# BLAKE ENGINEERING PLLC

# BID Addendum No. 1

June 15, 2022

## Cornwall Central School District
## HS Cooling Tower Replacement Project

NYSED Project Control Number: 44-03-01-06-0-012-008

This BID Addendum No. 1 forms part of the Contract Documents and modifies the original documents issued for bid on May 27, 2022.

**REVISIONS TO THE PROJECT MANUAL**

| NO. | SECTION | REVISION DESCRIPTION |
|---|---|---|
| 1 | **230515** | **REPLACE** Section 002113 with the attached Section 002113 – Instructions to Bidders |
| 2 | **230515** | **ADD** the attached Section 230515 – Variable Frequency Drives |

**REVISIONS TO THE CONTRACT DRAWINGS**

| NO. | DRAWING | REVISION DESCRIPTION |
|---|---|---|
| 1 | **M.101** | **REPLACE** drawing sheet M.101 with the attached sheet M.101. |
| 2 | **M.103** | **REPLACE** drawing sheet M.101 with the attached sheet M.101. |

**RESPONSES TO RFIs**

1. ED-202 shows note for us to temporarily disconnect/remove & store lights? Can we get a count and type of lights we need do this for? Plan does not show anything, just an empty space?
    a. ***RESPONSE: We don't have an exact count within this space. Assume that there are (10) 2'x4' light fixtures***

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2. Can you confirm that all the work will be done on 2nd shift after school hours?
    a. ***RESPONSE: Refer to Section 011100 Paragraph E, work can be performed on 1st or 2nd shift. Work within student occupied areas will have to be coordinated with the Owner so that the space can be made available as required to complete the work.***
3. Can you confirm that there is no allowance for each contract?
    a. ***RESPONSE: Confirmed, there are no allowances.***
4. Can you clarify who is responsible for the removal of the equipment, cooling tower, pumps, etc? I assume we are just disconnecting power and the Mechanical contractor will remove and replace all equipment shown? Please confirm?
    a. ***RESPONSE: Mechanical contractor is responsible for demolition of the mechanical equipment (cooling tower, pumps, etc.), Electrical contractor is responsible for the disconnection of power to the equipment and the demolition of all electrical components (wiring, conduit, switches, VFDs, breakers, etc.)***
5. Can you confirm the use of EMT for all new mechanical branch circuits or does it need to be GRS?
    a. ***RESPONSE: Refer to Section 260533 Paragraph 3.1. This table identifies what type of conduit materials are required for which applications.***
6. Can you provide the ceiling heigh in the chiller room, mechanical room shown on E2.01?
    a. ***RESPONSE: We don't have an exact but we estimate that the ceiling height in the chiller room and mechanical room is approximately 12'-0".***
7. Can you provide details/pictures of existing panel PMPNH1 that we need to provide new breaker for?
    a. ***RESPONSE: Panel BMPNH1 is a 600A,480Y/277VAC, 3 Ph., 4 Wire, Square D I-Line panelboard catalog number 12163705060080001. The panel currently has (8) 3-pole circuit breakers installed with open spaces available.***
8. Who is to furnish the VFD/disconnect shown on E2.01 for the new pumps? I assume the mechanical contractor will furnish and we install? Please confirm?
    a. ***RESPONSE: Refer to Section 011200 Paragraph 1.6.B.10.a. MC shall furnish disconnects, VFDs, starters for installation by the EC.***
9. Please confirm there is no Fire Alarm scope of work needed for this project?
    a. ***RESPONSE: Confirmed.***
10. E2.03 note for us to install conduits up through roof provided by mechanical contactor? What size conduit are we installing and where from so we know the route and LF we need to install?
    a. ***RESPONSE: Power for the cooling tower comes from existing panelboard BFLNH2, see panel schedule 2 on sheet E.101. Panel is located in electrical closet as shown on sheet E.202.***
11. We need location of cooling tower in respect to the panel location BFLNH2, plans do not show column number or anything to direct us to how far the panel is from the cooling tower? We need the wiring diagrams in order to provide all the wiring and conduit to the 4 fan motors called out for new cooling tower?
    a. ***RESPONSE: The cooling tower is located above the room labeled Faculty Dining on sheet E.202. This space is now connected to the General Music classroom, so it is a student occupied space. We do not have wiring diagrams for the cooling tower, we suggest reaching out to the tower manufacturer for diagrams or additional information.***

12. For the lightning protection, the vendor wants to know if you need a UL master label certification, this is only provided with new systems, this is just a simple disconnect and reconnect right, no need to extend the system or recertify correct?
    a. ***RESPONSE: Recertification of the system is not required as the scope is just a disconnect and reconnect of the existing air terminals, the quantity of terminals and overall layout of the system is not changing.***
13. Can you please forward a budget for the Mechanical Construction (MC) contract?
    a. ***RESPONSE: We don't have a detailed breakdown of the budget to share but the overall budget for all project scope/contracts is $750,000.***
14. Are there liquidated damages?
    a. ***RESPONSE: Yes, see the revised Section 002113 Instructions to Bidders attached to this document for additional information.***
15. Does the condenser water receive insulation? If so, please provide a specification.
    a. ***RESPONSE: No, insulation is not required on the condenser water piping.***
16. The rigger is requesting if the 40' container and shed can be moved to allow for the crane to positioned properly. Please advise.

    ***RESPONSE: The 40' container and shed can be temporarily relocated if necessary to allow for proper crane positioning. Contractor is responsible to move container and shed to an adjacent location on the site and then to position back in the original position after crane work is complete.***

# SECTION 002113 – INSTRUCTIONS TO BIDDERS

## PART 1 - DEFINITIONS

A. Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Invitation to Bid, Instruction to Bidders, the Bid Form, Supplementary Bid Forms and other sample bidding and contract forms.

B. Contract Documents include the Contract Forms between the Owner and Contractor, Contractor's executed Bid Form and executed Supplementary Bid Forms, Conditions of the Contract (General, supplemental and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

C. Definitions set forth in the General Conditions of the Contract of Construction, or in other Contract Documents are applicable to the Bidding Documents.

D. Addenda are written or graphic instruments issued by the Engineer prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

E. A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1. Wherever the word "Bid" occurs in the documents, it refers to Bidders Proposal.

F. The Base Bid is an amount stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents.

G. An Alternate is an amount stated on the Bid Form to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

H. A Unit Price is an amount stated on the Bid Form as a price per unit of measurement for materials, equipment for services or a portion of the Work as described in the Bidding Documents.

I. A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

1. A Sub-bidder is a person or entity who submits a Bid to a Bidder for materials, equipment or labor for a portion of the Work.

## PART 2 - BIDDER'S REPRESENTATIONS

A. The Bidder by making a Bid represents that:

1. The Bidder has read and understands the Bidding Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being Bid concurrently or presently under construction.
2. The Bid is made in compliance with the Bidding Documents.

3. The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.
4. The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

B. Each Bidder is required to form an individual opinion of the quantities and character of construction work by personal examination of the site and all existing facilities where the project work is to be done, and of the plans and specifications relating to it by such means as is preferred. Each Bidder shall inspect accessible concealed areas of existing construction, provided no significant permanent damage is inflicted upon the property. Lack of knowledge about conditions in accessible concealed areas shall not be the basis for additional cost claims at a later time.

C. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that the budder has and has implemented a written policy addressing sexual harassment prevention in the workplace and provides annual sexual harassment prevention training to all its employees. Such policy shall, at minimum, meet the requirements of Section 201-G of the New York State Labor Law.

## PART 3 - BIDDING DOCUMENTS

### 3.1 COPIES

A. It is the intention of this Project to be both environmentally and fiscally conscious of paper use and consumption. Therefore, documents will be distributed as digital sets. Bidding Documents, Drawings, and Specifications may be viewed online free of charge at www.revplans.com under 'Public Projects', or electronically downloaded for a non-refundable charge of one hundred dollars ($100.00).

1. Please note, in order to access online documents and information, a log in is required. New users can create a free online account upon visiting site by clicking 'Register for an Account'.

B. Complete sets of Bidding Documents, Drawings, and Specifications, on compact disc (CD) may be obtained from REVplans, 28 Church Street, Unit 7, Warwick, NY 10990 Tel: 1-877-272-0216, upon depositing the sum of one hundred dollars ($100.00) for each combined set of documents. Checks or money orders shall be made payable to Cornwall Central School District.

1. Deposit is refundable in accordance with the terms in the Instructions to Bidders to all submitting bids. Any bidder requiring CD(s) to be shipped shall make arrangements with the printer and pay for all related packaging and shipping costs.
2. Any bidder requiring paper copies of the Bidding Documents, Drawings, and Specifications, shall make arrangements with the printer, and pay for all related printing, packaging, and shipping costs. Such costs are non-refundable.

C. All bid addenda will be transmitted to registered plan holders via email and will be available at www.revplans.com. Plan holders who have paid for CD's or hard copies of the bid documents

will need to make the determination if hard copies of the addenda are required for their use and coordinate directly with the printer for hard copies of addenda to be issued.

1. There will be no charge for registered plan holders to obtain hard copies of the bid addenda.

D. Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Engineer assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

E. The Owner and Engineer may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

## 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

A. The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being Bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Engineer errors, inconsistencies or ambiguities discovered. All reports to the Engineer shall be in writing.

B. No interpretation of the meaning of the Contract Documents, the existing conditions, or of the scope of Work will be made verbally. Provide every request for such interpretation in writing, addressed to Blake Engineering, Attention: Broderick Knoell, 1898 County Route 1, Westtown, New York 10998 by e-mail: bknoell@blakeengineeringpllc.com and to be given consideration must be received at least seven (7) business days prior to the date of the Bids opening.

C. Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders are not required to rely upon them.

D. The Bidding Documents for this project have been prepared using certain existing construction documents furnished by the Owner, which pertain to the construction of the existing conditions, and limited observations obtained by the Engineer at the project site.

1. More extensive investigations of existing conditions, including disassembly or testing of existing building components, was not undertaken by the Engineer.
2. Portrayal of such existing conditions obscured or concealed from the Owner or Engineer's view prior to the start of this Project's construction activities, is based on reasonable implications and assumptions. The Owner and Engineer do not imply or guarantee to the Bidders, in any way, that such portrayals are accurate or true existing conditions.

## 3.3 EQUIVALENTS

A. Each Bidder shall base his Bid upon the materials and equipment described in the Bidding Documents to the fullest extent possible.

B. In the specifications, two or more kinds, types, brands, or manufacturers or materials may be named. They shall be regarded as the required standard of quality, and overall, are judged to be

equivalent by the Engineer. The Bidder may select one of these named items as the basis for his Bid or, if the Bidder desires to use any other kind, type, brand, or manufacturer or material other than those named in the specification, it shall indicate in writing, when requested, and prior to the award of the Contract, what kind, type, brand, or manufacturer is proposed in lieu of the named specified item(s).

## 3.4 ADDENDA

A. Addenda will be transmitted to all that are known to have received a complete set of Bidding Documents.

1. Provide Bidding Document distributor with full company name, address, telephone and facsimile numbers and contact person’s name.

B. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

C. Addenda will not be issued later than five (5) business days prior to the time specified for receipt of Bids, except any Addendum withdrawing the request for Bids or one which includes postponement of the time for receipt of Bids.

D. Each Bidder shall ascertain upon submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt on the Bid Form.

## 3.5 TAX LIABILITY

A. Bidders are exempt from payment of manufacturer's excise taxes for materials purchased for the exclusive use of the Owner, provided that manufacturer has complied with rules and regulation of the Commissioner of Internal Revenue Service.

B. New York State Sales Tax does not apply to this project. Contractors are exempt from payment on purchase of materials for the execution of this Contract and such taxes shall not be included in Bids. Exemption Certificates will be provided upon request.

C. All other taxes shall be included in the Bid.

## 3.6 PRE-BID CONFERENCE

A. There will be a Pre-Bid Conference as detailed in the Advertisement for Bids. A lack of representation at the Pre-Bid Conference will not be justification for additional costs due to unforeseen conditions during the construction phases of the Contracts.

## PART 4 - BIDDING PROCEDURES

### 4.1 PREPARATION OF BIDS

A. Bids shall be submitted on forms identical to the Bid Forms contained in this Project Manual or submitted using unaltered and legible copies thereof.

B. All blanks on the Bid Form shall be legible executed in a non-erasable medium.

C. Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in word shall govern.

D. Interlineations, alterations and erasures must be initialed by the signer of the Bid.

E. Bid all requested alternates. If no change in the Bid is required, enter "No Change."

F. Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each Bid copy shall be signed by the person or persons legally authorized to bind the Bidder to a Contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

### 4.2 BID SECURITY

A. Each Bid must be accompanied by a certified bank check of the Bidder, or a Bid Bond prepared by a surety company licensed in New York State.

1. Bid Security shall be provided in the amount of five (5) percent of the dollar amount of the Base Bid.
2. Bid Security shall be payable to Cornwall Central School District.
3. If certified check is utilized, the Bidder shall provide written confirmation from a licensed New York State Surety company that Performance and Payment Bonds will be available to said Bidder for this project.
4. The apparent successful Bidders, upon failure or refusal to furnish the required Performance and Payment Bonds and execute a Contract within ten (10) calendar days after receipt of notice of the acceptance of Bid, shall forfeit the Bid Security as liquidated damages for such failure to refusal, and not as a penalty.
5. The successful Bidders shall have the Bid Security returned upon execution of an Owner/Contractor Agreement.
6. Unsuccessful Bidders shall have their Bid Security returned following the execution of the Owner/Contractor Agreements or the forty-five (45) day period following the Bid Opening, whichever occurs first.
7. The Bid Security shall not be forfeited to the Owner in the event the Owner fails to comply with subparagraph 6.2.

B. Surety Bond shall be written on AIA Document A310, Bid Bond, and the attorney-in-fact that executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

C. The Owner will have the right to retain the Bid Security of Bidders to whom an award is being considered until either:

1. The Contract has been executed and bonds, when required, have been furnished, or;
2. The specified time has elapsed so that Bids may be withdrawn or;
3. All Bids have been rejected.

4.3 SUBMISSION OF BIDS

A. All copies of the Bid, the Bid Security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated Contract for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

1. If Bidder submits for different Contracts, each shall be submitted individually and so labeled for that Contract.

B. Bids shall be deposited at the designated location prior to the time and date indicated in the Advertisement for Bids for the receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

1. The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.
2. Oral, telephonic, telegraphic, facsimile or other electronically transmitted Bids will not be considered.

C. Bids not exhibiting original signatures or seals will not be accepted as a responsive Bid.

D. Bids shall be submitted in duplicate. Executed forms required for each submitted Bid are as follows:

1. Bid Form.
2. Resolution.
3. Non-Collusive Bid Certification.
4. Iran Divestment Act Certification.
5. Bid Security.

## 4.4 MODIFICATION OR WITHDRAWAL OF BID

A. A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid. No Bidder may withdraw a Bid within the forty-five (45) day period following the time of the Bid Opening.

B. Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date and time- stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

C. Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids, provided that they are then fully in conformance with these Instructions to Bidders.

# PART 5 - CONSIDERATION OF BIDS

## 5.1 OPENING OF BIDS

A. The properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids will be made available to Bidders.

## 5.2 REJECTION OF BIDS

A. The Owner shall maintain the right to reject any or all Bids. A Bid not accompanied by the required Bid Security or by other data required by the Bidding Documents, or which is in any way incomplete or irregular is subject to rejection.

## 5.3 AWARD OF BID

A. The Board of Education of the **Cornwall Central School District** reserves the right to waive any informality in submitted bids, reject any or all bids, and to award contracts on its determination of the lowest responsible bidder. The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

# PART 6 - SUPPLEMENTARY BID FORMS

## 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

A. Bidders to whom award of a Contract is under consideration shall submit to the Engineer & Construction Manager, within three (3) calendar days, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

## 6.2 OWNERS FINANCIAL CAPABILITY

A. The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven (7) days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

## 6.3 SUBMITTALS

A. Within three (3) calendar days following the Bid Opening time, the apparent lowest Bidder, shall furnish to the Owner through the Engineer the following information:

1. DRAFT Schedule of Values (cost breakdown)
2. Proposed Project Manager and Superintendent resumes.
3. Contractor’s Qualification Statement – AIA Document 305, 1986 edition.
4. Proposed Substitution List.
5. Proposed Subcontractor List.
6. Itemized list of Work to be self-performed.

B. The Bidder will be required to establish to the satisfaction of the Owner, Engineer and Construction Manager the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

C. Upon request only, the apparent second and third low Bidders shall be prepared to submit the information of paragraphs 6.1 and 6.3.A.

D. Prior to the execution of the Contract, the Construction Manager will notify the Bidder in writing if either the Owner, Engineer/Engineer or Construction Manager, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner, Engineer or Construction Manager has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity. In the event of withdrawal or disqualification, Bid Security will not be forfeited.

E. Persons and entities proposed by the Bidder and to whom the Owner, Engineer and Construction Manager have made no reasonable objection must be used on the Work for whom they were proposed and shall not be changed except with the written consent of the Owner and Construction Manager.

F. Any Bidder, upon failure to submit the information required in subparagraphs 6.1.A, 6.3.A, and 6.3.B in the allowed time, may have the Bid rejected. In that event, the Bidder shall forfeit the Bid Security to the Owner as liquidated damages for such failure or refusal, and not as penalty.

## 6.4 BOND REQUIREMENTS

A. The Owner requires the apparent successful Bidder to furnish and deliver bonds, covering the faithful performance of the Contract Work and payment of all obligations arising thereunder duly executed by the Bidder and a surety company licensed to do business in New York State rating.

B. The premiums shall be included in the Bid and paid by the Contractor. The Bidder shall proportionally distribute the costs of such bonds between the Base Bid and any Alternates.

6.5 TIME OF DELIVERY AND FORM OF BONDS

A. The Bidder shall deliver the required bonds to the Owner on or before the time of execution of the Owner/Contractor Agreement. Bonds shall be payable to Cornwall Central School District.

B. Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond, Version 2010. Both bonds shall be written in the amount of the Contract Sum.

C. The bonds shall be dated the same as the Owner/Contractor Agreement.

D. The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

PART 7 - AGREEMENT FORM BETWEEN OWNER AND CONTRACTOR

***A. Agreement Forms are included in the bidding documents, refer to Section 005216.1 Agreement Contract 1 for the Mechanical Construction Agreement and refer to Section 005216.2 Agreement Contract 2 for the Electrical Construction Agreement.***

***PART 8 - LIQUIDATED DAMAGES***

***A. Liquidated Damages. Liquidated damages in the sum of Five Hundred Dollars ($500.00) per day, as set forth in the General Conditions attached hereto, will be assessed for each consecutive calendar day of delay in the completion of the work not excusable as provided in the Contract Documents.***

***1. In view of the difficulty of accurately ascertaining the loss in which the Owner will suffer by reason of such delay in the completion of the work, said per diem sum is hereby fixed and agreed to by the Contractor as the liquidated damages, upon the execution of the Agreement.***

***2. Separate and in addition to the per day liquidated damages, shall be added, engineering costs, inspection fees and administrative costs for that time after the expiration of the time of completion incurred by the Owner, and any penalties which may be assessed against the Owner by other agencies as a result of the delay to complete the work. Such costs shall be at the set rate for services paid by the Owner for the firm providing the services.***

***B. Excusable Delays. Under certain conditions, when a delay in completion of the work occurs, assessment of Liquidated Damages may not occur. Refer to Section 1.15.D. of the General Conditions for such excusable delays.***

***1. The Contractor shall notify the Owner in writing of any other such delays beyond his control and request an extension of time to cover such delays. The Contractor shall make such written notifications by Certified Mail within forty-eight (48) hours of such delay. The Notice shall clearly describe the cause of the delay and the resultant effect on his work. Unless such request is granted thereby allowing the Contractor to continue and finish the work, or any part thereof, after the time fixed for its completion, or after the date to which the time for completion may have been extended, such Notice shall in no way operate as a waiver on the part of the Owner of any of its rights under the Contract. The causes of all excusable delays must be documented to the satisfaction of the Owner and Engineer.***

END OF SECTION 002113

# SECTION 230515 - VARIABLE FREQUENCY DRIVES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes separately enclosed, pre-assembled, combination VFDs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFD indicated. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, and furnished specialties and accessories.

1. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Enclosure types and details.
d. Nameplate legends.
e. Short-circuit current (withstand) rating of enclosed unit.
f. Features, characteristics, ratings, and factory settings of each VFD and installed devices.
g. Specified modifications.

2. Schematic and Connection Wiring Diagrams: Indicate all field wiring required for the project.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFDs to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and MCP trip settings.
2. Manufacturer's written instructions for setting field-adjustable overload relays.
3. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
4. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

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. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

## 1.6 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. Comply with NFPA 70.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller.

## 1.8 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without de-rating, under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 14 deg F and not exceeding 104 deg F.
2. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F
3. Humidity: Less than 95 percent (non-condensing).
4. Altitude: Not exceeding 3300 feet.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFDs, including clearances between VFDs, and adjacent surfaces and other items.

## 1.9 COORDINATION

A. Coordinate features of motors, load characteristics, installed units, and accessory devices to be compatible with the following:

1. Torque, speed, and horsepower requirements of the load.
2. Ratings and characteristics of supply circuit and required control sequence.
3. Ambient and environmental conditions of installation location.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace VFDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ABB.
2. AC Tech/Lenze
3. Eaton Electrical Inc.; Cutler-Hammer Business Unit
4. Square D.

B. General Requirements for VFDs: Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508C.

C. VFD Description: Variable-frequency power converter (rectifier, dc bus, and IGBT, PWM inverter) factory packaged in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

E. Output Rating: Three-phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

F. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 3 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
4. Minimum Efficiency: 96 percent at 60 Hz, full load.

5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: 22 kA.
7. Ambient Temperature Rating: Not less than 14 deg F and not exceeding 104 deg F.
8. Ambient Storage Temperature Rating: Not less than minus 4 deg F and not exceeding 140 deg F
9. Humidity Rating: Less than 95 percent (non-condensing).
10. Altitude Rating: Not exceeding 3300 feet.
11. Vibration Withstand: Comply with IEC 60068-2-6.
12. Overload Capability: 1.15 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
13. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
14. Speed Regulation: Plus or minus 5 percent.
15. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
16. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

G. Isolated Control Interface: Allows VFDs to follow remote-control signal over a minimum 40:1 speed range.

1. Signal: Electrical.

H. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 0.1 to 999.9 seconds.
4. Deceleration: 0.1 to 999.9 seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

I. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors to provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
3. Under- and overvoltage trips.
4. Inverter overcurrent trips.
5. VFD and Motor Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFDs and motor thermal characteristics, and for providing VFD overtemperature and motor overload alarm and trip; settings selectable via the keypad; NRTL approved.
6. Critical frequency rejection, with three selectable, adjustable deadbands.
7. Instantaneous line-to-line and line-to-ground overcurrent trips.
8. Loss-of-phase protection.
9. Reverse-phase protection.
10. Short-circuit protection.
11. Motor overtemperature fault.

J. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

K. Bidirectional Auto Speed Search: Capable of starting VFD into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

L. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

M. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

N. Integral Input Disconnecting Means and OCPD: NEMA KS 1, fusible switch with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFD input current rating, whichever is larger.
2. Auxiliary Contacts: NO/NC, arranged to activate before switch blades open.
3. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
4. NC alarm contact that operates only when circuit breaker has tripped.

## 2.2 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.

C. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

D. Indicating Devices: Digital LCD display and additional readout devices as required, mounted flush in VFD door and connected to display VFD parameters including, but not limited to:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. Set point frequency (Hz).

E. Control Signal Interfaces:

1. Electric Input Signal Interface:

   a. A minimum of two programmable analog inputs: 0- to 10-V dc or 4- to 20-mA dc
   b. A minimum of six multifunction programmable digital inputs.

2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BAS or other control systems:

   a. 0- to 10-V dc.
   b. 4- to 20-mA dc.
   c. Potentiometer using up/down digital inputs.
   d. Fixed frequencies using digital inputs.

3. Output Signal Interface: A minimum of one programmable analog output signal(s) (0- to 10-V dc or 4- to 20-mA, which can be configured for any of the following:

   a. Output frequency (Hz).
   b. Output current (load).
   c. DC-link voltage (V dc).
   d. Motor torque (percent).
   e. Motor speed (rpm).
   f. Set point frequency (Hz).

4. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

   a. Motor running.
   b. Set point speed reached.
   c. Fault and warning indication (over temperature or over current).
   d. PID high- or low-speed limits reached.

F. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display VFD status and alarms and energy usage. Allows VFD to be used with an external system within a multidrop LAN configuration; settings retained within VFD's nonvolatile memory.

1. Network Communications Ports: Ethernet and RS-485.

2. Embedded BAS Protocols for Network Communications: Contractor to confirm with Technology Contract and Owner's Representative; protocols accessible via the communications ports.

## 2.3 LINE CONDITIONING AND FILTERING

A. Input Line Conditioning: Based on the harmonic analysis study and report, provide input filtering, as required, to limit TDD at input terminals of VFCs to less than 8 percent and THD(V) to 5 percent.

B. Input Line Conditioning: Based on the harmonic analysis study and report, provide input filtering, as required, to limit TDD and THD(V) at the defined PCC per IEEE 519.

C. EMI/RFI Filtering: CE marked; certify compliance with IEC 61800-3 for Category C2.

## 2.4 BYPASS SYSTEMS

A. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually. Selector switches set modes and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.

B. Bypass Mode: Manual operation only; requires local operator selection at VFC. Transfer between power converter and bypass contactor and retransfer shall only be allowed with the motor at zero speed.

C. Bypass Controller: Two-contactor-style bypass allows motor operation via the power converter or the bypass controller with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, IEC-rated contactor.
2. Output Isolating Contactor: Non-load-break, IEC-rated contactor.
3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

D. Bypass Contactor Configuration: Full-voltage (across-the-line) type.

1. NORMAL/BYPASS selector switch.
2. HAND/OFF/AUTO selector switch.
3. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFC while the motor is running in the bypass mode.
4. Contactor Coils: Pressure-encapsulated type.
    a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

b. Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.

5. Control Circuits: 24-V ac; obtained from integral CPT, with primary and secondary fuses, with control power source of sufficient capacity to operate all integral devices and remotely located pilot, indicating, and control devices.

a. CPT Spare Capacity: 50 VA.

6. Overload Relays: NEMA ICS 2.

a. Solid-State Overload Relays:
1) Switch or dial selectable for motor-running overload protection.
2) Sensors in each phase.
3) Class 20 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
4) Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
5) Analog communication module.

b. NC/NO isolated overload alarm contact.
c. External overload reset push button.

## 2.5 ENCLOSURES

A. VFD Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 4.
3. Kitchen Areas: Type 4X, stainless steel.
4. Other Wet or Damp Indoor Locations: Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFD as "Plenum Rated."

## 2.6 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFD enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Standard-duty.

a. Push Buttons: Recessed Unguarded types; momentary.
b. Pilot Lights: LED types; push to test.
c. Selector Switches: Rotary type.

B. Reversible NC/NO bypass contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Under-voltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable under-voltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

## 2.7 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFDs according to requirements in NEMA ICS 61800-2.

1. Test each VFD while connected to a motor that is comparable to that for which the VFD is rated.
2. Verification of Performance: Rate VFDs according to operation of functions and features specified.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFDs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance.

B. Examine VFD before installation. Reject VFDs that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFD installation.

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

## 3.2 HARMONIC ANALYSIS STUDY

A. Perform a harmonic analysis study to identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze operating scenarios, including recommendations for VFC input filtering to limit TDD and THD(V) at each VFC to specified levels.

B. Prepare a harmonic analysis study and report complying with IEEE 399 and NETA Acceptance Testing Specification.

## 3.3 INSTALLATION

A. Coordinate layout and installation of VFDs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Wall-Mounting Controllers: Install VFDs on walls with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks.

C. Install fuses in each fusible-switch VFD.

D. Install fuses in control circuits if not factory installed. Comply with requirements in Division 26 Section "Fuses."

E. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

F. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

G. Comply with NECA 1.

## 3.4 IDENTIFICATION

A. Identify VFDs, components, and control wiring.

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFD with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

## 3.5 CONTROL WIRING INSTALLATION

A. Install wiring between VFDs and remote devices and facility's central-control system.

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic control devices that have no safety functions when switches are in manual-control position.
2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

## 3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. 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.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each VFD element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Inspect VFD, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each VFD element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFD locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Engineer before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
7. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. VFDs will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

## 3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

## 3.8 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers.

## 3.9 PROTECTION

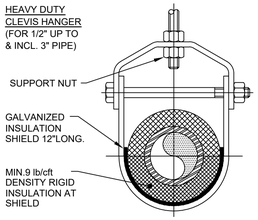
A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

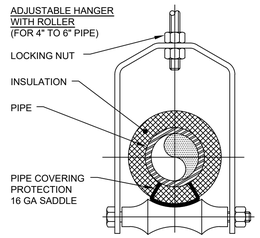
B. Replace VFDs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

## 3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFDs.

END OF SECTION 230515

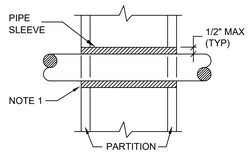



NOTES:
1. PIPE 8" AND LARGER SHALL HAVE ROLLER SUPPORTED WITH DUAL RODS.
2. FOR CHW SERVICE OVER 3" REPLACE SADDLE WITH 12" LONG 14 GA SHIELD WITH RIGID INSULATION BETWEEN PIPE AND SHIELD.

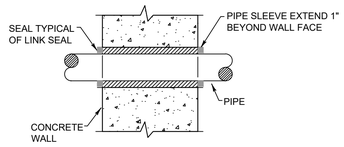
| PIPE Ø (IN.) | MAX. SPACING BETWEEN HANGERS (FT.) | | | MIN. ROD SIZE (IN.) |
|---|---|---|---|---|
| | STEEL PIPE | COPPER PIPE | CPVC | |
| 1/2 THRU 1 | 7 | 5 | 5 | 3/8 |
| 1-1/2 THRU 2 | 9 | 8 | 6 | 3/8 |
| 2-1/2 | 11 | 9 | 7.5 | 1/2 |
| 3 | 12 | 10 | 7.5 | 1/2 |
| 4 | 14 | 12 | 8.5 | 5/8 |
| 6 | 17 | 14 | 9 | 3/4 |
| 8 | 19 | 16 | 10 | 7/8 |
| 10 | 22 | 18 | 10.5 | 7/8 |

1 / M.101 — Pipe Hanger Support
N.T.S.

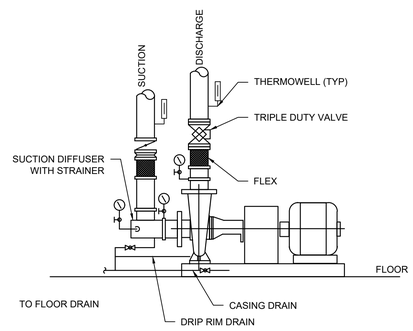



NOTES:
1. AT FIRE RATED PARTITIONS, ADD ADDITIONAL LAYER OF FIRE SAFING INSULATION AROUND PENETRATION SO AS TO FILL CAVITY.
2. DUCT AND PIPE PENETRATIONS THRU CORRIDOR WALLS ABOVE THE CEILING ARE TO BE FIRE STOPPED AROUND THE PENETRATION.

2 / M.101 — Partition Wall Pipe Penetration Detail
N.T.S.




3 / M.101 — Exterior / Concrete Wall Pipe Penetration Detail
N.T.S.




4 / M.101 — Base Mounted Pump Detail
N.T.S.

## General Symbols:

- DIRECTION OF PIPE PITCH (DOWN)
- DIRECTION OF FLOW
- ANCHOR
- REDUCER OR INCREASER
- ECCENTRIC REDUCER
- TOP CONNECTION, 45° OR 90°
- BOTTOM CONNECTION, 45° OR 90°
- SIDE CONNECTION
- CAPPED OUTLET
- RISE OR DROP IN PIPE
- UNION
- PIPE UP
- PIPE DOWN
- THERMOMETER
- PRESSURE GAGE
- VENTURI FLOW METER
- REFRIGERANT SIGHT GLASS
- TEST PLUG (PRESSURE/TEMPERATURE)
- AUTOMATIC AIR VENT
- MANUAL AIR VENT
- QUICK-COUPLE HOSE CONNECTOR
- POINT OF CONNECTION BETWEEN NEW AND EXISTING WORK

## Valve Symbols:

- GATE VALVE - THREADED/FLANGED
- GLOBE VALVE - THREADED/FLANGED
- GATE VALVE WITH 3/4" HOSE ADAPTER
- CHECK VALVE
- WYE STRAINER (WITH BALL VALVE & HOSE CONNECTION)
- WYE STRAINER WITH VALVED DRAIN AND QUICK-COUPLE HOSE CONNECTOR
- FLEXIBLE CONNECTION
- ANGLE GLOBE VALVE
- BUTTERFLY VALVE
- BALL VALVE
- MODULATING CONTROL VALVE
- MODULATING CONTROL BUTTERFLY VALVE
- TWO POSITION CONTROL VALVE
- THREE-WAY MODULATING CONTROL VALVE
- THREE-WAY TWO POSITION CONTROL VALVE
- PRESSURE REGULATING VALVE
- PRESSURE SAFETY VALVE
- AUTOMATIC BALANCING CONTROL VALVE
- WATER BALANCE DEVICE
- CIRCUIT SETTER VALVE
- GATE VALVE WITH GLOBE-VALVED BYPASS
- PLUG VALVE
- CONTROL VALVE (CV) - FLOAT-OPERATED
- PRESSURE REDUCING VALVE (PRV)

## PUMP SCHEDULE

| EQUIPMENT TAG | MANUFACTURER (OR ACCEPT. EQUAL) | MODEL | LOCATION | AREA SERVED | PUMP TYPE | CIRCULATING FLUID | | | | MOTOR | | | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FLUID | G.P.M. | HEAD (FT.) | TEMP. (°F) | NOM. H.P. | VOLT. | PHASE | HZ. | RPM | FLA | |
| P-6A | TACO | FI6011D | CHILLER ROOM | COOLING TOWER | BASE MOUNTED | CONDENSER WATER | 1650 | 75 | 95 | 40 | 480 | 3 | 60 | 1760 | 52 | MC TO FURNISH VFD W/ INTEGRAL BYPASS FOR INSTALLATION BY EC |
| P-6B | TACO | FI6011D | CHILLER ROOM | COOLING TOWER | BASE MOUNTED | CONDENSER WATER | 1650 | 75 | 95 | 40 | 480 | 3 | 60 | 1760 | 52 | MC TO FURNISH VFD W/ INTEGRAL BYPASS FOR INSTALLATION BY EC |
| P-7A | TACO | FI6011D | CHILLER ROOM | CHILLER | BASE MOUNTED | CHILLED WATER | 1285 | 75 | 44 | 40 | 480 | 3 | 60 | 1760 | 52 | MC TO FURNISH VFD W/ INTEGRAL BYPASS FOR INSTALLATION BY EC |
| P-7B | TACO | FI6011D | CHILLER ROOM | CHILLER | BASE MOUNTED | CHILLED WATER | 1285 | 75 | 44 | 40 | 480 | 3 | 60 | 1760 | 52 | MC TO FURNISH VFD W/ INTEGRAL BYPASS FOR INSTALLATION BY EC |

1

## COOLING TOWER SCHEDULE

| EQUIPMENT TAG | MANUFACTURER (OR ACCEPT. EQUAL) | MODEL | LOCATION | SERVES | EWT (°F) | LWT (°F) | AMBIENT WB (°F) | FLOW RATE (GPM) | SUMP CAPACITY (GAL) | DRY WEIGHT (LBS) | OPERATING WEIGHT (LBS) | SHELL MATERIAL | FAN MOTORS | | | | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | QTY. | NOM. H.P. | VOLT. | PHASE | HZ. | RPM | FLA | |
| CT-1 | DELTA | TM-203312 | ROOF | EXISTING CHILLER | 95 | 85 | 75 | 1,650 | 960 | 13,000 | 24,400 | POLYETHYLENE (HDPE) | 4 | 3.0 | 480 | 3 | 60 | 900 | 4.8 | 1-7 |

1. PROVIDE W/ PREMIUM EFFICIENT VFD RATED MOTORS
2. PROVIDE W/ ALUMINUM LADDER AND OSHA SAFETY CAGE
3. PROVIDE W/ UPPER SAFETY HANDRAIL SYSTEM & SAFETY GATE
4. PROVIDE W/ PVC MESH SCREEN OUTLET STRAINER
5. PROVIDE W/ NEMA 4X VIBRATION CUT OFF SWITCH W/ MANUAL RESET
6. PROVIDE W/ ANTI-MICROBIAL HDPE BLUE RESIN
7. PROVIDE W/ NEMA 3R VFD W/ MANUAL BYPASS PACKAGE

## Mechanical Notes:

1. ALL MATERIALS AND EQUIPMENT ARE TO BE NEW, UNUSED, AND FREE FROM DEFECTS OF ANY KIND. THE BASIS OF QUALITY SHALL BE THE LATEST REVISION OF ASTM, ANSI, OR OTHER ACCEPTABLE STANDARDS.
2. THESE DRAWINGS ARE DIAGRAMMATIC, AND INDICATE GENERAL ARRANGEMENT OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE TO HAVE REVIEWED THE SITE FOR HIS WORK PRIOR TO HAVING SUBMITTED HIS PROPOSAL. NO ADDITIONAL COMPENSATION WILL BE ALLOWED FOR CONDITIONS FOUND DURING THE COURSE OF THE CONTRACT.
3. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH THAT OF ALL OTHER TRADES.
4. ALL WORK INCLUDING LABOR AND MATERIALS SHALL BE FULLY GUARANTEED FOR ONE (1) YEAR FROM THE DATE OF PAYMENT AND FINAL ACCEPTANCE BY THE OWNER AND ENGINEER.
5. ALL CUTTING, PATCHING, FIRE-STOPPING, AND SURFACE RESTORATION IN CONNECTION WITH THIS TRADE SHALL BE COMPLETED BY THIS CONTRACTOR.
6. A MINIMUM OF FOUR (4) COPIES OF SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO ORDERING AND INSTALLATION OF THE EQUIPMENT AND/OR MATERIALS. BY SUBMITTING SHOP DRAWINGS, THE CONTRACTOR REPRESENTS THAT ACTUAL FIELD CONDITIONS ARE VERIFIED BY HIM AND ARE REFLECTED ON HIS SUBMITTALS.
7. THIS CONTRACTOR SHALL PAY ALL FEES, GIVE ALL NOTICES, FILE ALL NECESSARY DRAWINGS, AND OBTAIN ALL PERMITS, INSPECTIONS AND CERTIFICATES OF APPROVAL REQUIRED IN CONNECTION WITH WORK UNDER THIS CONTRACT.
8. ALL WORK IN ASSOCIATION WITH THIS CONTRACT SHALL BE COMPLETED IN STRICT COMPLIANCE WITH THE 2020 BUILDING CODE OF NEW YORK STATE, 2020 MECHANICAL CODE OF NEW YORK STATE & 2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.
9. ALL DUCTWORK IS TO BE CONSTRUCTED OF GALVANIZED SHEET STEEL (EXCEPT WHERE OTHERWISE SPECIFIED) WITH GAUGES, BRACING AND CONSTRUCTION IN ACCORDANCE WITH THE LATEST SMACNA DUCT MANUAL STANDARDS AND ALL OTHER AUTHORITIES HAVING JURISDICTION.
10. PROVIDE MANUAL DAMPERS AT EACH SPLIT OR TAP CONNECTION TO TRUNK DUCTS FOR BALANCING PURPOSES WHETHER OR NOT SPECIFICALLY SHOWN ON DRAWINGS. EACH DAMPER SHALL BE OF THE OPPOSED BLADE DAMPER TYPE INSTALLED WITH AN OPERATOR AND LOCKING DEVICE. ALL DAMPERS LOCATED ABOVE HARD OR INACCESSIBLE CEILINGS SHALL BE INSTALLED WITH REMOTE GEAR OPERATORS.
11. FURNISH & INSTALL FUSIBLE LINK FIRE DAMPERS AT ALL LOCATIONS WHERE DUCT PENETRATES FIRE-RATED FLOOR OR CEILING ASSEMBLY WHETHER OR NOT SPECIFICALLY SHOWN. INSTALL DUCTWORK CASING ACCESS DOORS AND FRAMES AHEAD OF EACH FIRE DAMPER FOR INSPECTION AND MAINTENANCE. DOORS SHALL BE A MINIMUM OF 20 GA. DOUBLE PANEL INSULATED TYPE.
12. INSTALL TURNING VANES ON ALL RECTANGULAR TURNS. TURNING VANES SHALL BE DOUBLE THICKNESS TYPE CONSTRUCTED IN ACCORDANCE WITH SMACNA MANUAL.
13. ROUND SHEET STEEL ELBOWS ARE TO BE INSTALLED AT THE DUCT CONNECTION TO ALL SUPPLY AIR DIFFUSERS. SHEET STEEL PLENUM BOXES ARE TO BE INSTALLED AT THE DUCT CONNECTION TO ALL RETURN AND EXHAUST AIR GRILLES. THE CONTRACTOR IS TO PAINT THE INSIDE OF THE SHEET STEEL PLENUM BOXES FLAT BLACK.
14. ALL SUPPLY AND RETURN DUCTWORK LOCATED IN UNCONDITIONED SPACES OR ABOVE CEILINGS SHALL BE INSULATED WITH A MINIMUM OF R-6 INSULATION. ALL DUCTWORK LOCATED OUTSIDE THE BUILDING ENVELOPE SHALL BE INSULATED WITH A MINIMUM OF R-12 INSULATION. INSULATION SHALL BE FIBERGLASS DUCT WRAP WITH VAPOR SEAL SECURELY TAPED AROUND DUCT. IF DUCT LINING IS TO BE USED, ALL DUCT SIZES SHOWN SHALL BE CONSIDERED TO BE INSIDE CLEAR DIMENSIONS.
15. INSTALL ALL DUCTWORK AS HIGH AS POSSIBLE PROVIDING RISERS, DROPS AND OFFSETS TO CLEAR STRUCTURAL MEMBERS, LIGHT FIXTURES, OTHER PIPING, AND OTHER OBSTRUCTIONS. WHERE CONFLICTS ARISE, IT SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION PRIOR TO PROCEEDING.
16. THE ENTIRE AIR DISTRIBUTION SYSTEM IS TO BE BALANCED TO WITHIN 10% OF THE SPECIFIED AIRFLOW REQUIREMENTS.
17. THE CONTRACTOR IS RESPONSIBLE TO TEST ALL EQUIPMENT, PIPING, FIXTURES, AND SYSTEMS INSTALLED UNDER THIS CONTRACT TO ENSURE PROPER OPERATION PRIOR TO FINAL ACCEPTANCE BY THE OWNER AND ENGINEER.
18. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE WHETHER SPECIAL LICENSING IS REQUIRED IN ORDER TO PERFORM THE REQUIRED WORK IN THE MUNICIPALITY WHERE THE PROJECT IS LOCATED. IF THE CONTRACTOR CANNOT OBTAIN THE REQUIRED LICENSING TO COMPLETE THE WORK WITHIN THE PROJECT SCHEDULE, THEN THE CONTRACTOR SHALL NOT BE PERMITTED TO BID ON THIS PROJECT.
19. CONTRACTOR IS RESPONSIBLE TO CREATE AND SUBMIT RED-LINE "AS-BUILT" PLANS TO THE ENGINEER AT THE END OF THE PROJECT. AS-BUILT PLANS SHALL ACCURATELY REPRESENT THE SYSTEMS AS THEY WERE INSTALLED.

## Hydronic Piping Notes:

1. ALL HYDRONIC HOT WATER PIPING AND FITTINGS ARE TO BE INSULATED WITH RIGID ONE-PIECE MOLDED SECTIONAL FIBERGLASS PIPE COVERING WITH UNIVERSAL JACKET. INSULATION SHALL BE 1-1/2" THICK FOR PIPING UP THRU 1-1/2" DIAMETER, AND 2" THICK FOR PIPING GREATER THAN 1-1/2" DIAMETER. ALL JOINTS ARE TO BE COMPLETELY SEALED A MINIMUM OF 6" BEYOND JOINT ENDS.
2. ALL PIPING SHALL BE PROPERLY SUPPORTED AND ROUTED PARALLEL OR PERPENDICULAR TO BUILDING WALLS. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL SUPPORT HANGERS AND MISCELLANEOUS METALS REQUIRED FOR PROPER INSTALLATION OF WORK.
3. HYDRONIC PIPING SYSTEM MATERIALS ARE TO BE AS FOLLOWS:
   - 3.1. PIPING UP THRU 3" DIAMETER IS TO BE TYPE L HARD DRAWN SEAMLESS COPPER TUBING MADE IN ACCORDANCE WITH ASTM B 88 WITH WROUGHT COPPER FITTINGS MADE IN ACCORDANCE WITH ASME B 16.22. JOINTS SHALL BE MADE BY APPLYING A FLUX CONFORMING WITH ASTM B 813, AND SOLDERED WITH A 95-5 LEAD-FREE SOLDER CONFORMING TO ASTM B 32.
   - 3.2. PIPING GREATER THAN 3" DIAMETER IS TO BE SCHEDULE 40 GRADE B SEAMLESS CARBON STEEL MADE IN ACCORDANCE WITH ASTM A 53 WITH FITTINGS MADE IN ACCORDANCE WITH ASTM B 16.9. JOINTS SHALL BE WELDED, OR MAY BE MADE USING GROOVED AND SHOULDERED MECHANICAL JOINTS CONFORMING TO THE REQUIREMENTS OF ASTM F 1476.
   - 3.3. FURNISH & INSTALL DIELECTRIC UNIONS WHERE JOINING STEEL TO COPPER PIPING.
4. ALL PIPING SHALL BE PITCHED SUCH THAT AIR IN THE SYSTEM CAN BE VENTED THROUGH MANUAL AIR VENTS.
5. TEST PIPING AND PROVE TIGHT FOR AT LEAST TWO HOURS TO TWICE THE SYSTEM WORKING PRESSURE. TEST SHALL BE PERFORMED IN THE PRESENCE OF THE ENGINEER AND LOCAL INSPECTOR. TEST SHALL BE REPEATED IF NECESSARY UNTIL FINAL APPROVAL OF SYSTEM IS OBTAINED.
6. SUPPORT HORIZONTAL PIPING UTILIZING A SPACING PER PIPING MANUFACTURER'S REQUIREMENTS.
7. INSTALL VALVES ON THE ENTIRE DISTRIBUTION SYSTEM, SO LOCATED AS TO GIVE COMPLETE CONTROL TO ALL FIXTURES AND EQUIPMENT.
8. INSTALL DRAIN VALVES AT BASE OF ALL RISERS AND AT LOW POINTS OF PIPING SYSTEM. INSTALL MANUAL AIR VENT VALVE FACILITIES AT THE TOP OF ALL RISERS AND AT HIGH POINTS OF THE PIPING SYSTEM.
9. PROVIDE PROPER PROVISION FOR EXPANSION/CONTRACTION OF PIPING TO PREVENT STRAIN ON THE SYSTEM AND/OR THE BUILDING STRUCTURE.
10. INSTALL ALL HYDRONIC PIPING AS HIGH AS POSSIBLE PROVIDING RISERS, DROPS AND OFFSETS TO CLEAR STRUCTURAL MEMBERS, LIGHT FIXTURES, OTHER PIPING, AND OTHER OBSTRUCTIONS. WHERE CONFLICTS ARISE, IT SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION PRIOR TO PROCEEDING.
11. THE ENTIRE HYDRONIC SYSTEM IS TO BE BALANCED TO WITHIN 10% OF THE SPECIFIED WATER FLOWRATE REQUIREMENTS. A CERTIFIED BALANCING REPORT AND VERIFICATION IS TO BE SUBMITTED TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE.

KEY PLAN:

'CORNWALL CENTRAL HIGH SCHOOL'


PROJECT:
CORNWALL CENTRAL HIGH SCHOOL
COOLING TOWER REPLACEMENT PROJECT
10 DRAGON DRIVE
NEW WINDSOR, NEW YORK 12553
SED #:44-03-01-06-0-012-008

SUB-CONSULTANT:

ENGINEER:

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NOT VALID FOR CONSTRUCTION UNLESS SIGNED AND SEALED BY ENGINEER

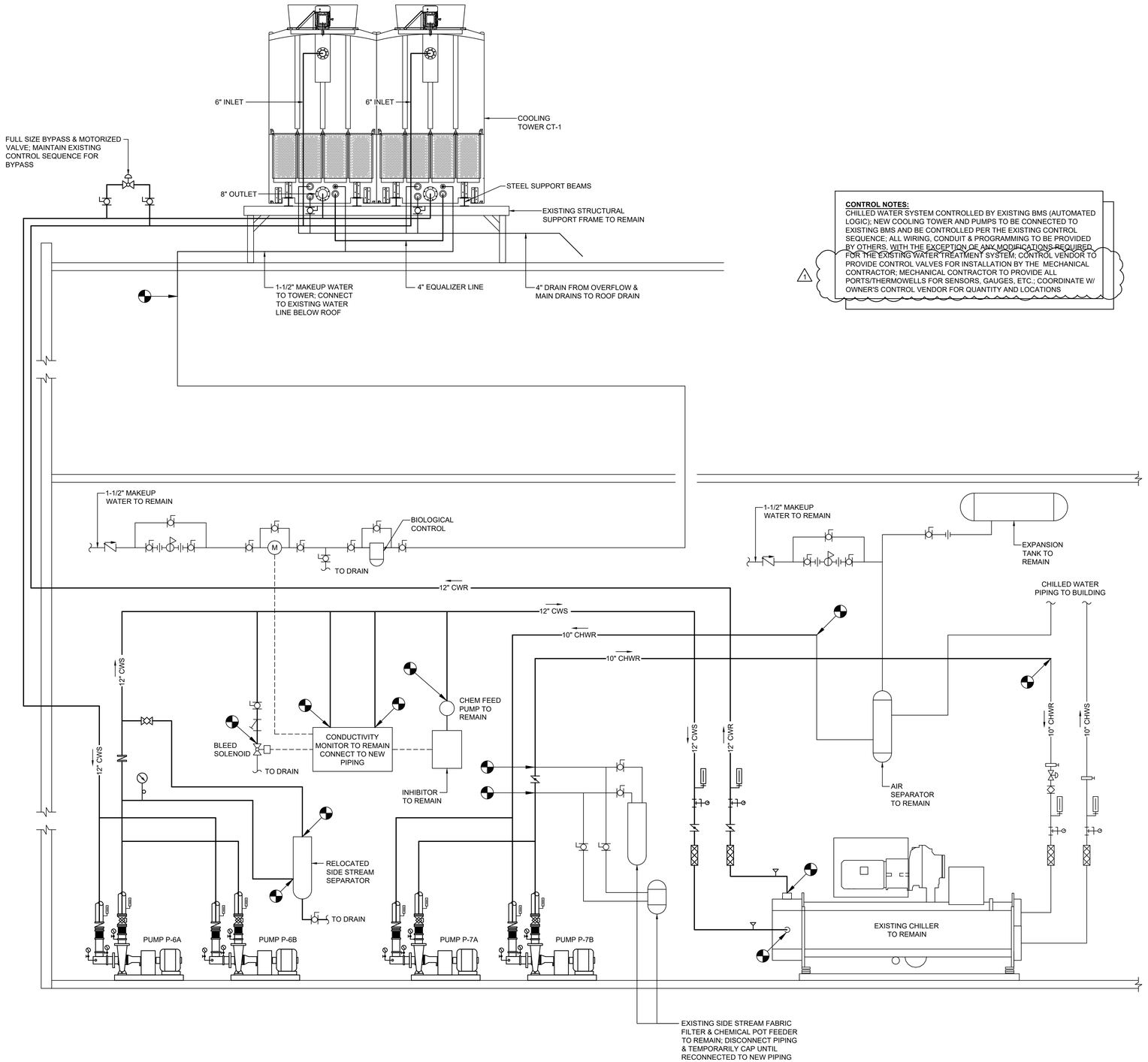
MATTHEW G. BLAKE, P.E., LEED AP
NY - 89039 NJ - GE050037 PA - PE079303
MA - 53197 CT - 32283 FL - 85928

MECHANICAL NOTES, SYMBOLS, DETAILS & SCHEDULES

| REV. | DATE: | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|
| | 05.27.2022 | BJK | MGB | CONSTRUCTION SET |
| 1 | 06.15.2022 | BJK | MGB | BID ADDENDUM #1 |

PROJECT NO. 2149

SHEET NO. M.101



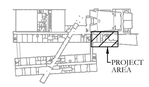

**CONTROL NOTES:**
CHILLED WATER SYSTEM CONTROLLED BY EXISTING BMS (AUTOMATED LOGIC); NEW COOLING TOWER AND PUMPS TO BE CONNECTED TO EXISTING BMS AND BE CONTROLLED PER THE EXISTING CONTROL SEQUENCE; ALL WIRING, CONDUIT & PROGRAMMING TO BE PROVIDED BY OTHERS, WITH THE EXCEPTION OF ANY MODIFICATIONS REQUIRED FOR THE EXISTING WATER TREATMENT SYSTEM; CONTROL VENDOR TO PROVIDE CONTROL VALVES FOR INSTALLATION BY THE MECHANICAL CONTRACTOR; MECHANICAL CONTRACTOR TO PROVIDE ALL PORTS/THERMOWELLS FOR SENSORS, GAUGES, ETC.; COORDINATE W/ OWNER'S CONTROL VENDOR FOR QUANTITY AND LOCATIONS

1 M.103 Cooling Tower Piping Diagram

N.T.S.

KEY PLAN:

'CORNWALL CENTRAL HIGH SCHOOL'




TRUE NORTH

PROJECT NORTH

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COOLING TOWER PIPING DIAGRAM

| DATE: | DRN | CHK | DESCRIPTION |
|---|---|---|---|
| 05.27.2022 | BJK | MGB | CONSTRUCTION SET |

| REV. | DATE: | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|
| 1 | 06.15.2022 | BJK | MGB | BID ADDENDUM #1 |

PROJECT NO. 2149

SHEET NO. M.103