit.
- G. Casing panels (top, sides, and bottom) shall be one piece double-wall construction with foam insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.
- H. Casing deflection shall not exceed an L/240 ratio when subject to an internal pressure of +/-8 in. w.g. and shall exhibit no permanent deformation at +/- 9 in w.g. L is defined as the longest linear panel or cabinet length (measured to AHRI 1350 Cd level 2).
- I. Casing leakage rate shall be less than 1% at +/- 8 in. w.g. of nominal unit airflow or 50cfm, whichever is greater. Leakage rate shall be tested and documented on a routine basis on random production units. Factory witness leak testing and test reports shall be available.
- J. Side panels shall be easily removable for access to unit and shall seal against a full perimeter automotive style gasket to ensure a tight seal.

- K. The panel retention system shall comply with UL 1995 which states all moving parts (for example, fan blades, blower wheels, pulleys, and belts) that, if accidentally contacted, could cause bodily injury, shall be guarded against accidental contact by an enclosure requiring tools for removal.
- L. Base rail shall overhang the curb to facilitate water run-off and protection of the curb to base connection from water intrusion.
- M. Fan supports, structural members, panels, or flooring shall not be welded unless aluminum, stainless steel, or other corrosion-resistant material is used. Painted welds on unit exterior steel or galvanized steel are not acceptable.
- N. Access Doors: shall be one piece, hinged, lockable, double-wall construction with foam insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.

2.04 FANS

A. General:

- 1. Forward-curved fan sections shall have one double-width double-inlet (DWDI) fan wheel and scroll. They shall be constructed of galvanized steel with baked enamel. They shall be designed for continuous operation at the maximum rated fan speed and motor horsepower. Fans shall have an AMCA class rating corresponding to the static pressure at which the fan is designed to operate (Class I or II). Completed fan assembly shall be dynamically balanced in accordance with AHRI Guideline G and ANSI S2.19 at design operating speed using contract drive and motor if ordered.
- 2. Isolated fan assembly vibration shall not exceed 0.248 in. per second when mounted on active isolators. Vibration shall be measured in both vertical and horizontal directions at the specified fan operating speed using specified motor. For testing purposes, accelerometers shall be mounted on the motor near the bearing locations and removed before shipment.
- 3. All fan sled components shall provide corrosion protection to pass 100-hour salt spray test per ASTM B-117.
- 4. Fan wheels for all AF, FC, belt drive PF, and direct drive PF with NEMA "T" frame motors shall be keyed to the shaft. Fan wheels for direct drive PF with EC motors shall be mounted directly to the rotor of the EC motor. All shall be designed for continuous operation at maximum rated fan speed and motor horsepower. Fan wheels and shafts shall be selected with a maximum operating speed 25" below the first critical.
- 5. Belt drive fan motor shall be mounted within the fan section casing on slide rails equipped with adjusting screws. Belt drive and direct drive with NEMA "T" frame motors shall be premium efficiency, totally enclosed fan cooled NEMA (National Electrical Manufacturers Association) Design A or B with size and electrical characteristics as shown on the equipment schedule. Motor shall be mounted on a horizontal flat surface and shall not be supported by the fan or its structural members. All three-phase motors shall have a +/- 10% voltage utilization range and a 1.15 minimum service factor. Motor shall be compliant with the Energy Independence and Security Act (EISA) of 2007. Single-phase motors shall be available up to and including 5HP.

B. Performance Ratings:

- 1. Supply fan performance shall be rated and certified in accordance with AHRI Standard 430.

C. Sound Ratings:

- 1. Manufacturer shall submit first through eighth octave sound power for fan discharge and casing radiated sound. Sound ratings shall be tested in accordance with AHRI 260.

D. Mounting:

- 1. AF, FC, Belt-drive PF, Direct-drive PF with NEMA motor: Fan scroll, wheel, shaft, bearings, drives, and motor shall be mounted on a common base assembly. The base assembly is isolated from the outer casing with factory-installed isolators and vibration

absorbent discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable. Units shall use 2" deflection spring isolators.

2. Direct drive PF with EC motor: Fan wheel, inlet plate, inlet ring, motor and motor supports shall be a common assembly. The assembly is mounted directly to panels on an internal bulkhead wall.
- E. Fan Accessories:
 1. Forward curved fans:
 - a. Belt guards.
 2. Flexible Connection:
 - a. The base assembly is isolated from the outer casing with factory-installed isolators and vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable.

2.05 BEARINGS AND DRIVES

- A. Bearings: Self-aligning, grease lubricated, anti-friction with lubrication fittings extended to drive side of fan section. All bearing life calculations shall be done in accordance with ABMA 9 for ball bearings and ABMA 11 for roller bearings.
 1. Size 03 to 110 forward-curved fans: Cartridge bearings for Class I fans. Heavy-duty pillow block type, self-aligning, regreasable ball or roller type bearings selected for a minimum average life for an L50 of 500,000 hours.
- B. Shafts: Fan shafts shall be solid steel, turned, ground, polished and coated with rust inhibitor.
- C. V-Belt Drive: Drive shall be designed for a minimum 1.2 service factor as standard with a factory-supplied extra set of belts. Drives shall be fixed pitch with variable pitch for motors 15hp or less. All drives shall be factory mounted, with sheaves aligned and belts properly tensioned.

2.06 FILTER SECTION

- A. Angle filter sections shall accept 4" filters or standard sizes, arranged in a horizontal V formation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.
- C. Verify existing roof framing conditions and coordinate between mechanical, structural and architectural requirements prior to setting unit.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Set unit on neoprene gasketing on roof curb.
- C. Install in accordance with NFPA 90A.

3.03 STARTING EQUIPMENT AND SYSTEMS

- A. Provide start-up and check-out in accordance with manufacturers instructions.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 05 05
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 SUBMITTALS

- A. See Division 1 for submittal procedures.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Owner before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

- H. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

- A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

SECTION 26 05 10
ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish all labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working electrical installation, as shown on the drawings or described in these specifications.

1.02 REFERENCES

- A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean the latest edition of such publications adopted and published prior to submittal of the bid proposed. Such codes or standards shall be considered a part of this specification as though fully repeated herein.
- B. When codes, standards, regulations, etc., allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred as reducing the quality, requirements or extent of the drawings and specifications.
- C. California Code of Regulations (CCR) Title 24, Part 3, Basic Electrical Requirements, State Building Standards Electrical Code
- D. National Fire Protection Association (NFPA).
- E. Equipment and materials specified under this Division shall conform to the following standards where applicable:
 - 1. UL Underwriters' Laboratories
 - 2. ASTM American Society for Testing Materials
 - 3. CMB Certified Ballast Manufacturers
 - 4. IPCEA Insulated Power Cable Engineer Assoc.
 - 5. NEMA National Electrical Manufacturer's Assn.
 - 6. ANSI American National Standards Institute
 - 7. ETL Electrical Testing Laboratories
- F. All base material shall be ASTM and/or ANSI standards.
- G. All electrical apparatus furnished under this Section shall conform to National Electrical Manufacturers Association (NEMA) standards and the NEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.

1.03 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. Where items are noted as "or equal" a product of equal design, construction and performance will be considered. Contractor must submit all pertinent test data, catalog cuts and product information required to substantiate that the product is in fact equal. Refer to Division 1, General Requirement for additional requirements. Only one substitution will be considered for each product specified.
- C. Submittals shall consist of detailed shop drawings, specifications, "catalog cuts" and data sheets containing physical and dimensioned information, performance data, electrical characteristics, material used in fabrication, material finish and shall clearly indicate those optional accessories which are included and those which are excluded. Shop drawings shall be prepared using AutoCAD 2018, Revit 2019, or later editions.

1.04 CUTTING, PAINTING AND PATCHING

- A. Structural members shall in no case be drilled, bored or notched in such a manner that will impair their structural value. Cutting of holes, if required, shall be done with core drill and only with the approval of the Engineer.
- B. Cutting and digging shall be under the direct supervision of the General Contractor. Include as necessary for the work in this section.

- C. The contractor shall be responsible for returning any surface from which he has removed equipment or devices to the condition and finish of the adjacent surfaces.

1.05 SUPERVISION

- A. Contractor shall personally or through an authorized and competent representative constantly supervise the work from beginning to completion and, within reason, keep the same workmen and foreman on the project throughout the project duration.

1.06 PROTECTION

- A. Keep conduits, junction boxes, and outlet boxes, and other openings closed to prevent entry of foreign matter: cover fixtures, equipment, and apparatus and protect against dirt, paint, water, chemical, or mechanical damage, before and during construction period. Restore to original condition any fixture, apparatus, or equipment damaged prior to final acceptance, including restoration of damaged shop coats of paint, before final acceptance. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.

1.07 EXAMINATION OF SITE

- A. The Contractor shall visit the site and determine the locale, working conditions, conflicting utilities, and the conditions in which the electrical work will take place. No allowances will be made subsequently for any costs which may be incurred because of any error or omission due to failure to examine the site and to notify the Engineer of any discrepancies between drawings and specifications and actual site conditions. Schedule visits at least 1 week in advance with Owner's Maintenance staff.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. After other work such as sanding, painting etc. has been completed, clean lighting fixtures, panelboards, switchboards, and other electrical equipment to remove dust, dirt, and grease, or other marks, and leave work in clean condition.

1.09 VOLTAGE CHECK

- A. At completion of job, check voltage at several points of utilization on the system which has been installed under this contract. During test, energize all loads installed. Measure 3-Phase voltages and note percentage differences. Submit report to Engineer. Include copy in O&M Manual.

1.10 TESTS

- A. Perform tests as specified to prove installation is in accordance with contract requirements. Perform tests in the presence of the Engineer and furnish test equipment, facilities, and technical personnel required to perform tests. Tests shall be conducted during the construction period and at completion to determine conformity with applicable codes and with these Specifications. Tests, in addition to specific system test described elsewhere, shall include:
 - 1. Insulation Resistance: All 600 volt insulation shall be tested at 1,000 volts D.C for one minute on all feeder and branch circuit conductors including the neutral, and make a typed record of all readings to be included in the maintenance instructions. The direct current amperes shall be recorded at start and at one minute. The value shall be declining and not more than one microampere.
 - 2. Circuit Continuity: Test all feeder and branch circuits for continuity. Test all neutrals for improper ground.
- B. Equipment Operations: Test motors for correct operation and rotation.
- C. Product Failure: Any products which fail during the tests or are ruled unsatisfactory by the Engineer shall be replaced, repaired, or corrected as prescribed by the Engineer at the expense of the Contractor. Tests shall be performed after repairs, replacements, or corrections until satisfactory performance is demonstrated.
- D. Miscellaneous: Include all test results in the maintenance manual. Cost, if any, for all tests shall be paid by the Contractor.

1.11 DRAWINGS

- A. Layout: General layout shown on the drawing shall be followed except where other work may conflict with the drawings.
- B. Accuracy:
 - 1. Drawings for the work under this section are diagrammatic.
 - 2. Contractor shall verify lines, levels, and dimensions shown on the drawings and shall be responsible for the accuracy of the setting out of work and for its strict conformance with existing conditions at the site.
 - 3. Contractor shall insure reconnection of existing equipment and circuits affected by contract demolition whether or not reconnection is specifically shown on the contract documents.

1.12 PROJECT RECORD DRAWINGS

- A. Refer to General Conditions for contractual requirements. Provide project record drawings as required by the General Provisions of the specifications and as required herein. Such drawings shall fully represent installed conditions including actual locations of outlets, true panelboard connections following phase balancing routines, correct conduit and wire sizing as well as routing, revised fixture schedule listing the manufacturer and products actually installed and revised panel schedule. All changes to drawings shall be made by qualified draftspersons to match existing linework and lettering as close as possible. When all the changes have been made to the trade drawings, contractor shall produce one (1) full size (E-Size) updated set of trade drawing(s) utilizing AutoCad 2018 or newer and supply one (1) set of USB Flash Drive (USB) reflecting same.

1.13 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Furnish to the Engineer four (4) hard back 3-ring binders containing all bulletins, operating and maintenance instructions and part lists and other pertinent information for each and every piece of equipment furnished under this specification. Include service telephone numbers. Each binder shall be indexed into sections and labeled for easy reference. Bulletins containing more information than the equipment concerned shall be properly stripped and assembled.
- B. At the time of completion, a period of not less than eight hours shall be allotted by the Contractor for instruction of building operating and maintenance personnel in the use of all systems. All personnel shall be instructed at one time, the Contractor making all necessary arrangements with manufacturer's representative. The equipment manufacturer shall be requested to provide product literature and application guides for the user's reference. Costs, if any for the above services shall be paid by the Contractor.

1.14 WARRANTIES

- A. Furnish to the Engineer four (4) hard back 3-ring binders containing all warranties of every piece of equipment furnished under this specification. Include terms and limitations of warranties, contact names, addresses, and telephone numbers of manufacturer. Each binder shall be indexed into sections and labeled for easy reference for each equipment warranty.

1.15 EXTRA MATERIALS

- A. See Division 1 - Product Requirements, for additional provisions.
- B. All special tools for proper operation and maintenance of the equipment provided under this Section shall be delivered to the District's representative

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WORKMANSHIP

- A. Preparation, handling, and installation shall be in accordance with manufacturer's written instructions and technical data particular to the product specified and/or accepted equal except as otherwise specified. Coordinate work and cooperate with others in furnishing and placing

this work. Work to reviewed shop drawings for work done by others and to field measurements as necessary to properly fit the work.

- B. Conform to the National Electrical Contractor's Association "Standard of Installation" for general installation practice.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 26 05 12
BASIC MATERIAL AND METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit, raceways and fittings.
- B. Wires and Cables for 600 Volts and less.
- C. Wire connections.
- D. Wire devices.
- E. Outlet boxes.
- F. Pull and junction boxes.
- G. Disconnect Switches.
- H. Fuses.
- I. Supporting Devices.
- J. Identifying Devices.
- K. Grounding and Bonding

1.02 SUBMITTALS

- A. Submit in accordance with the requirements of Division 1 the following items:
 - 1. A list of conduit types indicating where each type of conduit will be used. Indicate conduit manufacturers and fittings to be used.
 - 2. Wires and Cables.
 - 3. Wiring Devices and Plates
 - 4. Nameplates, including engraving schedules where engraved plates are specified.
 - 5. Fused disconnect switches.

1.03 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.04 REFERENCES

- A. NFPA 70-2017 - National Electrical Code; 2017.
- B. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated - latest edition.
- C. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated - latest edition.
- D. NECA (INST) - Standard of Installation; National Electrical Contractors Association - latest edition.
- E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies; latest edition.
- F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit - latest edition.
- G. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80) - latest edition.
- H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing - latest edition.
- I. NFPA 70 - National Electrical Code - latest edition.

PART 2 PRODUCTS

2.01 CONDUIT, RACEWAYS AND FITTINGS

- A. Rigid Steel Conduit

1. Rigid steel conduit shall be full weight, pipe size, finished inside and out by hot-dip galvanizing after fabrication, and shall conform with ANSI C80.1 and UL.
 2. Couplings shall be electroplated steel.
 3. Insulating Bushings: Threaded polypropylene or thermo-setting phenolic rated 150°C minimum.
 4. Insulated grounding Bushings: Threaded cast malleable iron body with insulated throat and steel "lay-in" ground lug with compression screw.
 5. Insulated Metallic Bushings: Threaded cast malleable iron body with plastic insulated throat rated 150°C.
 6. Running threads are not acceptable.
- B. Electrical Metallic Tubing (EMT):
1. Conduit: Conduit shall be formed of cold rolled strip steel, and shall comply with ANSI C80.3 and UL requirements.
 2. Couplings: Electroplated steel, UL listed rain and concrete tight through 1-1/4" trade size. All EMT fittings shall be compression type.
 3. Connectors: Steel, gland compression type with insulated plastic throat, 150°C temperature rated. All EMT fittings shall be compression type.
- C. Liquid Tight Flexible Metal Conduit:
1. Conduit: Conduit shall be fabricated in continuous lengths from galvanized steel strip, spirally wound. Flexible conduit, except where installed in concealed dry locations, shall be liquid tight with plastic jacket extruded over the outer zinc coating. No aluminum substitute will be accepted.
 2. Fittings: Connectors shall be the screw clamp on screw-in (Jake) variety with cast malleable iron bodies and threaded male hubs with insulated throat or insulated bushings. Set screw type connectors are not acceptable. Liquid tight fittings shall be of cadmium plated cast malleable iron, with insulated throat.
- D. Rigid Non-Metallic Conduit:
1. Conduit and fittings shall be homogeneous plastic material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections which could damage conductors or cables.
 2. Materials: Polyvinyl Chloride (PVC) schedule 40. Material shall comply with NEMA TC-2 for conduit and NEMA TC-3 for fittings.

2.02 WIRING AND CABLES

- A. Acceptable manufacturers: Southwire, or approved equal.
- B. Conductor material: All wire and cable shall be insulated, stranded copper conductors. Soft drawn annealed copper wire 98% conductivity, bearing the UL label.
- C. Minimum conductor size: AWG No.10 for all power and lighting branch circuits, unless specified otherwise on drawing notes. AWG No. 14 for all signal and control circuits.
- D. Color Coding: System conductors shall be identified as to voltage and phase connections by means of color impregnated insulation or approved colored marking tape as follows:
- E. For 120/240 volt, single phase, 3 wire system.
1. Phase A - Black
 2. Phase B - Red
 3. Phase C - Orange for High Leg (208v to neutral)
 4. Neutral - White
 5. Ground - Green
- F. For 120/208 volt, 3 phase, 4 wire systems.
1. Phase A - Black
 2. Phase B - Red
 3. Phase C - Blue
 4. Neutral - White

5. Ground - Green
- G. for 277/480 Volt, 3 phase, 4 wire system
 1. Phase A - Brown
 2. Phase B - Orange
 3. Phase C - Yellow
 4. Neutral - Grey
 5. Ground - Green
- H. Secondary Wire and Cable, 0 to 600 Volts;
 1. NEC Type THWN, or Type XHHW for feeders and branch circuits in wet or dry locations. NEC type THHN for branch circuits in dry locations.
 2. Electrical conductors serving equipment supplied by power conversion equipment as part of a variable frequency drive (VFD) system and/or a servo drive system shall have thermoset insulation type XHHW, or XHHW-2.

2.03 WIRE CONNECTION

- A. Wire Joints: Wires in sizes from #18 to #8 AWG, stranded conductor, with insulation rated 105 degrees C. or less shall be joined with electrical spring connectors of three part construction incorporating a non-restricted, zinc coated steel spring enclosed in a steel shell with an outer jacket of vinyl plastic with a flexible insulating skirt.
- B. Mechanical Compression Connectors and Taps: Stranded conductors from #6 AWG to 750 Kcmil shall be joined or tapped using bolted pressure connectors having cast bronze compression bolts. Fittings shall be wide range-taking and designed to facilitate the making of parallel taps, tees, crosses or end-to-end connections. Split-bolt connectors will not be acceptable.
- C. Fixture Connections: Splice fixture wire to circuit wiring with solderless connectors as specified above in paragraph A.
- D. Terminating Lugs: Conductors from size No. 6 AWG to 750 Kcmil, copper, shall be terminated using tin plated hydraulically operated crimping tools and dies as stipulated by the lug manufacturer. Lugs shall be 3M "Scotchlok" series 30000, Burndy Type Ya-L series, or equal.
- E. Splicing and Insulating Tape (600 volts and below): General purpose electrical tape shall be suitable for temperatures from minus 18 degrees C to 105 degrees C, shall be black, ultraviolet proof, self-extinguishing, 7 mil thick vinyl with a dielectric strength of 10,000 volts. Apply 4 layers half-lap with 2" over-lap on each conductor.
- F. Insulating Putty (600 volts and below): Pads or rolls of non-corrosive, self-fusing, one eight inch thick rubber putty with PVC backing sheet. Putty shall be suitable for temperatures from minus 17.8 degrees C to 37.8 degrees C and shall have a dielectric strength of 570 volts/mil minimum.
- G. Insulating Resin: Two Part liquid epoxy resin with resin and catalyst in pre measured, sealed mixing pouch. Resin shall have a set up time of approximately 30 minutes at 21.1 degrees C, and shall have thermal and dielectric properties equal to the insulation properties of the cables immersed in the resin.
- H. Terminal Strip Connectors: Terminate wire in locking tongue style, pressure type, solderless lug where applicable.

2.04 WIRING DEVICES

- A. Switches: Specification grade, flush mounting, quiet operating AC type, with toggle operator, heat resistant plastic housing and self grounding metal strap. Silver or silver alloy contact. Rated 20A at 120-277V and capable of full capacity on tungsten or fluorescent lamp load. Design for up to #10 wire. Use single pole, double pole, three-way, four-way, lighted, pilot, or keyed type, as indicated on drawings or required. Provide white color unless otherwise noted. Manufacturer: Leviton, Arrow Hart, or Hubbell.
- B. Receptacles: Specification grade, flush mounting receptacles with nylon face. High grade brass allow triple wipe contacts. Provide 2 pole, 3 wire grounding type with a green colored

brass hexagonal equipment grounding screw. Grounding shall be rivetless, single piece brass with no mechanical connections in the primary path between point of ground wire termination and ground blades. Use 20A rated receptacles, white in color, unless otherwise noted.

Manufacturer: Leviton, Arrow Hart, or Hubbell.

1. Isolated Ground - Provide separate path to ground, with orange faceplate or triangle to indicated isolated ground
 2. GFCI - Equipped with diagnostic indicator for miswiring.
 3. Weatherproof - GFCI type, outdoor rated, with metal lockable while in use cover
- C. Faceplates: Provide nylon cover faceplates for wall receptacles, outlets, and switches. Include thermal mounting screws that match plate and device color. Manufacturer: Leviton, Arrow Hart, or Hubbell.

2.05 OUTLET BOXES

- A. Standard outlet boxes: Galvanized, die formed or drawn steel, knock-out type of size and configuration best suited to the application indicated on the plans. Minimum box size, 4 inch square by 1-1/2 inch deep, indoor use. FS cast boxes are required for outdoor use.
- B. Cast Metal Outlet Boxes: FS/FD cast boxes are required for outdoor use. Malleable iron alloy with threaded hubs and mounting lugs as required. Boxes shall be furnished with cast cover plates of the same material as the box and neoprene cover gaskets. Thomas and Betts, Crouse-Hinds, Appleton or equal.
- C. Conduit Outlet Bodies: Cadmium plated, cast iron alloy. Obround conduit outlet bodies with threaded conduit hubs and neoprene gasketed, cast iron covers. Outlet bodies shall be used to facilitate pulling of conductors or to make changes in conduit direction only. Splices are not permitted in conduit outlet bodies. Thomas and Betts, Crouse Hinds Form 8 Condulets, Appleton form 35 Unilets, or equal.

2.06 PULL AND JUNCTION

- A. Sheet Metal Boxes: Use standard outlet or concrete ring boxes wherever possible; otherwise use minimum 15 gauge galvanized metal, NEMA 1 boxes, sized to code requirements with covers secured by cadmium plated machine screws located 6 inches on centers. Circle AW Products, Hoffman Engineering Co., or equal.
- B. Cast Metal Boxes: Use standard cast malleable iron outlet or device boxes wherever possible; otherwise use cadmium plated, cast malleable iron junction boxes with bolt-on, interchangeable conduit hub plates with neoprene gaskets. Appleton FS/FD series; Crouse Hinds FS/FD series, or equal.

2.07 DISCONNECT SWITCHES

- A. All disconnect switches shall be heavy-duty type and have the number of poles, voltage rating, and horsepower rating as required by the motor or equipment. Disconnect switches shall be in enclosures to suit conditions, NEMA 3R for outdoor and NEMA 1 for indoor. Disconnect switches shall be fused unless otherwise noted on the drawings. As manufactured by: Square D - Class 3110, ITE Siemens, or equal.

2.08 FUSES

- A. Dual Element, Time Delay, UL Class RK5. Rejection type. Size and Voltage as indicated on equipment. Bussman, Little Fuse, or approved equal.

2.09 ELECTRICAL SUPPORTING DEVICES

- A. Concrete Fasteners: Hilti Kwik Bolt TZ or equal, self drilling expansion type concrete anchor.
- B. Conduit Straps: Hot-dip galvanized, cast malleable iron, two hole type strap with cast clamp-backs and spacers as required. OZ/Gedney, Thomas & Betts, or equal.
- C. Construction Channel: 1-1/2 inch by 1-1/2 inch 12 gauge galvanized steel channel with 17/32 inch diameter bolt holes, 1-1/2 inch on center, in the base of the channel. Kindorf 905 series, Unistrut P-1000-HS or equal.

- D. Cable Ties and Clamps: Thomas and Betts Co. "Ty-Raps" Panduit "Pan-Ty" or equal one piece, nylon, reusable type lashing ties.
- E. Fasteners (General) : Wood screws for fastening to wood. Machine screws for fastening to steel. Toggle bolts for fastening to hollow concrete block, gypsum board, or plaster walls. Expansion anchors for attachments to pre-poured concrete.

2.10 IDENTIFYING DEVICES

- A. Nameplates: Type NP: Engraved black bakelite, 1 inch by 3-1/2 inch, 1/8 inch high white letters, machine screw retained. For permanent identification of all switchboards, panelboards, circuit breakers in separate enclosures, motor starters, relays, time switches, disconnect switches and other cabinet-enclosed apparatus including terminal cabinets or match existing as closely as possible.
- B. Legend Plates: Type LP: Die-stamped metal legend plate with mounting hole and positioning key for attachment to panel mounted operators' devices. Engraved paint-filled characters as specified.
- C. Wire & Terminal Markers: Self-adhering, pre-printed vinyl with self-laminating wrap around strip. Markers shall be legible after termination. Brady B191 series, Thomas & Betts WSL series or equal.
- D. Conductor Phase Markers: Thomas & Betts WCPHAS series or similar in addition to colored marking as specified under this section of the specifications.

2.11 GROUNDING AND BONDING

- A. Ground Rods
 - 1. Manufacturer: Blackburn, Erico, or approved Equal
 - 2. Size: 3/4" x 10' Ground Rods
- B. Grounding Electrode Conductor, 2/0 for foundation foots, and per NEC.
- C. Grounding Well - Christy Box, G5 Traffic Valve Box.

PART 3 EXECUTION

3.01 CONDUIT AND RACEWAY APPLICATIONS

- A. Rigid Steel Conduit: Use rigid steel conduit for the following locations or conditions:
 - 1. All exterior applications
 - 2. All conduits larger than 2" trade diameter.
 - 3. All conduits indoor below eight (8) feet above finished floor.
- B. Electrical Metallic Tubing (EMT): EMT is allowed for the following conditions:
 - 1. Interior only and above eight (8) feet from finished floor.
 - 2. Interior only and when entering a panel from above.
- C. Liquidtight Flexible Metallic Conduit: Use Liquidtight for the following conditions:
 - 1. In damp and wet locations for connections to motors, transformers, vibrating equipment and machinery.
 - 2. Connections to all pump motors, flow switches, and similar devices.
- D. Rigid Non-Metallic Conduit, Polyvinyl Chloride (PVC) Schedule 40:
 - 1. Underground installation.

3.02 CONDUIT INSTALLATION

- A. General
 - 1. All conduit runs shown on the plans are sized based on the use of rigid steel conduit and THWN copper conductors. If conductor type is changed the contractor shall be responsible for resizing conduits to meet code. In no case is conduit to be sized smaller than 3/4" trade diameter.
 - 2. Low voltage wiring shall be installed in conduit, minimum 3/4" trade diameter.
 - 3. Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

4. In making joints in rigid steel conduit, ream conduit smooth after cutting and threading.
 5. Clean any conduit in which moisture or any foreign matter has collected before pulling in conductors. Paint all field threaded joints to prevent corrosion.
 6. In all empty conduits or ducts, install an 1100 pound tensile strength polyethylene pulling rope.
 7. Conduit systems shall be electrically continuous throughout. Install code size, uninsulated, copper grounding conductors in all conduit runs, grounding conductor shall be bonded to conduit, equipment frames and properly grounded.
- B. Layout:
1. All new conduits shall be concealed. Any field conditions that does not allow concealment of conduits shall be reviewed with the Engineer prior to rough-in.
 2. Locations of conduit runs shall be planned in advance of the installation and coordinated with concrete work, plumbing and framing.
 3. Where practical install conduits in groups in parallel vertical or horizontal runs and at elevations that avoid unnecessary off-sets.
 4. Low voltage conduit shall be grouped separately and labelled every 10 ft interval as to system (i.e. fire, control, etc)
 5. Exposed conduit shall be run parallel or at right angles to the centerlines of the columns and beams.
 6. Conduits shall not be placed closer than 12 inches from a parallel hot water or steam line or three inches from such lines crossing perpendicular to the runs.
 7. In long runs of conduit, provide sufficient pull boxes per NEC inside buildings to facilitate pulling wires and cables. Support pull boxes from structure independent of conduit supports. These pull boxes are not shown on the plans.
- C. Supports:
1. All raceway systems shall be secured to building structures using specified fasteners, clamps and hangers spaced according to Code.
 2. Support single runs of conduit using two hole pipe straps. Where run horizontally on walls in damp or wet locations, install "clamp blocks" to space conduit off the surface.
 3. Multiple conduit runs shall be supported using "trapeze" hangers fabricated from 3/8 inch diameter, threaded steel rods secured to building structures. Fasten conduit to construction channel with standard two hole pipe clamps. Provide lateral seismic bracing for hangers.
 4. Installation
 - a. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
 - 1) Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
 - 2) Do not drill or cut structural members.
 - b. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
 - c. Install surface-mounted cabinets and panelboards with minimum of four anchors.
 - d. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
 - e. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- D. Terminations and Joints:
1. Raceways shall be joined using specified couplings or transition couplings where dissimilar raceway systems are joined.
 2. Rigid conduit connection to enclosures shall be made by Myers type grounding hubs only. EMT connections to enclosures shall be made with compression connector with grounding lock-nuts or bushings.
 3. Conduit terminations exposed at weatherproof enclosures and cast outlet boxes shall be made watertight using appropriate connectors and hubs.

4. Install expansion couplings where any conduit crosses a building separation or expansion joint.
 5. Install cable sealing bushings on all conduits originating outside the building walls and terminating in switchgear, cabinets or gutters inside the building. Install cable sealing bushings or caulk conduit terminations in all grade level or below grade exterior pull, junction or outlet boxes.
- E. Penetrations:
1. Furnish and install metal sleeves for all exposed interior conduit runs passing through concrete floors or walls. Following conduit installation, seal all penetrations using non-iron bearing, chloride free, non-shrinking, dry-pack, grouting compound.
 2. Install specified watertight conduit entrance seals and membrane clamps at all below grade wall and floor penetrations. Conduits penetrating exterior building walls and building floor slab shall be insulated rigid steel.
 3. Conduits penetrating rated walls, floors, etc. shall be fireproofed.

3.03 CABLE AND WIRE INSTALLATION

- A. Examination
1. Verify that interior of building has been protected from weather.
 2. Verify that mechanical work likely to damage wire and cable has been completed.
 3. Verify that raceway installation is complete and supported.
 4. Verify that field measurements are as indicated.
- B. Preparation
1. In existing conduits that will be reused, pull out existing conductors.
 2. Completely and thoroughly swab raceway before installing wire.
 3. Use 50/50 solution of Simple Green. Use CO2 to blow water and soap into conduit - let soak to break up dried out pulling compounds, then pull conductors. Pull one conductor at a time if will not pull all out together.
- C. General:
1. Conductors shall not be in conduit until all work of any nature that may cause injury is completed. Care should be taken in pulling conductors that insulation is not damaged. U.L. approved non-petroleum base and insulating type pulling compound shall be used as needed.
 2. All cables shall be installed and tested in accordance with manufacturer's requirements and warranty.
 3. Block and tackle, power driven winch or other mechanical means shall not be used in pulling conductors of size smaller than AWG # 1.
- D. Splicing and Terminating:
1. All aspects of splicing and terminating shall be in accordance with cable manufacturer's published procedures.
 2. Make up all splices in outlet boxes with connectors as specified herein with separate tails of correct color to be made up to splice. Provide at least six (6) inches of tails packed in box after splice is made up.
 3. All wire and cable in panels, control centers and equipment enclosures shall be bundled and clamped.
 4. Encapsulate splices in exterior outlet, junction and pull boxes using insulating resin kits. All splices for exterior equipment in pump rooms shall be made up watertight.
 5. Insulate mechanical compression taps AWG #1/0 and larger using pre-molded heat shrink tubing ITCSN Heaving Wall rated to 600V. Heating process should start from the middle of the heat shrink tubing and move to its ends.
- E. Identification:
1. Securely tag all branch circuits, noting the purpose of each. Mark conductors with vinyl wrap-around markers. Where more than two conductors run through a single outlet, mark each circuit with the corresponding circuit number at the panelboard.

2. Color code conductors size #6 and larger using specified phase color markers and identification tags.
3. All terminal strips are to have each individual terminal identified with specified vinyl markers.
4. All identification shall be legible and readable after completion of installation.
5. Provide labeling for all switches and receptacle outlets. Self-adhering machine clear tape with black letters.

3.04 INSTALLATION:

- A. Route wire and cable as required to meet project conditions.
 1. Wire and cable routing indicated is approximate unless dimensioned.
 2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
 3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.
- B. Install wire and cable in accordance with the NECA "Standard of Installation."
- C. Use wiring methods indicated.
- D. Pull all conductors into raceway at same time.
- E. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- F. Protect exposed cable from damage.
- G. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- H. Use suitable cable fittings and connectors.
- I. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- J. Clean conductor surfaces before installing lugs and connectors.
- K. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- L. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- M. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- N. Trench and backfill for direct burial cable installation as specified in Underground Structure Section. Install warning tape along entire length of direct burial cable.
- O. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.

3.05 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.

- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

3.06 INSTALLATION OF BOXES

- A. General:
 1. Leave no un-used openings in any box. Install close-up plugs as required to seal openings.
 2. Exposed outlet boxes and boxes in damp or wet locations shall be cast metal with gasketed cast metal cover plates.
- B. Box Layout:
 1. Outlet boxes shall be installed at the locations and elevations shown on the drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.
 2. Install junction or pullboxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Consult wire and cable manufacturer.

3.07 INSTALLATION OF WIRING DEVICES

- A. General
 1. Install all devices flushmounted unless otherwise noted on the drawings. Comply with layout drawings for general locations. Consult Engineer or Owner's Representative for locations that have conflict with other devices or manner not suitable for installation. Avoid placing devices behind open doors.
 2. Align devices horizontally and vertically. Device plates shall be aligned vertically with tolerance of 1/16". All four edges of device plates shall be in contact with the wall surface.
 3. Mounting height as indicated on the drawings and according to ADA requirements.
 4. Install device plates on all outlet boxes. Provide blank plates for all empty, spare, and boxes for future use.
 5. Securely fasten devices into boxes and attach appropriate cover plates.
 6. Caulk around edges of outdoor device plates and boxes when rough wall surfaces prevent raintight seal. Use caulking materials approved by Engineer. Fireproof around opening of devices located or penetrating fire-rated construction assemblies.
 7. Fireproof around opening of devices located or penetrating fire-rated construction assemblies.
- B. Switches
 1. Where switches are indicated to be installed near doors, corner walls, etc. mount not less than 2 inches and not more than 18" from trim. Verify exact location with Architect or Engineer prior to rough-in.
 2. Coordinate the location of switches to insure locations at the strike side of doors.
 3. Furnish and install engraved legend of each switch that controls exhaust fans, motors, equipment systems, etc. not located within sight of the controlling switch.
 4. Ganging of Switches - provide barriers for switches of different phases and voltages. Otherwise switches shall be gauged in one faceplate.
- C. Receptacles
 1. Mount receptacles vertically with U-shaped ground position on bottom.
 2. Do not combine GFCI protected circuits with other circuits in the same raceway. Limit number of GFI protect circuits in any one raceway to a maximum of one (1) circuit.
- D. Identification
 1. Label all outlets and switches. Mark each wiring device where circuits and panel supply is derived from.
 2. All identification shall be legible and readable after completion of installation

3.08 INSTALLATION OF FUSES AND DISCONNECT SWITCHES

- A. Fuses shall be installed where noted on plans. Sizes are based on design data provided by equipment mfg. Listed or labeled equipment must be in accordance with instructions included in the listing or labeling. Be sure to observe maximum branch circuit fuse size labels.
- B. Disconnect switches shall be mounted on the equipment, where possible. Coordinate with mechanical contractor to ensure switches are not mounted on a removable access panel.
- C. Label each disconnect fuse with equipment tag as indicated in the single line diagram, or as directed.

3.09 ELECTRICAL EQUIPMENT GROUNDING

- A. Ground non-current carrying metal parts of electrical equipment enclosures, frames, conductor raceways or cable trays to provide a low impedance path for line-to-ground fault current and to bond all non-current carrying metal parts together. Install a ground conductor in each raceway system in addition to conductors shown. Equipment ground conductor shall be electrically and mechanically continuous from the electrical circuit source to the equipment to be grounded. Size ground conductors per NEC 250 unless larger conductors are shown on the drawings.
- B. Grounding conductors shall be identified with green insulation, except where a bare ground conductor is specified. Where green insulation is not available, on larger sizes, black insulation shall be used and suitably identified with green tape at each junction box or device enclosure.
- C. Install metal raceway couplings, fittings and terminations secure and tight to insure good ground continuity. Provide insulated grounding bushing and bonding jumper where metal raceway is not directly attached to equipment metal enclosure and at concentric knock-outs.
- D. Motors shall be connected to equipment ground conductors with a conduit grounding bushing and with a bolted solderless lug connection on the metal frame.
- E. Conduit terminating in concentric knockouts at panelboards, cabinets and gutters shall have insulated grounding bushings and bonding jumpers installed interconnecting all such conduits and the panelboard cabinet, gutter, etc.
- F. Performance:
 - 1. Measure the resistance to ground of each ground rod before connection to the other ground rods. The resistance shall not exceed 25 ohms.
 - a. A single electrode which does not have a resistance to ground of 25 ohms or less shall be augmented by additional electrode(s).
 - 2. Measure the resistance to ground of the total ground system with all connections completed. The resistance shall not exceed 2 ohms for primary services or 5 ohms for secondary services.
 - 3. Tests of the resistance to ground shall be made using either the three point method or the fall-of-potential method.
 - 4. Perform a continuity check from equipment ground bus bars and ground lugs to the ground system.

3.10 BONDING

- A. Bonding shall be provided to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed.
- B. Bonding shall be in accordance with NEC Article 250, Part V.

3.11 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

END OF SECTION

APPENDIX

Dublin San Ramon Services District

Appendix A

Forms

The following forms are part of the Contract Documents

Daily Extra Work Report..... 1 Page

Progress Payment Request 1 Page

**Dublin San Ramon Services District
Daily Extra Work Report**

Job Title:	Contract No.:	DEWR Report No.:	Sheet No. ____ of ____
Contractor:		Field Order No.:	Job No.:
Description of Work (Check one: ____ Extra Work, ____ RW Delay)		Date Reported:	Date Performed
		Contractor's Job No.:	
		Contractor's Report No.:	

Equipment*			Hours	Hourly Rate	Delay Factor	Extended Amounts	Labor*		Hours	Hourly Rate	Extended Amounts
Model	Code	Description									
					1.00	\$0.00					\$0.00
					1.00	\$0.00					\$0.00
					1.00	\$0.00					\$0.00
					1.00	\$0.00					\$0.00
					1.00	\$0.00					\$0.00
					1.00	\$0.00					\$0.00
					1.00	\$0.00					\$0.00
					1.00	\$0.00					\$0.00
					1.00	\$0.00					\$0.00
Total Cost of Equipment - Regular Hours			B.			\$0.00	Subtotal - Overtime Hours				\$0.00

Material and/or Work done by Others**					Subtotal - Regular Hours		Reg		\$0.00
Description	No. Units	Unit Cost		Extended Amounts	Description	Ltr.	% Markup	Total Costs	
				\$0.00	Total Cost of labor (Regular + OT)	A.		\$0.00	
				\$0.00	Total Cost of Equipment	B.		\$0.00	
				\$0.00	Material and/or Work done by Others	C.		\$0.00	
				\$0.00	Markup on Labor (A.)		15%	\$0.00	
				\$0.00	Markup on Equipment (B.)		15%	\$0.00	
				\$0.00	Markup on Materials and Work (C.)		10%	\$0.00	
Total Cost of Materials and Work - Regular Hours					Total This Report			\$0.00	

* Includes Equipment and Labor of Subcontractors and Owner-Operators.

** Section is used to report work for which labor rates as described in the specifications are unavailable.

1. List Model, Code & Description of Equipment as it appears in the equipment rental rates booklet published by Caltrans.

2. List labor as it appears in the labor rate breakdown as described in the specifications.

3. Attach photocopies of applicable labor rate breakdown and equipment rental sheets with DEWR force's highlighted.

4. Consult District's specifications for method of payment calculation for extra work or R/W delay.

5. List operator on same line as equipment.

Contractor's Authorized Field Representative

DSRSD Field Representative

Receipt does not constitute acceptability for payment or acceptance of "Extra Work" status for work.

DUBLIN SAN RAMON SERVICES DISTRICT

PROGRESS PAYMENT REQUEST

pprform

Thru

PP #1

From

Contractor:		NTP Date		
Proj. Manager/Const. Manager		Completion Date		
Proj. Name:		Completion Date Rev		
CIP NO.		Contract Days	Days Expended	% Time Elapsed
P.O. Number:		#VALUE!	#VALUE!	#VALUE!
Description	Authorized Amount	(Previous Earned to Date + Current.) Earned To Date	(Prior Mo. Earned to Date) Previous Earned To Date	Current Earned This Period
Contract Award				
Contract Amount		-		
1		-		
2		-		
3		-		
4		-		
5		-		
6		-		
7		-		
8		-		
9		-		
Total Authorized Contract Amount	-			-

Percent Earned & Paid

#DIV/0!

#DIV/0!

#DIV/0!

A. Total Work Earned to Date		-		
B. Materials Currently in Storage (not subject to retention)	-	-25%	-	-
C. Previous Retentions Withheld				
D. Total Work Earned and Materials in Storage (A + B + C)			-	-
E. Less Previous Total Payment to Contractor to Date				
F. Total less Previous/Current Misc. Amts. Withheld			-	
G. Current Retention (F X %)	5%		-	-
H. Total Retention Withheld to Date		-		
I. Sub Total of Payment Due			-	0
J. Less special amts withheld or add special amts released.		(description required)	-	-
1	Amount \$		-	
2	Amount \$		-	
3 Cumulative Total of Add'l Amounts Withheld to Date				0
K. % of Retention to Release	0%			-
L. Net Payment to Contractor			-	
M. Total Payment to Contractor to Date			-	
N. Retention and Special Instructions:	(Escrow Agreements, CD's)			
Escrow Admin Fees (- 375.00) set up (-30.00) account transaction				

900.1.410.00

Total Payment Due this Period

I certify to the best of my knowledge that the payment requested is a fair and accurate representation of the value of the work completed.

Contractors Request for Approval		Date	
Const. Mgr. Recommended Approval		Date	
Project Mgr. Recommended Approval		Date	
District Approval by:		Date	

ENGINEERING MANAGER

%	Account Code Information	Project No.	Amount	Accounting Original	☐
			#VALUE!	Project Eng. Copy	☐
			#VALUE!	Contractor Copy	☐
100.00%			-	Less Retention	
			-		
			#VALUE!		