100% CONSTRUCTION DOCUMENTS PHASE

SPECIFICATIONS
FOR THE
VENTURA COMMUNITY COLLEGE DISTRICT

CHILLER REPLACEMENT PROJECT

AT

MOORPARK COLLEGE PHYSICAL SCIENCE BUILDING
7075 Campus Road,
Moorpark California

93021 Prepared by:

AE Group Mechanical Engineers, Inc.
838 Front Street
Ventura California 93001

For OWNER:

VENTURA COMMUNITY COLLEGE DISTRICT
761 East Daily Drive,
Camarillo, California
93010

July 22, 2022

SPECIFICATIONS MANUAL for the construction of:

MOORPARK COLLEGE
PHYSICAL SCIENCE BUILDING CHILLER REPLACEMENT PROJECT

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Mechanical Engineer

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Structural Engineer

DIVISION OF THE STATE ARCHITECT
APPL. #03-122447

STATE OF CALIFORNIA - DEPARTMENT OF GENERAL SERVICES
DIVISION OF THE STATE ARCHITECT
LOS ANGELES BASIN REGIONAL OFFICE

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 03-122447 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☐
DATE: 09/09/2022

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SECTION 00115 – BASIC CONTRACT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY OF WORK

A. This work includes the demolition and disposal of a Chiller, tanks, and pumps. This work includes the installation of a new chiller with volume tank and pumps. Included, but not limited to, in the work are concrete demolition, concrete, anchorage, controls, piping, insulation, and electrical connections.

1.2 SELECTIVE DEMOLITION

A. Coordinate demolition with all trades and protect areas not involved with the installation of the new equipment. Demolish and remove existing equipment only to the extent required for the new construction. Legally dispose of all demolished materials. Recycle to the greatest extent possible.

1.3 CUTTING AND PATCHING

A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction. Closely match texture and finish of existing adjacent surfaces. Extend final coat of paint to a logical stopping point such as door frame or wall corner. Employ qualified workers to perform cutting and patching.

B. Do not cut any structural member without prior notification to the Engineer.

C. Substitution shall be approved by the Engineer prior to the construction of the change.

1.4 PROJECT RESTROOM FACILITIES

A. Contractor shall provide portable restroom for use by the workers on the project.

1.5 CONSTRUCTION LAYDOWN AREA

A. Owner will identify a construction laydown area. The contractor shall provide temporary fencing around this area. Contractor is responsible for securing materials in this area.

1.6 INSPECTION

A. Contractor is responsible for scheduling inspection and maintaining permitted construction plans at the site.

1.7

Contractor shall provide temporary trailer office within laydown area. Site electricity may be used and contractor is responsible for connections.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION 00115

SECTION 01000 – GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 All work shall conform to 2019 Title 24, California code of regulations (CCR)

1.2 Changes to the approved drawings and specifications shall be made by addenda or a change order approved by the Engineer, as required by Section 4-338, Part1, Title 24, CCR.

1.3 Contractor will be informed at the pre-bid job walk of the construction times available for work and will coordinate with the Owner to provide an absolute minimum of disruption to the building's operation. Coordinate any building service shutdown with owner.

1.4 The contractor shall make a thorough examination of the site to determine all existing conditions affecting the site. This is a remodel contract with associated existing components in place. No change order will be issued for existing conditions that could have been determined prior to the bid.

1.5 Contractor shall provide to the Owner a construction schedule with 7 days of the issuance of the letter of intent and shall continuously provide written updates if the schedule if the contractor is aware of changes.

1.6 Contractor shall provide within two weeks of the notice to proceed a schedule of values.

1.7 An existing temporary chiller is operating to cool the loop. This chiller shall remain in operation during the replacement of the permanent chiller. Provide any needed fittings and connections to keep the temporary chiller functional during the change. Test existing chiller for proper performance prior to disconnecting the temporary chiller.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION 01000

SECTION 01040 – PROJECT COORDINATION

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Coordination of Work of all trades.

1.2 RELATED REQUIREMENTS

A. Section 01200 - Project Meetings.

B. Section 01700 - Contract Closeout: Closeout Submittals.

1.3 DESCRIPTION

A. Coordinate scheduling, submittals, and work of the various sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

B. Coordinate sequence of work to accommodate Owner occupancy.

1.4 MEETINGS

A. In addition to progress meetings specified in Section 01200, hold coordination meetings and pre-installation conferences with personnel and sub-contractors to assure coordination of work.

1.5 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals.

B. Provide a complete list of submittals, indicating specified sections, sub-contractors, numbering system, etc.

C. Coordinate work of various sections having independent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other sections.

E. The first submittal shall be comprehensive and complete. Product specifics such as color, voltage, options, etc. shall be clearly marked. A copy of the submittal with review shall be kept on the jobsite.

1.6 COORDINATION OF SPACE

A. Coordinate use of project space and sequence of installation of mechanical and electrical work which is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

B. In finished areas except as otherwise shown conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

C. Existing building will have to accommodate new material installation. Provide all required furring, anchors, finishes, etc. necessary for new material installation.

1.7 COORDINATION OF CONTRACT CLOSEOUT

A. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion.

B. After Owner occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

C. Assemble and coordinate closeout submittals.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION 01040

SECTION 01200 – PROJECT MEETINGS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Contractor participation in preconstruction conferences.

B. Contractor participation in progress meetings.

C. Contractor administration of progress meetings and pre-installation conferences.

1.2 RELATED REQUIREMENTS

A. Section 01300 – Submittals: Progress Schedules.

B. Section 01700 – Contract Closeout: Project record documents.

1.3 PRECONSTRUCTION CONFERENCES.

A. Engineer will administer preconstruction conference for execution of Owner-Contractor Agreement and exchange of preliminary submittals.

1.4 PROGRESS MEETINGS

A. Schedule and administer Project meetings throughout progress of the Work at weekly intervals, called meetings, and pre-installation conferences.

B. Make physical arrangements for meetings, prepare agenda with copies for participants. Engineer will preside at meetings, record minutes, and distribute copies within three working days to Contractor, participants, and those affected by decisions made at meetings.

C. Attendance: Job superintendent, major subcontractors and suppliers; Owners and Engineer as appropriate to agenda topics for each meeting.

D. Suggested Agenda: Review of Work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions, and other items affecting progress of Work.

1.5 PREINSTALLATION CONFERENCES

A. When required in individual specification Section, convene a pre-installation conference prior to commencing work of the Section.

B. Require attendance of entities directly affecting, or affected by, work of the Section.

C. Review conditions of installation, preparation and installation procedures, and coordination with related work.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION 01200

SECTION 01210 – PRECONSTRUCTION CONFERENCES

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Contractor participation in preconstruction conferences.

1.2 RELATED REQUIREMENTS

A. Section 01040 – Project Coordination.

1.3 PRECONSTRUCTION CONFERENCE

A. Engineer will schedule conference within 15 days after notice of award.

B. Attendance: District Project Manager, Campus Representatives, Engineer, Contractor, Superintendent, and Project Manager.

C. Agenda:

1. Submittal of executed bonds and insurance certificates.
2. Execution of Owner-Contractor Agreement.
3. Distribution of Contract Documents.
4. Submittal of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of responsible personnel.
6. Procedures and processing of field decisions, submittals, product data, submittal log, substitutions, applications for payments, proposal requests, change orders, and Contract closeout procedures.
7. Scheduling.

1.4 SITE MOBILIZATION CONFERENCE

A. Engineer will schedule conference at Project site prior to Contractor occupancy.

B. Attendance: Owner, Engineer, Consultants, Contractors, and major subcontractors.

C. Agenda:

1. Use of premises by Owner and Contractor.
2. Owner’s requirements and occupancy.
3. Construction facilities and controls provided by Owner.
4. Construction facilities and controls provided by Contractor.
5. Temporary utilities provided by Owner.
6. Security and housekeeping procedures.
7. Schedules.
8. Procedures for testing.
9. Procedures for maintaining record documents.
10. Requirements of startup and campus maintenance personnel training of equipment.
11. Inspection and acceptance of equipment put into service during construction period.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION 01210

SECTION 01300 – SUBMITTALS AND MANUALS

PART 1 GENERAL

1.1 WORK INCLUDED

A. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data, and for review and acceptance or rejection by the Engineer.

1.2. REQUIREMENTS INCLUDED

A. Procedures.

B. Construction Progress Schedules.

C. Schedule of Values.

D. Manufacturer's Instructions.

E. Manufacturer's Certificates.

1.3 RELATED REQUIREMENTS

A. Section 01700 – Contract Closeout: Warranties and Manufacturers Certificates.

1.4 PROCEDURES

A. Deliver submittals to Engineer at address listed on cover of Project Manual.

B. Transmit each item under Engineer–accepted form, Identify Project, Contractor, subcontractor, major supplier. Identify pertinent Drawing sheet and detail number, and Specification Section number, as appropriate. Identify deviations from Contract Documents. Provide space for Contractor and Engineer review stamps.

C. Submit initial progress schedules and schedule of values in duplicate within 10 days after date established in Notice to Proceed. After review by Engineer revise and resubmit as required. Submit revised schedules with each second Application for Payment, reflecting changes since previous submittal.

D. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.

E. After Engineer review of submittal, revise and resubmit as required, identifying changes made since previous submittal.

F. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.5 CONSTRUCTION PROGRESS SCHEDULES

A. Submit horizontal bar chart with separate bar for each major trade or operation, identifying first work day of each week.

B. Show complete sequence of construction by activity, identifying work of separate stages and

other logically grouped activities. Show projected percentage of completion for each item of Work as of time of each Application for Progress Payment.

C. Show submittal dates required for shop drawings, product data, and samples, and product delivery dates, including those furnished by Owner and those under Allowances.

1.6 SCHEDULE OF VALUES

A. Submit typed schedule on Contractor's standard form or media-driven printout will be considered on request.

B. Format: Table of Contents of this Project Manual. Identify each line item with number and title of the major Specification Sections.

C. Include in each line item a directly proportional amount of Contractor's overhead and profit.

D. Provide a sub schedule for each separate state of Work specified.

E. Revise schedule to list change orders, for each application for payment.

PART 2 PRODUCTS

2.1 SHOP DRAWINGS

A. Submit shop drawings within 14 days after letter of intent is issued by the Owner. Provide five copies to engineer for review.

2.2 SUBMITTALS

A. Submit submittals within 14 days after letter of intent is issued by the Owner. Provide PDF files to engineer for review.

2.3 AIR BALANCE REPORTS AND CONTROLS COMMISSIONING REPORT

A. Provide air balance report and controls commissioning report to engineer within one week of completion of task.

2.4 OPERATION AND MAINTENANCE DATA

A. Submit 4 copies of Operation and Maintenance Manuals promptly after completion of work for review by the engineer and owner.

1. Preparation of data shall be done by personnel trained and experienced in maintenance and operation of the described products, skilled in technical writing to the extent required to communicate essential data, and draftsmen shall be competent to prepare the required drawings.

PART 3 EXECUTION

3.1 SUBMITTALS

A. Submittals shall be provided in a commercial binder clearly labeled with the project title in 8-1/2"x11" format clearly legible. Products to be used shall be clearly identified on each sheet. If variations are shown on the product sheet then the contractor shall clearly identify which product is being submitted for review. All options and electrical information where shown shall

be clearly identified as to which is being submitted for review.

END OF SECTION 01300

SECTION 01310 – PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Format

B. Content

C. Revision to schedules.

D. Submittals.

1.2 QUALITY ASSURANCE

A. Scheduler: Specialist consultant specializing in scheduling with two years minimum experience in scheduling construction work of a complexity comparable to the Project and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: Five years minimum experience in using and monitoring schedules on comparable project.

1.3 FORMAT

A. Prepare bar charts showing sequence of events.

B, Sequence of Listings: The chronological order of the start of each item of work and completion of each item of work.

C. Scale and Spacing: To provide space for notations and revisions.

D. Sheet Size: Minimum 22x17.

1.4 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by Specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules for each stage of Work as requested by Engineer.

E. Provide sub-schedules to define critical portions of the entire schedule.

F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

G. Provide separate schedule of submittal dates for shop drawings, product data, samples, and dates reviewed submittals will be required from Engineer. Indicate decision data for selection of finishes.

H. Coordinate content with Schedule of Values specified in Section 01370.

1.5 REVISIONS TO SCHEDULES

A. Indicate progress of each activity to date of submittal and projected completion date of each activity.

B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of separate contractors.

D. Revise schedule when outdated to provide accurate indication of progress. See submittals at end of this section.

1.6 SUBMITTALS

A. Required submittals are indicated at the end of this section.

1.7 DISTRIBUTION

A. Distribute copies of reviewed Schedules to project site file, Subcontractors, suppliers, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in Schedules.

PART 4 SUBMITTALS

4.1 REQUIRED SUBMITTALS

A. Include this form with submittals of this specification section. Unless a substitute product is being proposed, then refer to SECTION 01630 for SUBSTITUTION REQUEST.

Contractor's Initials	Contractor is to acknowledge with initials each submittal included. Attach a letter of explanation for each submittal not included.
_____	All submitted products are as specified.

B. SUBMITTALS

_____1.	Submit preliminary outline Schedules within 15 days after date established in Notice to Proceed for coordination with Owner's requirements and work of separate contracts. After review, submit detailed Schedules within 15 days, modified to accommodate revisions recommended by Engineer.
_____2.	Submit revised Progress Schedules with every second Application for Payment.
_____3.	Submit one opaque reproduction and one reproducible transparency.

END OF SECTION 01310

SECTION 01370 – SCHEDULE OF VALUES

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Procedures for preparation and submittal of Schedule of Values.

1.2 FORMAT

A. Contractor's standard form or media-driven printout will be considered on request.

B. Follow Table of Contents of Project Manual for listing component parts. Identify each line item by number and title of major Specifications section.

1.3 CONTENT

A. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress payments. Round off values to nearest dollar.

B. For each major subcontract, list products and operations of that subcontract as separate line items.

C. Include Work Allowances within line item of Work.

D. Coordinate listings with Progress Schedule.

E. Component listings shall each include a directly proportional amount of Contractor's overhead and profit.

F. For items on which payments will be requested as allowed according to the General Conditions for stored products, list sub-values for cost of stored products with taxes paid.

G. The sum of values listed shall equal total Contract Sum.

1.4 SUBMITTAL

A. Required submittals are indicated at the end of this section.

1.5 SUBSTANTIATING DATA

A. When Engineer requires substantiating information, submit data justifying line item amounts in question.

B. Provide one copy of data with cover letter for each copy of Application. Show Application number and date, and line item by number and description.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION 01370

SECTION 01630 – SUBSTITUTIONS AND PRODUCT OPTIONS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Contractor's options in selection of products.

B. Products list.

C. Requests for substitution of products.

D. Substitution Request Form.

1.2 OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.

B. Products Specified by Naming Two or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named.

C. Products Specified by Naming Only One Manufacturer: No option: no substitution allowed.

1.3 PRODUCTS LIST

A. Within 15 days after date of Owner-Contractor Agreement, transmit three copies of a list of major products which are proposed for installation, including name of manufacturer.

B. Tabulate products by Specifications section: number, title, and article number.

C. Products specified only by reference standards, give manufacturer, trade name, model or catalog designation and reference standards.

D. Engineer will reply in writing within ten days stating whether there is reasonable objection to listed items. Failure to object to a listed item shall not constitute a waiver of requirements of Contract Documents.

1.4 LIMITATIONS ON SUBSTITUTIONS

A. During Bidding period, no substitutions shall be considered.

B. Requests for substitutions of products will be considered only within 35 days after date of Owner-Contractor Agreement. Subsequent requests will be considered only in case of product unavailability or other conditions beyond control of Contractor.

C. Substitutions will not be considered when indicated on shop drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.

D. Substitute products shall not be ordered or installed without written acceptance.

E. Only one request of substitution for each product will be considered. When substitution is not accepted, provide specified product.

F. Engineer will determine acceptability of substitutions.

1.5 REQUEST FOR SUBSTITUTIONS

A. Requirements as stated on Substitution Request Form at the end of this section.

1.6 CONTRACTOR REPRESENTATION

A. Requirements as stated on Substitution request Form at the end of this section.

1.7 SUBMITTAL PROCEDURES

A. Submit three copies of request for substitution of the Substitution Request Form at the end of this section.

B. Engineer will review Contractor's requests for substitutions with reasonable promptness.

C. For accepted products, submit shop drawings, product data, and samples.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

SECTION CONTINUED ON NEXT PAGE

SUBSTITUTION REQUEST FORM

PAGE 1 OF 2

Include this form with each request for substitution.

_____

DATE OF REQUEST

General Contractor's Initials _____ SPECIFICATION SECTION _____ PRODUCT

_____ Contractor acknowledges and certifies that this substitution request is with all limitations of paragraph 1.05 LIMITATIONS ON SUBSTITUTIONS

REQUESTS FOR SUBSTITUTIONS

_____A. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.

_____B. Identify product by Specifications section and Article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.

_____C. Attach product data as specified in Section 01340.

_____D. List similar projects using product, dates of installation, and names of Engineer and Owner.

_____E. Give itemized comparison of proposed substitution with specified product, listing variations, and reference to Specifications section and Article numbers.

_____F. Give quality and performance comparison between proposed substitution and the specified product.

_____G. Give cost data comparing proposed substitution with specified product, and amount of net change to Contract Sum.

_____H. List availability of maintenance services and replacement materials.

_____I. State effect of substitution on construction schedule, and changes required in other work or products.

continued on next page

SUBSTITUTION REQUEST

PAGE 2 OF 2

General
Contractor's

Initials

_____

CONTRACTOR REPRESENTATION

_____A. Request for substitution constitutes a representation that Contractor has investigated proposed product and has determined that it is equal to or superior in all respects to specified product or that the cost reduction offered is ample justification for accepting the offered substitution.

_____B. Contractor will provide same warranty for substitution as for specified product.

_____C. Contractor will coordinate installation of accepted substitute, making such changes as may be required for Work to be complete in all respects.

_____D. Contractor certifies that cost data presented is complete and includes all related costs under this Contract.

_____E. Contractor waives claims for additional costs related to substitution which may later become apparent.

END OF SECTION 01630

SECTION 01700 – CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Closeout Procedures.

B. Final Cleaning.

C. Project Record Documents.

D. Operation and Maintenance Data.

E. Warranties and Bonds.

F. Spare Parts and Maintenance Materials.

1.2 CLOSEOUT PROCEDURES

A. Comply with procedures stated in General conditions of the Contract for issuance of Certificate of Substantial Completion.

B. When Contractor considers Work has reached final completion, submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.

C. In addition to submittals required by the conditions of the Contract, provide submittals required by governing authorities, and submit a final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remain due.

D. Engineer will issue final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Order.

1.3 FINAL CLEANING

A. Execute prior to final inspection.

B. Clean interior and exterior surfaces exposed to view: remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.

C. Clean site: sweep paved areas, rake clean other surfaces.

D. Remove waste and surplus materials, rubbish, and construction facilities from the Project and from the site.

1.4 PROJECT RECORD DOCUMENTS

A. Store documents separate from those used for construction.

B. Keep documents current; do not permanently conceal any work until required information has been recorded.

C. At Contract closeout, submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

1.5 OPERATION AND MAINTENANCE DATA

A. Provide data for:

1. Mechanical equipment and controls – Division 15.
2. Electrical equipment and controls – Division 16.

B. Submit two sets prior to final inspection, bound in 8-1/2 x 11 three-ring binders with durable plastic covers.

C. Provide a separate volume for each system, with a table of contents and index tabs for each volume.

D. Part 1: Directory, listing names, addresses, and telephone numbers of: Engineer, Contractor, and Subcontractors.

E. Part 2: Operation and maintenance instructions, arranged by system. For each system, give names addresses, and telephone numbers of subcontractors and suppliers. List:

1. Appropriate design criteria.
2. List of equipment.
3. Parts list.
4. Operating instructions.
5. Maintenance instructions, equipment.
6. Maintenance instructions, finishes.
7. Shop drawings and product data.
8. Warranties.

1.6 WARRANTIES AND BONDS

A. Provide duplicate, notarized copies. Execute Contractor's submittals and assemble documents executed by subcontractors, suppliers, and manufacturers. Provide Table of Contents and assemble in binder with durable plastic cover.

B. Submit material prior to final application for payment. For equipment put into use with Owner's permission during construction, submit within 10 days after first operation. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.7 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that used for construction of Work. Coordinate with Owner, deliver to Project site and obtain receipt prior to final payment.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION 01700

SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 15 Sections, in addition to the general requirements.

B. Mechanical work includes the following: furnish and install all mechanical equipment shown on the mechanical, plumbing, and electrical drawings and described in these specifications. Contractor shall furnish and install, make operable, and test all mechanical equipment shown on the plans. In connection therewith, contractor shall also furnish and install all necessary work, devices, hardware, and systems required to make said equipment properly and safely operable, including but not limited to, mounting hardware and framing, insulation, vibration control devices, piping, valves, systems, energy management systems, and equipment installation startup and commissioning.

1.2 WORK SEQUENCE

A. Install work in phases to accommodate Owner's construction requirements. Refer to Mechanical and Electrical Drawings for the construction details and coordinate the work of this division with that of other divisions. Order the work of this division so that progress will harmonize with that of other divisions and all work will proceed expeditiously. During the construction period, coordinate mechanical schedule and operations with General Contractor and any other related subcontractor.

1.3 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work as required.

1.4 SUBMITTALS

A. Submit the following:

B. Proposed Products List: Include Products specified in the following Sections:

1. Section 15 - Plumbing.

2. Section 15 - Mechanical.

3. Project Drawings

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

D. Equipment and materials shall be ordered only after satisfactory review by Owner and

Engineer.

E. The following statement applies to all items reviewed. "Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for dimensions which shall be confirmed at the job site; fabrication processes and techniques of construction; coordination of his work with that of other trades; and the satisfactory performance of his work."

F. Contractor shall clearly mark the submittal sheet as to which model number, size, color, etc. when there is more than one choice available.

1.5 REGULATORY REQUIREMENTS

A. Conform to 2019 California Building Code.

B. Fire Protection: Conform to 2019 California Fire Code, and California State Fire Marshall Regulations, Title 19, Public Safety.

C. Plumbing: Conform to 2019 California Plumbing Code.

D. Mechanical: Conform to 2019 California Mechanical Code.

E. Electrical: 2019 California Electrical Code.

F. Obtain approved inspections from authority having jurisdiction.

G. Conflicts: Where conflict or variation exists amongst Codes, the most stringent shall govern.

1.6 PROJECT/SITE CONDITIONS

A. Install work in locations shown on drawings, unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other Sections. Obtain permission of owner before proceeding.

C. PIPING LOCATIONS: Piping locations shown are diagrammatic only. Contractor shall verify locations of all lateral stubs, offsets, etc. required in the field. The actual locations of lines, cleanouts and connections may vary provided that complete systems are installed in compliance with codes.

D. CONSTRUCTION OBSERVATION: In addition to the requirement for obtaining inspections by the local jurisdiction, contractor shall notify Engineer at appropriate times during the construction process so that Engineer can visit site to become generally familiar with the progress and quality of contractor's work and to determine if the work is proceeding in general accordance with the contract documents.

E. SCALING OF DRAWINGS: In no case shall working dimensions be scaled from plans, sections, or details from the working drawings. If no dimension is shown on the drawings, the prime contractor shall request in writing that the Engineer provide clarification or the specific dimension.

1.7 QUALITY ASSURANCE

A. Qualification of Manufacturer: Products used in work shall be produced by manufacturers

regularly engaged in the manufacture of similar items.

B. Qualification of Installer: Use adequate number of skilled workman, thoroughly trained and experienced in the necessary crafts, and completely familiar with the specified requirements contained in the plans and specifications.

C. Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured in accordance with ASME, AWWA, or ANSI standards. Power using equipment shall be meet the California energy efficiency standards as defined in the current Title 24 requirements.

D. Welding procedures and testing shall comply with ANSI Standard B31.1.0 standard code for pressure piping and the American Welding Society – Welding Handbook. Welding shall also comply with Division of the State Engineer and structural plan requirements for materials, procedures, qualifications, and inspections.

1.8 DRAWINGS AND SPECIFICATIONS

A. Drawings and specifications are intended to complement each other. Where a conflict exists between the requirements of the drawings and/or specifications, the contractor shall immediately and before commencing work, request clarification from Engineer.

B. The Engineer shall interpret the drawings and the specifications, and the Engineer's decision as to the true intent and meaning thereof and the quality, quantity, and sufficiency of the materials and workmanship furnished there under shall be accepted as final and conclusive.

C. In case of conflicts not clarified prior to bidding deadline, use the most costly alternative (better quality, greater quantity, or larger size) in preparing the Bid. A clarification will be issued to the successful Bidder as soon as feasible after the Award and if appropriate a deductive change order will be issued.

D. All provisions shall be deemed mandatory except as expressly indicated as optional by the word "may" or "option".

E. Examine and compare the contract drawings and specifications with the drawings and specifications of other trades. Report any discrepancies to the Engineer. Install and coordinate the work in cooperation with the other trades.

PART 2 PRODUCTS

A. Maintain uniformity of manufacturer for equipment used in similar applications and sizes.

B. Provide products and materials that are new, clean, free from defects, damage, and corrosion.

C. Provide name/data plates on major components with manufacturer's name, model number, serial number, date of manufacturer, capacity data, and electrical characteristics permanently attached in a conspicuous location on the equipment.

D. Protect materials stored at site and installed from damage.

E. Verify dimensions of equipment and fixtures prior to ordering.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all equipment per the manufacturer's instructions for installing, connecting, and adjusting. A copy of the instructions shall be kept at the equipment during installation and provided to the engineer at his/her request.

B. Adjust pipes, ducts, panels, equipment, etc., to accommodate the work to prevent interferences.

1. Right-of-Way: Lines which pitch have the right-of-way over those which do not pitch. Lines whose elevations cannot change have right-of-way over lines whose elevations can be changed.

2. Provide offsets, transitions, and changes in directions of pipes and ducts as required to maintain proper head room and pitch on sloping lines. Provide traps, air vents, drains, etc., as required. It is the intent of this paragraph that all cost associated with compliance be borne by the contractor.

3. All equipment shall be firmly anchored to building structural elements.

4. Carefully check space requirements with other trades and existing conditions to ensure material, fixtures or equipment can be installed in the spaces allotted.

C. Install all mechanical equipment and plumbing fixtures to allow for service and replacement of coils, motors, belts, filters, gaskets, sheaves, controls, and any other part requiring periodic replacement or maintenance.

D. Disconnect existing chiller and pumps from existing electrical service. Reconnect chiller and pumps with VFD's to existing electrical systems. Provide all needed connectors, conduit, wire, and supports.

3.2 COMMISSIONING

A. All mechanical equipment including chiller, VFD's, and controls shall be commissioned and fully-function tested to verify the proper operation. A written operation report of all equipment shall be provided to the owner two weeks prior to substantial completion.

B. Chiller shall have factory startup & owner training. A written start-up report shall be provided to the owner with set-points and specific operational details.

3.3 SPECIAL TOOLS AND TRAINING

A. The contractor shall provide to the owner any special tools need to service and access the equipment provided in this contract.

B. The mechanical contractor shall provide to the owner one hours of training on operation and maintenance of the new mechanical equipment.

END OF SECTION 15010

SECTION 15130 - METERS, GAUGES AND THERMOMETERS

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work of this section shall include, but is not limited to, the following:

1. Pressure gauges.
2. Thermometers.

1.2 RELATED DOCUMENTS

A. Section 15510 – Hydronic Piping

B. Section 15900 – Energy Management Control System

1.3 SUBMITTALS

A. Submit manufacturer's data for instrument types, materials, accessories and installation.

B. Submit list indicating use, operating range, total range and location.

1.4 QUALITY ASSURANCE

A. Instruments shall be factory calibrated for the temperature and pressure of the systems in which they are installed.

B. Pressure gauges shall be manufactured in accordance with ANSI Specification B-40-1 grade 2A.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Thermometers and Pressure Gauges: Weiss, Trerice, Weskler, Taylor, Ashcroft.

2.2 PRESSURE GAUGES

A. 4-1/2 inch diameter process type in impact resistant phenolic case, glycerin filled phosphorbronze bourdon tube to 600 psi. Brushed stainless steel movement, 1/4 inch brass socket and 1% mid-scale accuracy with front recalibration adjustment, black figures on white background. Provide brass needle valve, snubber and maximum and minimum pointers. Weiss Instrument Model LF4UGYI or equal.

2.3 PRESSURE / TEMPERATURE TEST PORTS

A. Provide test ports 1/2 " NPT made of brass with Nordel core. In addition, supply three kits consisting of 1/4" NPT pressure gauge, gauge adapter with 1/8" probe and protecting shield, bi- metal thermometer range 25 F to 125 F with 5" stem and 1-3/4" diameter dual, bi-metal thermometer range 20 F to 240 F with 5 degree increments: stem and 1-3/4" diameter dial. Each kit to be provided in an impact resistant carrying case.

2.4 THERMOMETERS

A. 3-inch diameter with adjustable angle dial face, bi-metal thermometer, 2 F scale division, accurate to plus or minus 1 percent of scale range, Type 304 stainless steel

case and bezel, shatterproof glass window, silicone filled. Weiss Model SF5VBM or equal.

B. Thermometers shall be installed where shown on the drawings or as specified. Pressure temperature ratings of each thermometer shall be suitable for the system in which it is installed. Thermometers shall have the following insertion lengths:

1. 4" and 5" Pipe - 2-1/2".
2. 6" and up - 4".
3. Provide Type 304 stainless steel wells for all pipe mounted thermometers.
4. Provide extended wells and stem lengths to accommodate insulation thickness for insulted pipe applications.

C. Scale shall be based on the following schedule:

1. Chilled Water - 30 to 130 Deg. F

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide one pressure gauge per chiller. Install piping from pressure gauge to taps before strainers and on suction and discharge of chiller. Install isolation valves at each side of pressure gauge tees.

3.2 SCHEDULE

A. Pressure Gauges:

1. Pumps .

2. Chiller

Other locations as indicated on drawings.

C. Thermometers:

1. Chiller. Chilled water and condenser water

D. Pressure Gauge:

1. Chiller (differential pressure) Chilled water and condenser water.
2. Pumps (differential pressure).

END OF SECTION 15130

SECTION 15140 - SUPPORTS AND ANCHORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and equipment hangers and supports.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

1.2 RELATED SECTIONS

A. Section 15260 - Piping Insulation.

B. Section 15510 - Hydronic Piping.

1.3 REFERENCES

A. ASME B31.2 - Fuel Gas Piping.

B. ASME B31.9 - Building Services Piping.

C. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

D. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturers.

E. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

F. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.4 SUBMITTALS

A. Submit the following:

B. Product Data: Provide Manufacturers catalog data including load capacity.

1.5 REGULATORY REQUIREMENTS

A. Conform to 2019 California Plumbing Code for support of piping

B. Chapter 16A of the 2019 California Building Code

PART 2 PRODUCTS

2.1 PIPE HANGERS, STEEL STRUT, AND SUPPORTS

A. Manufacturers:

1. Cooper B-Line's Tolco™.
2. Other acceptable Manufacturers offering equivalent products.
3. All exterior materials shall be hot dipped galvanized or stainless steel.

a) Unistrut.
b) Michigan Hanger
c) Or equal.

B. Hydronic Piping and Drains

1. Conform to ASTM A36, A-53, A-500 Grade B, A-123
2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Pre-Galvanized Carbon steel, adjustable, ring hanger.
3. Floor Support for Pipe: B-line B-22 strut secured to Galvanized HSS steel tube, welded, HSS to center of base plate. Galvanized steel base plate.
4. See mechanical plans and details for more information.

C. Equipment

1. Support or anchor all equipment per CBC requirements.
2. All equipment shall be braced to resist seismic induced motion.
3. All materials that are to be installed outside shall be hot dipped galvanized or powder coated epoxy.

2.2 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.3 ANCHORS

A. Steel Wedge Type A.

1. Install per ICC report requirements.
2. All anchors shall be tighten prior to inspection request.
3. Test per CBC, DSA, and structural plans requirements

B. Epoxy

C. Install per ICC report requirements.

1. All anchors shall be tightened prior to inspection request.
2. Test per CBC, DSA, and structural plans requirements

D. Manufacturers:

1. Hilti KB-TZ2 (ICC ER – 4266)
2. Simpson Wedge-All (ICC ESR-1396)
3. Redhead Tru-bolt (ICC ESR-1372)
4. Simpson Titen HD (ICC ESR - 2713)

2.4 SEISMIC RESTRAINT

1. Materials for piping and duct seismic restraint shall be per approved plans.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with Manufacturer's instructions.

B. Support ducting per 2019 California Mechanical Code Requirements.

C. Brace all piping & ducting per the approved plans.

3.2 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled and per approved plans.

B. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.

C. Place hangers within 12 inches (300 mm) of each horizontal elbow.

D. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet (1.5 m) maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Install plastic pipe isolators for copper cold & hot piping at all wood penetrations.

M All pipes shall be braced to resist seismic induced motion based upon the approved plans.

3.3 EQUIPMENT BASES AND SUPPORTS

A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

3.4 SCHEDULES (See plans and details for more information)

MAXIMUM PIPE SIZE Inches (mm)	HANGER ROD HANGER SPACING Feet (m)	DIAMETER Inches (mm)
4 to 6 (100 to 150)	8 (3)	5/8 (15)

END OF SECTION 15140

SECTION 15190 - MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Valve and automatic damper identification.

B. Equipment identification.

C. Piping identification.

1.2 RELATED SECTIONS

1.3

A. Section 15510 - Hydronic Piping.

B. Section 15900 - Energy Management Control System.

1.4 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.5 SUBMITTALS

A. Submit under provisions of Division 1.

B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Submit valve and damper chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number. Submit lists of pipe and equipment to be labeled.

D. Product Data: Provide manufacturers catalog literature for each product required, including samples of valve and damper tags, equipment identification and piping identification. .

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Maintenance Manuals: Provide valve and damper tag schedules for inclusion in maintenance manuals.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Brady / Seton

B. Stranco

2.2 VALVE AND DAMPER IDENTIFICATION

A. All tagged components shall be in accordance with ANSI A13.1.

B. For valves and automatic dampers, use metal tags 2 inch minimum diameter, fabricated of brass, stainless steel or aluminum.

C. Attach tags with jack chain S-hook or split ring of same materials.

D. For stamped tags, use 1/4 inch high letters.

2.3 LABELS

A. Labels shall have 2 inch high letters and integral directional flow arrows. Smaller letters may be used only when space does not permit 2 inch high lettering.

B. For piping up to 5 inch diameter, use pre-formed snap-on markers - Seton "Setmark" or equal. For piping 6" diameter and up, used pre-formed strap-on markers - Seton "Setmark" or equal.

C. Pressure sensitive tapes are not acceptable.

2.4 EQUIPMENT IDENTIFICATION

A. Mechanical equipment shall be identified by means of nameplates permanently screw fastened to the equipment. Nameplates shall be black surface, white core laminated bakelite with engraved letters. Plates shall be a minimum of 3" long by 2" wide with white letters 3/8" high.

B. Identification of Energy Management Control System to be as per Section 15860 and Division 16 requirements.

C. Color code as follows:

1. Yellow - HVAC equipment
2. PART 3 EXECUTION

3.1 VALVE AND AUTOMATIC DAMPER IDENTIFICATION

A. Identify equipment with identical letters and/or numbers as used on drawings. Where space is available use full name of equipment. Attach nameplates in a permanent manner in a location that will be clearly visible after installation is complete.

B. Controls identification shall be as specified in Section 15860 and Division 16. Also identify controls not included in Section 15860 such as switches, alarms, remote pushbutton switches with 1-1/4" high lettering and laminated plastic plates screwed or chained to equipment.

3.2 PIPING IDENTIFICATION

A. Piping identification shall be in conformance with ANSI A3.1.

B. Identify piping systems with color coded bands, sharply contrasting with background. Locate bands near strategic points, such as valves, items of equipment, changes in direction, wall penetrations, capped stub outs for future connection and every 40 feet of straight runs. If necessary, paint a stripe background of black or white to obtain contrast.

C. Apply bands where they can be easily read. Provide bands with backgrounds of different colors.

D. Drain piping serving mechanical equipment items for which the drain discharge is not visible from the equipment shall be marked near the point of discharge indicating the item of equipment served.

E. Identify service, damper, duct access door, piping and equipment behind all access doors.

F. Removable ceiling tile shall be marked by small color markings at corner of tile or door in accordance with the following color assignments:

1. HVAC - yellow

3.3 EQUIPMENT IDENTIFICATION

A. Install tags at all air handlers, pumps, fan coils, exhaust fans, vav boxes, and boilers. Tags shall uniquely identify the unit and also describe the area served.

B. Terminal equipment installed in ceiling spaces such as mixing boxes, fan coil units, heat pumps, etc. shall have identifying number stenciled on bottom of unit so that it is visible from below.

END OF SECTION 15190

SECTION 15260 - PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED SECTIONS

A. Section 15510 - Hydronic Piping.

1.3 REFERENCES

A. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

C. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

D. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

E. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

F. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

G. ASTM C552-88 - Cellular Glass Block and Pipe Thermal Insulation.

H. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

I. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

J. ASTM C1136 - Flexible Low Permeance Vapor Retarders for thermal Insulation: Types I & II.

K. ASTM E96 - Water Vapor Transmission of Materials.

L. NFPA 255 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit the following:

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer's Installation Instructions: Indicate procedures, which ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with

NFPA 255.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of the general conditions.

B. Deliver materials to site in original factory packaging, labeled with Manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by Manufacturer of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 GLASS FIBER FOR ABOVE GROUND CHILLED WATER PIPING

A. Manufacturers:

1. Above Ground, Knauf Earthwook with ASJ Jacket & PVC fittings, or equal.

B. Insulation: ASTM C547; rigid molded, noncombustible.

1. 'K' ('ksi') value: ASTM C335, 0.24 at 75 degrees F (0.035 at 24 degrees C).
2. Minimum Service Temperature: -20 degrees F (-28.9 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket

1. ASTM C1136.
2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
3. Secure with self-sealing longitudinal laps and butt strips.

2.2 CLOSED CELL INSULATION FOR MISCELLENOUS PIPING

A. Manufacturers:

1. Armaflex or equal

2. Closed cell neoprene type insulation

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install materials in accordance with Manufacturer's instructions.

B. On exposed piping, locate insulation and cover seams in least visible locations.

C. For insulated pipes conveying fluids below ambient temperature:

1. Provide standard jackets, with vapor barrier, factory applied or field applied.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive.

3. PVC fitting covers may be used at interior locations.

D. Finish insulation at supports, protrusions, and interruptions. Cover all valves and fittings with custom made insulation covers.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 GLASS FIBER INSULATION SCHEDULE

PIPING SYSTEMS	PIPE SIZE Inch (mm)	THICKNESS Inch (mm)
Chilled Water Systems	1/2"-1-1/2"(12.7-38.1)	1" (25.4)
Chilled Water Systems	2"-6"(50.8 -152.4)	2" (50.8)

END OF SECTION 15260

SECTION 15510 - HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings for:

1. Heating water piping system.
2. Chilled water piping system.

B. Valves:

1. Globe or angle valves.
2. Ball valves.
3. Check valves.

C. Domestic water piping system.

D. Condensate drain piping system.

1.2 RELATED SECTIONS

A. Section 15260 - Piping Insulation.

B. Section 15515 - Hydronic Specialties.

C. Section 15545 - Chemical Water Treatment: Pipe cleaning.

1.3 REFERENCES

A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brasing Operators.

B. ASME B31.9 - Building Services Piping.

C. ASTM A53 - Pipe, Steel.

D. ASTM A234 - Fittings, forged steel welding type.

E. ASTM B16.3 - Fittings, malleable iron.

F. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

G. ASTM B32 - Solder Metal.

H. ASTM B88 - Seamless Copper Water Tube.

I. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.

1.4 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use grooved mechanical couplings and fasteners in accessible locations.

C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

D. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

E. Provide pipe hangers and supports in accordance with ASTM B31.9 unless indicated otherwise.

F. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

G. Use globe valves with differential pressure ports for throttling, bypass, or manual flow control services.

H. Use 3/4 inch (20 mm) gate ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.5 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Record actual locations of valves and piping.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit to owner.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.8 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

B. Perform Work in accordance with State of California plumbing code.

C. Conform to applicable code for installation of backflow prevention devices.

D. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices. Pay all fees required.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Division 1.

B. Provide two repacking kits for each size and valve type.

PART 2 PRODUCTS

2.1 CHILLED WATER PIPING

A. Steel Pipe: ASTM A53, Schedule 40, US Manufactured.

1. Fittings: ASME B16.3, malleable iron or ASTM A234, forged steel welding type.
2. Joints: Grooved, Threaded or AWS D1.1 welded. Final connections to chiller may be made with grooved style connections.

B. Copper Tubing: ASTM B88, Type L, hard drawn, US Manufactured.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper, US Manufactured.
2. Joints: Solder, lead free, Bridgit.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: ASTM B88, Type L, hard drawn, US Manufactured.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper, US Manufactured.
2. Joints: Solder, lead free, [ASTM B32,] 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F (220 to 280 degrees C).

2.3 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches (50 mm) and Under:

1. Copper Pipe: Bronze, soldered joints.
2. Steel Pipe: 150 psig malleable iron, threaded.

B. Flanges for Pipe Over 2 Inches (50 mm):

1. Ferrous Pipe: 150 psig forged steel, slip-on.
2. Gaskets: 1/16 inch thick preformed neoprene.

C. Grooved and Shouldered Pipe End Couplings:

1. Housing Clamps: Malleable iron to engage and lock, designed to permit some angular deflection, contraction, and expansion.
2. Sealing Gasket:
3. Accessories: Steel bolts, nuts, and washers.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.4 BUTTERFLY VALVES AND STRAINERS

A. Up To and Including 2 Inches (50 mm):

1. Manufacturers:
   a) Stockham
   b) Nibco
   c) Apollo

B. Over 2 Inches (50 mm):

1. Manufacturers:
   a) Stockham
   b) Nibco
   c) Apollo

2.5 BALL VALVES

A. Up To and Including 2 Inches (50 mm):

1. Manufacturers:
   a) Apollo
   b) Nibco
   c) Stockham

B. Over 2 Inches (50 mm):

1. Manufacturers:
   a) Apollo
   b) Nibco
   c) Stockham

2.6 FLEX CONNECTIONS

A. Up to and including 6 Inches:

1. Manufacturers.
   a) Metraflex

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Prepare piping connections to equipment with flanges or unions.

C. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

D. After completion, fill, clean, and treat systems. Refer to Section 15545

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water to ASME B31.9. Install chilled water piping to ASME B31.5.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Slope piping and arrange to drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

J. Provide access where valves and fittings are not exposed.

K. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Division 9.

L. Install valves with stems upright or horizontal, not inverted.

END OF SECTION 15510

SECTION 15515 - HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air Vents
B. Strainers.
C. Buffer Tank
D. Air Seperator

1.2 RELATED SECTIONS

A. Section 15510 - Hydronic Piping.

B. Section 15545 - Chemical Water Treatment: Pipe Cleaning.

1.3 REFERENCES

A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

1.4 SUBMITTALS

A. 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, model and dimensions.

B. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Record actual locations of all equipment.

1.6 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. 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

2.1 AIR VENTS

A. Manual Type: Short vertical sections of 2 inch (50 mm) diameter pipe to form air chamber, with 1/8 inch (3 mm) brass needle valve at top of chamber.

B. Float Type:

1. Manufacturers:
   a) Bell & Gossett
   b) Armstrong.

2.2 STRAINERS

A. Size 2 inch (50 mm) and Under:

1. Manufacturers:
   a) Bell & Gossett
   b) Armstrong.

B. Size 2-1/2 inch (65 mm) to 6 inch (100 mm):

1. Manufacturers:
   a) Bell & Gossett

2.3 BUFFER TANK

A. Welded steel with flanged connections and baffle. 2” Insulation with aluminum jacket. Tested to 163 PSIG.

B. Manufactures

1. Roy E. Hanson Jr.
2. American Wheatly.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Where large air quantities can accumulate, provide enlarged air collection standpipes.

C. Provide manual air vents at system high points and as indicated.

D. Provide valved drain and hose connection on strainer blow down connection.

E. Pipe relief valve outlet to nearest floor sink.

F. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

G. Install air vent at top of buffer tank. Anchor tank per details. Insulate all fitiings.

END OF SECTION 15515

SECTION 15545 - CHEMICAL WATER TREATMENT

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work of this section shall include, but is not limited to, the following:

1. Chilled water piping.

1.2 RELATED DOCUMENTS

A. Section 15010 – Mechanical General Provisions.

1.3 SUBMITTALS

A. Description of treatment program including calculations, list of chemicals and quantities of chemicals to be used.

B. Provide written report witnessed by Contractor containing log and procedure of system cleaning, giving times, dates, problems encountered and condition. of water.

C. Manufacturer’s installation instructions.

D. Manufacturer’s descriptive literature, operating instructions, and maintenance and repair data.

E. Properties and product datasheets for all chemicals.

1.4 REFERENCES

A. ASRAE – American Society of Heating Refrigeration and Air Conditioning Engineers.

B. UL – Underwriter’s Laboratories

C. OSHA – Occupational Safety and Health Act.

D. EPA – Environmental Protection Agency.

1.5 QUALITY ASSURANCE

A. Retain a national water treatment chemical company to provide water treatment chemical feed equipment and chemicals for circulating water systems, steam systems and equipment as defined herein and as may be required to maintain the integrity of the piping systems and mechanical equipment.

B. The water treatment chemical and service supplier shall be a recognized specialist, active in the field of industrial water treatment, whose business is in the field of water treatment, and who has full time personnel within the trading area of the job site.

C. Furnish and install all equipment and material on this project in accordance with the

requirements of the authority having jurisdiction, suitable for its intended use on this project, approved by the Environmental Protection Agency (EPA), and so certified by the manufacturer.

D. Treatment standards:

1. Closed Recirculating Water Systems: Hot water, glycol, chilled water and closed condenser water (220° F).

a) Nontoxic organic corrosion and scale inhibitor. Control level: 2000 ppm as total organic inhibitor.

b) Molydate: Control level: 200-300 ppm.

c) Nitrate: Control level: 500-700 ppm Hot Water as NO^2.

d) PH: Control level: 7-9.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Chemical Water Treatment Service:

1. Nalco
2. Mogul
3. or equal.

2.2 PRESTART-UP CLEANING AND FLUSHING

A. Furnish all required pipe cleaning chemicals, chemical feed equipment, materials, and labor necessary to clean the piping as herein specified. In addition, permanently install necessary chemical injection fittings complete with stop valves and coupon racks, etc.

B. Provide a prestart-up, non-foaming, liquid detergent dispersant cleaner for cleaning of all water systems to remove oil and foreign matter from the piping and equipment prior to the final filling of the systems. This chemical shall not be injurious to persons, piping, pipe joint compounds, packing, coils, valves, pumps and their mechanical seals, tubes or other parts of the system.

C. Furnish instructions dictating the quantities of the cleaner to use, methods and duration of the operation.

2.3 WATER TREATMENT CHEMICALS

A. Provide proper chemical treatment for entire building water loop including the following:

1. Closed System Chemical Treatment (Chilled Water: Liquid nitrate to reduce scale

deposits, to adjust pH and to inhibit corrosion. Treatment shall not contain any chromates or other toxic substances.

PART 3 EXECUTION

3.1 TECHNICAL SERVICE AND CONTROL

A. The entire chilled water loop for the building shall be cleaned and flushed. Coordinate with owner for timing of flushing shutdown.

B. Supervise the cleaning of chilled water systems and provide a written certification of cleanliness at completion of cleaning procedure. Install water treatment chemicals to proper levels. Provide report.

C. Provide a one hour training program to the Owner's operating personnel instructing them clearly and fully on the installation, care, maintenance, testing, and operation of the water treatment system. The training course shall be arranged by the mechanical contractor at the start up of the system.

3.2 INITIAL CLEANING OF SYSTEMS

A. Upon completion of cleaning, dose system with chemicals to obtain specified treatment conditions.

END OF SECTION 15545

SECTION 15550 HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Close-coupled, in-line centrifugal pumps.

1.3 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

1.4 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated.

C. 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.

D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One mechanical seal for each pump.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grundfos/Paco Pumps Corporation.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump for installation with pump and motor shafts mounted horizontally or vertically.

C. Motor: Single speed Rated with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Inverter rated

D. Capacities and Characteristics: See Schedule on Plans.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

B. Suspend vertically mounted, in-line centrifugal pumps per detail on plans. Install pumps with motor and pump shafts vertical.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install pressure gages on pump suction and discharge. Install single gage with multiple input selector valve.

F. Install flexible electrical connections for power, controls, and devices.

END OF SECTION 232123

SECTION 15682 - WATER COOLED CHILLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chiller package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Chilled water connections.

1.02 RELATED SECTIONS

A. Section 15510 - Hydronic Piping.

B. Section 15900 - Energy Management Control System

1.03 REFERENCES

A. ANSI/ARI 590 - Reciprocating Water - Chilling Packages.

B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

C. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.

D. ANSI/ASME SEC 8 - Boiler and Pressure Vessel Code

E. ANSI/UL 465 Ä Central Cooling Air Conditioners.

1.04 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Submit shop drawings indicating components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate valves, strainers, and thermostatic valves required for complete system.

C. Submit product data under provisions of Division 1.

D. Submit product data indicating rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

E. Submit written certification that components of package not furnished by manufacturer have been selected in accordance with manufacturers requirements.

F. Submit manufacturer's installation instructions.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operations data under provisions of Division.

B. Include start-up instructions, maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

C. Submit maintenance data under provisions of Division 1.

1.06 REGULATORY REQUIREMENTS

A. Conform to ANSI/ARI 590 code for testing and rating of reciprocating water chillers.

B. Conform to ANSI/UL 465 code for construction of reciprocating water chillers.

C. Conform to ANSI/ASME SEC 8 Boiler and Pressure Vessel Code for construction and testing of reciprocating water chillers.

D. Conform to ANSI/ASHRAE 15 code for construction and operation of reciprocating water chillers.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

D. Protect units on site from physical damage.

1.08 MAINTENANCE SERVICE

A. Furnish service and maintenance of complete assembly for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CHILLER

A. Refrigeration shall be scroll type with Puron (R-410A) chlorine free refrigerant, dual independent refrigerant circuits, multi- step capacity control, micro-processor control capable of interface with energy management system. Interface shall be able to pass status, water temperatures, electrical information, loading, alarm, refrigerant information to EMS, and shall be BACnet capable.

B. Unit base shall be heavy gage painted galvanized steel. Cabinet shall be galvanized steel with baked enamel finish.

C. Install flow switch, isolation valves, flex connectors, and pressure gauges as required by manufacture and shown on the plans.

D. Options – Factory install energy management module, dual point electrical connection, circuit breaker with external overloads, compressor suction service valve.

F. Cooler shall be shell and tube direct expansion type with seamless copper tubes with two independent circuits. All cold components shall be insulated with closed cell insulation.

H. Unit shall have the following safeties; Loss of refrigerant, reverse rotation, low chilled fluid temperature, flow switch, thermal overload, high pressure, electrical overload, and

loss of phase.

I. Manufacturer

1. Quantech Model
2. York Model 0104SE

K. Provide factory start-up and tuning with written report. Provide 2 hours of factory training.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor chiller per details.

C. Connect to electrical service. Refer to Division 16.

D. Arrange piping for easy dismantling to permit tube cleaning.

E. Connect to piping, electrical, and controls.

3.02 MANUFACTURER'S FIELD SERVICES

A. Supply service of factory trained representative, supervise testing, dehydration and charging of machine, start-up, and 1 hours of instruction on operation and maintenance to Owner.

B. Supply initial charge of refrigerant and oil.

3.03 DEMONSTRATION

A. Provide systems demonstration including the operation of all stage functions, alarm Reset set-point to stage compressors. Turn pump off to show shutdown on loss of flow.

END OF SECTION 15682

SECTION 15900 - ENERGY MANAGEMENT CONTROL SYSTEM

PART 4 - GENERAL

4.1 GENERAL REQUIREMENTS

A. The contract documents shall apply in their entirety to the work specified herein.

B. Submittals: Submit shop drawings and manufacturer's data in accordance with this section.

C. Maintenance and Operation Manuals: Provide 2 copies of manufacturer's operation and maintenance manual to owner.

1. Include: Shop drawings, wiring diagrams, network architecture and manufacturers' Owners manuals.

4.2 SYSTEM DESCRIPTION

A. This document contains the specification, input/output summaries for the Building Automation and Control System (BACS). The system architecture shall be an EIA-485 BACnet controller network. Operator Workstations may be connected to the controller network via direct EIA-232, modem, or Ethernet local area network connections through a microprocessor-based communication device.

B. Owner currently is operating a Campus-wide Automated Logic Control System. No substitution is allowed.

4.3 SCOPE OF WORK

A. General: Furnish and install all necessary hardware, software, wiring and computing equipment as defined in this specification.

B. System Requirements:

1. All materials and equipment used shall be standard components, regularly manufactured and available and not custom designed especially for this project. All systems and components, except site specific software, shall have previously been thoroughly tested and proven in actual use prior to installation on this project.

2. The system architecture shall be fully modular permitting the expansion of application software, system peripherals, and field hardware.

3. The DDC system upon completion of the installation and prior to acceptance of the project shall perform all operation functions as detailed in these specifications.

C. System hardware shall include all necessary controllers, thermostats, control transformers, relays, wiring and all other devices and equipment required to provide a complete and operating system.

D. Include all programming and building graphics to control the HVAC systems shown on the plans. Included in the programming shall be alarm limits and system trending.

4.4 SUBMITTALS, DOCUMENTATION AND ACCEPTANCE

A. Submittals:

1. Shop drawings. A minimum of three copies of shop drawings shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog sheets and installation instructions. Shop drawings shall also contain complete wiring and routing, ID numbers of devices and any other details required to demonstrate that the system will function properly. Drawings shall show proposed layout and installation of all equipment and the relationship to other parts of the work.
2. Programming.
3. Block diagram.
4. Equipment.

B. Project Specific Manuals.

C. Acceptance Test and Acceptance.

1.5 RELATED SECTIONS

A. Sections 01 9113 General Commissioning Requirements

PART 5 - PRODUCTS

5.1 HARDWARE

A. Network Computer

1. Owner has existing computer with Automated Logic Programming installed.

B. System Components – The Contractor shall provide the following:
1. Wire, conduit, connections, reprogramming with graphics, sensors, relays, transformers as needed. .

5.2 CONTROLS MANUFACTURER

A. Manufacturer: Subject to compliance with requirements, provide products by the following:

1. Automated Logic Controls.

5.3 SOFTWARE MANUFACTURER

A. Manufacturer: Subject to compliance with requirements, provide products by the following:

1. Automated Logic Controls. No substitution allowed.

B. Install the most recent version of program. Upgrade existing campus programming as needed to be compatible with new software version.

PART 6 - EXECUTION

6.1 EXECUTION

A. Provide all necessary programming to fully optimize the operation of the building's HVAC systems. Provide fully commented programming and notes to owner. Provide submittal of control block diagram for Owner's and Engineers review and approval. Include in bid two revisions of programming for control optimization. Integrate programming and graphics into existing system. Coordinate any system shutdowns with Owner.

B. Provide 1 hours of training to Owner's representative after system is fully functional.

1. Provide system manual to Owner.
2. Provide documentation of complete system testing.

C. Install all necessary equipment including but not limited to: controllers, thermostats, computer interface, programming, surge protectors, wiring, cables, connectors, conduit, relays, etc. required to provide a complete working energy management system.

D. Label all control components per Division 16 requirements. All boxes with controller shall have an accurate laminated control diagram fixed to the inside cover.

E. Minimum conduit size shall be 3/4 inch.

F. Provide for 2 sets of minor programming changes to any and all systems to optimize system after continuous operation is observed in both heating and cooling seasons respectively.

6.2 SEQUENCE OF OPERATION

A. The new Building Automation System (bas) shall control all mechanical equipment, except where noted. The bas shall be Automated Logic Corp. (alc) controls system. The system shall control, monitor and generate alarms as specified herein. The system program shall maintain trending information on all system functions, unless otherwise specified. Each piece of mechanical equipment shall be controlled by a unitary control module (module), unless otherwise specified.

B. Air Handling Units (AH-1): This is a heat exchanger unit providing tempered outside air to the building and other air handlers and fan coils. AH 1 shall be started and stopped on a schedule per College parameters. The ahu fan shall run continuously during the scheduled occupied mode. The bas shall control the vfds on the supply and return fans.

C. Chiller shall operate based on building schedule. The chiller shall have a Bacnet connection. The chilled water setpoint shall adjusted based on outside air temperature (OAT) from 55 F @ 70F OAT to 45 F @ 90 F OAT (adj).

D. Chiller Alarms:

1. An alarm shall be generated when the primary loop pump is called “on” and the flow switch fails verify chw flow.
2. An alarm shall be generated when the primary pump is called “on” and the pump status sensor fails to verify pump “on”.
3. An alarm shall be generated when the secondary loop pump is called “on” and the pump status sensor fails to verify the pump “on”.
4. An alarm shall be generated when the pumps are verified “on”, the flow switch is made and the pressure sensor fails to verify proper loop pressures.
5. An alarm shall be generated when the chiller is enabled and the temperature sensor fails to verify specified chw temperatures (chiller failure).

E. Unoccupied Mode: The chiller system shall have the capability of running in the unoccupied mode when a zone tlo (timed local override) is activated and an “on” call is broadcast to the chiller module.

6.3 TESTING

A. All control functions shall be tested for performance. This testing shall be done after all programming and graphics have been completed and installed on the Owner’s computer system.

B. Reports shall be provided that details each element, including but not limited to sensors, vav boxes, controllers, and its verified performance.

C. After the reports are provided and reviewed, the Engineer and Owner shall witness test (with Controls Contractor) the operation of the system.

END OF SECTION 230900