BID #WG26-32 SPECIFICATIONS

The specifications shall be construed as minimum. All integral parts not specifically mentioned in the scope of these specifications that are necessary to provide a complete working unit shall be furnished. All workmen and equipment shall be furnished by the Contractor.

Bidder shall give a Lump Sum price as indicated on the Bid Response Form. The price shall include all applicable charges, to include but not limited to delivery, installation, labor, materials, etc.

The use of specific names and numbers in the specifications is not intended to restrict the bidder or any seller or manufacturers, but solely for the purpose of indicating the type, size and quality of equipment considered best adapted to Baldwin County.

No bid may be withdrawn for a period of thirty (30) days following the bid opening unless approved by the Baldwin County Commission, Bay Minette, Alabama.

BID RESPONSE FORM

Each supplier should use the Response Form provided for their bid. All warranties and exceptions are to be attached to the back of the Response Form. The Bid Guarantee should be attached to the front of the Response Form.

WARRANTY

Bidders shall submit a copy of the manufacturer's standard warranty along with a complete explanation of the warranty with their bid.

BIDS FOR ALL OR PART

The County reserves the right to award the contract in whole or in part, according to the best interest of the County.

BIDDERS QUALIFICATIONS

The County may make such investigations as they deem necessary to determine the ability of the bidders to furnish all materials, and the bidder shall furnish to the County all such information and data for this purpose as the County may request. The County reserves the right to reject any bid if the evidence submitted, or investigation of such bidder, fails to satisfy the County that such bidder is properly qualified to carry out the obligations of the contract and to furnish all materials contemplated therein. Conditional bids will not be accepted.

"ALABAMA GENERAL CONTRACTORS LICENSE NUMBER MUST BE CLEARLY LISTED ON THE OUTSIDE OF THE VENDOR BID ENVELOPE"

LAWS AND REGULATIONS

The bidder's attention is directed to the fact that all applicable state laws, municipal ordinances, and rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

POWER OF ATTORNEY

Attorneys-in-fact who sign bid bonds must file with each bond a certified and effectively dated copy of their power of attorney.

PERFORMANCE BOND

A Performance Bond in the amount of one-hundred percent (100%) of the total amount of the project and a Labor and Materials Bond in the amount of fifty percent (50%) of the total amount of the project will be provided prior to any work beginning. The Contractor must furnish to the County at the time of the signing of the Contract a certificate of insurance coverage as provided in the specifications. Bidder(s) must have a Contractor's License issued by the Alabama State Licensing Board for General Contractors under the provision of Title 34, Chapter 8, Code of Alabama. Bidder(s) shall submit a copy of license.

TRAFFIC CONTROL, SAFETY ITEMS

Contractor shall erect all warning signs, and provide the appropriate personnel, if required, and all other items required to safely handle traffic through work area. Traffic Control Devices shall be provided by the Contractor. Traffic Control Devices provided must comply with MUTCD.

CONTRACTORS AND SUBCONTRACTORS AND INSURANCE

The Contractor shall not commence work under this contract until all the required insurance has been obtained by Contractor and approved by the County. Nor shall the Contractor allow any Subcontractor to commence work on his subcontract until the insurance required of the Subcontractor has been obtained and approved.

COMPENSATION INSURANCE

Contractor shall procure and shall maintain during the life of this contract Workmen's Compensation Insurance for all of his employees to be engaged in work on the project under his contract, and, in case of any such work sublet, the Contractor shall require the Subcontractor similarly, to provide Workmen's compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case a class of employees engaged in hazardous work on the project under this contract is not protected under the Workmen's Compensation Statute, the Contractor shall provide and shall cause each Subcontractor to provide adequate employer's general liability insurance for the protection of such of his employees as are not otherwise protected. The Baldwin County Commission, its Departments and its employees shall be named as additional insured.

CONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE

The Contractor shall procure and shall maintain during the life of this contract a Comprehensive Liability Policy providing bodily injury and property damage coverage on an occurrence basis including damages arising from blasting explosion or collapse, mechanical equipment digging in streets or highways, and including completed operations, independent contractors and contractual general liability. Insurance shall be contractual general liability $500,000.00 per occurrence bodily injury and property damage; $5,000 per person medical payments or medical expense; $500,000.00 per occurrence bodily injury and property damage; $5,000 per person medical payments or medical expense; $500,000.00 personal and advertising injury; $50,000.00 fire damage (any one firm); $1,000,000.00. The Baldwin County Commission, its Departments and its employees shall be named as additional insured.

The Contractor agrees to maintain such coverage as is required in this section for a period of one (1) year from the date of acceptance of the work by the County or at the date of the final amounts owed the Contractor by the County, whichever occurs first.

COMPREHENSIVE AUTOMOBILE LIABILITY INSURANCE

The Contractor agrees to carry a Comprehensive Automobile Liability Policy providing bodily injury liability on an occurrence basis and providing property damage liability on an accident basis. This policy shall protect the Contractor against all liability arising out of the use of automobiles, both private, passenger and commercial, regardless of whether such vehicles shall be owned by the Contractor, owned by others or hired. Limits of liability for Comprehensive Automobile Liability Insurance shall be $1,000,000.00 combined single limit bodily injury and property damage each occurrence. The Baldwin County Commission, its departments and its employees shall be named as additional insured.

COUNTY'S PROTECTIVE LIABILITY INSURANCE

The Contractor shall at his expense provide County's protective Liability policies issued in the names of the County and its departments covering their liability for operation of the Contractor. These policies shall provide limits of liability in the amount of $1,000,000.00 per occurrence bodily injury and property damage, $1,000,000.00 aggregate.

HOLD HARMLESS PROVISION

Provider shall indemnify, defend and hold County and its Commissioners, affiliates, employees, agents, and representatives (collectively "County") harmless from and against any and all claims, demands, liabilities, damages, losses, judgments, costs, and expenses including, without limitations, attorneys' fees, for any and all personal injury (including death) and property damage of any kind or nature whatsoever, incurred by, asserted against, or imposed upon County, as a result of or in any manner related to provision of services hereunder, or any act or omission, by Provider. Contractor shall provide the COUNTY with proof of general liability coverage including the COUNTY as an additional insured. This indemnification shall survive the expiration of this Contract.

SUBCONTRACTOR'S PUBLIC LIABILITY & PROPERTY DAMAGE INSURANCE

The Contractor shall require each of his Subcontractors to produce and maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance of the type specified in the above paragraph hereof, in amounts approved by the County.

Three (3) executed copies of each subsequent endorsement affecting the coverage of policies and of each cancellation shall be forwarded to the County.

SAFETY STANDARDS AND ACCIDENT PREVENTION

With respect to all work performed under this Contract, the Contractor shall:
Comply with the safety standards provisions of applicable laws, building and construction codes as required by the Associated General Contractors of America, and the requirements of OHSA (Occupational Safety and Health Act). Exercise every precaution at all times for the prevention of accidents and the protection of people (including employees) and property. The Contractor shall furnish and maintain sufficient and adequate danger signals, lights, barriers**,** etc., as necessary to prevent accidents and to protect the work site. These items are Considered incidental and are considered as part of the Contract.

TIME OF COMPLETION

Projects must be completed within **ONE HUNDRED FIFTY (150) days** of notification to proceed including 90 days of construction once the equipment is available. Project shall be complete after receipt of Manufacturer's Warranty.

LIQUIDATED DAMAGES

Liquidated damages shall be applied to this project. Liquidated damages shall be applied based on the number of days the project is delayed beyond completion of the construction schedule for installing and having the chilled and heating hot water systems operational. The first 5 days of delay shall be for $750.00 per day, the next 5 days (day 6 through day 10) shall be for $1,500.00 per day and from day 11 and on shall be $2,000.00 per day. The construction schedule beyond the chilled and heating hot water system becoming operational is sufficient for completing construction of the project. Failure to complete project construction within the construction schedule shall initiate a second phase of liquidated damages.

CLEANUP

Accumulated debris shall be removed periodically to assure maximum safety and sanitation at all times. At the time of completion, the Contractor shall remove all excess material and debris from the site and leave all roof surfaces free from accumulations of dirt, debris and other extraneous materials.

FINAL PAYMENT

The Contractor, immediately after the completion of the contract, shall give notice of said completion by an advertisement in some newspaper of general circulation in the local area, for a period of three (3) successive weeks. Proof of publication of said notice shall be made by the Contractor to the County, by affidavit of the publisher and a printed copy of the notice published. The advertisement of completion shall provide that any person having claims for labor and/or materials are requested to file notice of such claims with the County. The final payment shall not be made upon the contract until the expiration of 30 days after the completion of the notice and including all necessary cleanup, and the Baldwin County Commission receives written verification of completion and intent to warranty job, by the Manufacturing Company.

FUNDING SOURCE

This public works project is being funded 100% by the Baldwin County Commission.

BID DOCUMENTS AND DRAWINGS ATTACHED

BID #WG26-32 RESPONSE FORM
Purchase and Installation of HVAC Upgrade to the Baldwin County Annex V Revenue Commission Building located in Bay Minette, Alabama

Date: _____

Out of State _____ or _____ If yes, _____
Yes No Registration Number

Company Name: _____

Address: _____

_____

_____

Company Rep_____
(Rep. Name Typed or Printed)

Position: _____

Phone: _____

Fax: _____

Email: _____

Contractor's License Number _____
(License Issued by the Alabama State Licensing Board for General Contractors)

"ALABAMA GENERAL CONTRACTORS LICENSE NUMBER MUST BE CLEARLY LISTED ON THE OUTSIDE OF THE VENDOR BID ENVELOPE"

Make / Model: _____

Amount Bid for Project: _____

Completion Time: _____

State of Alabama)

County of Baldwin)

CONTRACT FOR PROFESSIONAL & CONSTRUCTION SERVICES

This Contract for **Professional and Construction** Services is made and entered into by and between the County of Baldwin (hereinafter called "COUNTY") acting by and through its governing body, the Baldwin County Commission, and _____**,** (hereinafter referred to as "PROVIDER").

WITNESSETH:

Whereas,

Whereas,

NOW, THEREFORE, in consideration of the premises and the mutual covenants herein contained the sufficiency of which being hereby acknowledged, PROVIDER and COUNTY do hereby agree as follows:

I. Definitions. The following terms shall have the following meanings:

A. COUNTY: Baldwin County, Alabama

B. COMMISSION: Baldwin County Commission

C. PROVIDER: _____

II. Obligations Generally. The COUNTY hereby retains, and the PROVIDER agrees to perform for the COUNTY, those services as hereinafter set forth. This document shall serve as the binding contract for the services of the PROVIDER. The PROVIDER shall immediately commence performance of the services outlined herein upon full execution of this Contract. All work shall be commenced and completed in a timely manner as, and at the times, herein set out.

III. Recitals Included. The above recitals and statements are incorporated as part of this Agreement and shall have the effect and enforceability as all other provisions herein.

IV. Professional Qualifications. For the purpose of this Contract, the PROVIDER represents and warrants to the COUNTY that it possesses the professional, technical, and administrative personnel with the specific

experience and training necessary to provide the professional services required herein.

V. No Prohibited Exclusive Franchise. The COUNTY neither perceives nor intends, by this Contract, a granting of an exclusive franchise or violation of Art. I, Section 22 of the Alabama Constitution.

VI. Representation/Warranty of Certifications, Etc. PROVIDER represents and warrants that PROVIDER is presently certified, licensed and otherwise permitted under all necessary and applicable laws and regulations to perform the services herein, and that PROVIDER shall renew, maintain, and otherwise ensure that all such certifications, licenses, and permits are current and valid, without interruption, for and through completion of the services. The representation and warranty aforesaid is a material inducement to the COUNTY in entering this Contract, and the parties agree that the breach thereof shall be deemed material at the County's option.

VII. Legal Compliance. PROVIDER shall at all times comply with all applicable Federal, State, local and municipal laws and regulations.

VIII. Independent Contractor. PROVIDER acknowledges that it is an independent contractor, and PROVIDER shall at all times remain as such in performing the services under this Contract. PROVIDER is not an employee, servant, partner, or agent of the COUNTY and has no authority, whether express or implied, to contract for or bind the COUNTY in any manner. The parties agree that PROVIDER shall be solely responsible for and shall have full and unqualified control over developing and implementing its own means and methods, as it deems necessary and appropriate in providing the aforementioned services, and that the COUNTY's interests herein are expressly limited to the results of said services. PROVDIER is not entitled to unemployment insurance benefits, and PROVIDER is responsible for and obligated to pay any and all federal and state income tax on any monies paid pursuant to this Contract.

IX. No Agency Created. It is neither the express nor the implied intent of PROVIDER or COUNTY to create an agency relationship pursuant to this Contract. Therefore, the PROVIDER does not in any manner act on behalf of COUNTY and the creation of such a relationship is prohibited and void.

X. Unenforceable Provisions. If any one or more of the provisions contained herein shall, for any reason, be held to be invalid, illegal or unenforceable in any respect, then such provision or provisions shall be deemed severable from the remaining provisions hereof, and such invalidity, illegality or unenforceability shall not affect any other provision hereof. This Contract shall be construed as if such invalid, illegal or unenforceable provision had never been contained herein.

XI. Entire Agreement. This Contract represents the entire and integrated agreement between COUNTY and PROVIDER and supersedes all prior negotiations, representations, or agreements, either written or oral. This Contract may be amended only by written instrument signed by all parties.

XII. Failure to Strictly Enforce Performance. The failure of the COUNTY to insist upon the strict performance of any of the terms, covenants, agreements and conditions of this Contract shall not constitute, and shall never be asserted by PROVDIER as constituting, a default or be construed as a waiver or relinquishment of the right of the COUNTY to thereafter enforce any such term, covenant, agreement, or condition, but the same shall continue in full force and effect.

XIII. Assignment. This Contract or any interest herein shall not be assigned transferred or otherwise encumbered by PROVIDER without the prior written consent of the COUNTY, which may be withheld or granted in the sole discretion of the COUNTY.

XIV. Ownership of Documents/Work. The COUNTY shall be the owner of all copyright or other intellectual property rights in reports, documents and deliverables produced and paid for under this Contract, and to the extent permitted by Alabama law, any such material may be reproduced and reused at the discretion of the COUNTY without payment of further consideration. PROVIDER shall not transfer, disclose, or otherwise use such information for any purpose other than in performance of the services hereunder, without the COUNTY's prior written consent, which may be withheld or granted in the sole discretion of the COUNTY.

XV. Notice. Notice required herein shall be in writing, unless otherwise allowed, and said notice shall be deemed effective when received at the following addresses:

PROVIDER:

COUNTY: Baldwin County Commission
c/o Chairman
312 Courthouse Square
Suite 12
Bay Minette, AL 36507

XVI. Services to be Rendered. PROVIDER is retained by the COUNTY as a professionally qualified Contractor. The general scope of work for the services shall include all the terms and Conditions of "**Competitive Bid #WG26-32",** the same being expressly incorporated herein by reference, and without limitation will encompass:

"Competitive Bid #WG26-32 – Purchase and Installation of HVAC Upgrade to the Baldwin County Annex V Revenue Commission Building located in Bay Minette, Alabama, for the Baldwin County Commission."

A. PROVIDER will provide ongoing communications with COUNTY regarding this service, including updates, emails, etc. as requested. Additionally, PROVIDER will meet with COUNTY as needed or requested.

B. PROVIDER is responsible for the professional quality, technical accuracy, timely completion, and coordination of all services furnished by or in relation to this Contract.

C. PROVIDER represents and warrants that its services shall be performed within the limits and standards provided by the COUNTY, in a manner consistent with the level of care and skill ordinarily exercised by similar providers under similar circumstances at the time the services are performed.

XVII. General Responsibilities of the COUNTY.

A. The COUNTY shall provide reasonable notice to PROVIDER whenever the COUNTY actually observes or otherwise actually becomes aware of any development that affects the scope or time of PROVIDER's services hereunder or any defect or nonconformance in the work of PROVIDER.

B. The COUNTY shall pay to PROVIDER the compensation as, and subject to the terms set out below.

XVIII. Termination of Services. The COUNTY or PROVIDER may terminate this contract, with or without cause or reason, by giving ten (10) days written notice of such to the other party. Upon receipt of such notices, PROVIDER shall discontinue its work to the extent specified in the notice.

In the event of termination, the COUNTY shall pay PROVIDER for all services satisfactorily rendered, and for any expenses deemed by COUNTY to be a reimbursable expense incurred pursuant to this Contract and prior to the date of termination.

XIX. Compensation Limited. The compensation to be paid to the PROVIDER shall be the full compensation for all work performed by PROVIDER under this Contract. Any and all additional expenditures or expenses of PROVIDER, not listed in full within this Contract, shall not be considered as a part of this Agreement and shall not be demanded by PROVIDER or paid by COUNTY.

XX. Direct Expenses. Compensation to PROVIDER for work shall be paid $_____. Said compensation shall be all inclusive, including without limitation, reimbursement of all cost, incidentals and operating expense associated with those directly engaged in performance of the requested services

XXI. Method of Payment. PROVIDER shall submit invoices to the COUNTY for payment for work performed. Such invoices shall be accompanied by a detailed account of compensation to be paid PROVIDER.

Payment shall be made by the COUNTY within thirty (30) days of the approval of the invoice submitted by the PROVIDER. The COUNTY agrees to review and approve invoices submitted for payment in a timely manner.

XXII. Effective and Termination Dates. This Contract shall be effective and commence immediately upon the same date as its full execution and shall terminate upon either the expiration of not more than **one hundred fifty (150) days** after the Notice to Proceed is given including 90 days of construction once the equipment is available or upon a written notification thereof received by either party within the required ten (10) day period. [Nothing herein stated shall prohibit the parties from otherwise terminating this Contract according to the provisions herein.]

XXIII. Force Majeure. The Parties hereto shall incur no liability to the other if performance becomes impossible or impracticable by reason on an event or effect that the parties could neither have anticipated nor controlled. This allowance shall include both an act of nature and acts of third parties. Any costs that would otherwise be incurred and/or necessitated by the provisions herein shall be alleviated for either party by such event or effect.

XXIV. Indemnification. Provider shall indemnify, defend and hold County and its Commissioners, affiliates, employees, agents, and representatives (collectively "County") harmless from and against any and all claims, demands, liabilities, damages, losses, judgments, costs, and expenses including, without limitations, attorneys' fees, for any and all personal injury (including death) and property damage of any kind or nature whatsoever, incurred by, asserted against, or imposed upon County, as a result of or in any manner related to provision of services hereunder, or any act or omission, by Provider. Contractor shall provide the COUNTY with proof of general liability coverage including the COUNTY as an additional insured. This indemnification shall survive the expiration of this Contract.

XXV. Number of Originals. This Contract shall be executed with three originals, all of which are equally valid as an original.

XXVI. Governing Law. This Contract in all respects, including without limitation its formation, validity, construction, enforceability, and available remedies, shall be governed by the laws of the State of Alabama, without regard to Alabama conflict of law principles.

XXVII. Insurance. Prior to performing services pursuant to this Contract, Provider shall carry, with insurers satisfactory to County, throughout the term of hereof, Auto Liability Insurance, including owned, hired and non-owned vehicles, with limits of not less than $1,000,000, combined single limit, for both bodily injury liability and property damage liability each occurrence; Commercial General Liability Insurance, including all contractual liability hereunder, with limits not less than $1,000,000, combined single limit, for both bodily injury liability and property damage liability each occurrence, and Worker's Compensation Insurance, meeting the statutory limits of the State of Alabama and Employer's Liability Insurance fully covering all employees and supervisors participating in the work at the subject property site. All liability insurance shall name the County as an additional insured. Prior to commencing operations hereunder, a Certificate of Insurance evidencing such coverage, satisfactory to County, shall be furnished to County, which shall specifically state that such insurance shall provide for at least ten (10) days' notice to County in the event of cancellation, termination, or any change in such insurance policies. The worker's compensation certificate shall bear an endorsement clearly, evidencing a waiver of the right of subrogation against County and County Representatives. Should Provider fail to furnish current evidence upon demand of any insurance required hereunder, or in the event of cancellation, termination or change in any such insurance, County may, at its option, suspend this Contract until insurance is obtained, terminate this Contract immediately without further action, or hold Provider in material default and pursue any and all remedies available.

XXVIII. Surety: As a material inducement for the County to enter this Contract, any and all bond and/or surety guarantees required by the County in reference to the Project shall be in a form acceptable to the County and shall, without limitation, meet the following requirements:

(a) Acceptance of Surety. The bond and/or surety document must be reviewed by, and be acceptable to, County staff and approved by the County Commission. In the event that such document is not in an acceptable form at any time prior to or during the effectiveness of this Contract, the services and/or work described in this Contract shall either not commence or immediately cease, depending on the situation. Any project delay that is attributable to the County's acceptance, or non-acceptance, of the bond and/or surety document form shall in no way be consider as a delay caused by the County, and the Contractor and/or

Provider waives all rights to claim that any such delay was the fault of the County.

(b) Value of Surety. The bond and/or surety guarantee shall be of an amount equal to or greater than 100 percent of the total cost identified in the bid response.

(c) Term of Surety. Any bond and/or surety guarantees required by the County must be valid at all times during the life of this Contract. Notwithstanding anything written or implied herein to the contrary, in no event shall the bond and/or surety document lapse, terminate, expire, or otherwise become invalid prior to the County, or the County's authorized agent, providing a written Notice to the Provider/Contractor that the Project is in fact completed in all respects. Said Notice from the County or its authorized agent shall not be provided until the County, in its sole discretion, is satisfied that the Project is complete in all respects.

(d) Scope of the Surety. The terms and provisions of any bond and/or surety guarantee provided as part of this Project shall in all respects, without limitation, be consistent and in agreement with, the provisions of this Contract. In the event that the bond and/or surety guarantee is in conflict with this Contract, this Contract shall govern. Neither this section nor this provision limits the duties of the Provider/Contractor to satisfy all of the requirements in this Contract.

XXIX. The public works project which is the subject of this Contract is 100% funded by the Baldwin County Commission.

XXX. Title 39/Code of Alabama Compliance. As a condition of any Bid Award and the respective contract(s) pursuant thereto, the County places full reliance upon the fact that it is the sole responsibility of any contractor, person or entity entering into such a contract with Baldwin County for the prosecution of any public works, to ensure that they and/or any of their respective agents comply with all applicable provisions of Title 39-1-1 et seq. Code of AL 1975, as amended. More specifically, any contractor, person or entity entering into such a contract with Baldwin County for the prosecution of any public works shall be in compliance with, and have full knowledge of, the following provisions of Title 39 including, but not limited to, the following:
"(f) The Contractor shall, immediately after the completion of the contract give notice of the completion by an advertisement in a newspaper of general circulation published within the city or county in which the work has been done, for a period of three successive weeks. A final settlement shall not be made upon the contract until the expiration of 30 days after the completion of the notice. Proof of publication of the notice shall be made by the contractor to the authority by whom the contract was made by affidavit of the publisher and a printed copy of the notice published . . ." §39-1-1(f) Code of AL 1975.

"(g) Subsection (f) shall not apply to contractors performing contracts of less than one hundred thousand ($100,000) in amount. In such cases, the governing body of the contracting agency, to expedite final payment, shall cause notice of final completion of the contract to be published one time in a newspaper of general circulation, published in the county of the contracting agency and shall post notice of final completion on the agency's bulletin board for one week, and shall require the contractor to certify under oath that all bills have been paid in full. Final settlement with the contractor may be made at any time after the notice has been posted for one entire week." §39-1-1 (g) Code of AL 1975.

NOTE: Any failure to fully comply with this section or any applicable laws of the State of AL shall be deemed a material breach of the terms of both the Bid Award and the Respective contracts resulting there from. Furthermore, Baldwin County takes no responsibility for resulting delayed payments, penalties, or damages as a result of any failure to strictly comply with Alabama Law.

IN WITNESS WHEREOF, the parties hereto have executed this contract on the last day of execution by the COUNTY as written below.

COUNTY

_____

James E. Ball /Date
Chairman

ATTEST:

_____

Roger H. Rendleman /Date
County Administrator

State of Alabama)

County of Baldwin)

I, _____Notary Public in and for said County, in said State, hereby certify that, James E. Ball, whose name as Chairman of Baldwin County Commission, and Roger H. Rendleman, whose name as County Administrator, are known to me, acknowledged before me on this day that, being informed of the contents of the Contract for Professional and Construction Services, they, as such officers and with full authority, executed same knowingly and with full authority to do so on behalf of said Commission.

GIVEN under my hand and official seal, this the _____ day of _____ 2026.

_____

Notary Public
My Commission Expires

SIGNATURE AND NOTARY PAGE TO FOLLOW

PROVIDER:

Insert Providers Name

_____/_____
By _____/Date
Its _____

State of Alabama)

County of _____)

I, _____, Notary Public in and for said County and State, hereby certify that _____ as _____ of _____, whose name is signed to the foregoing in that capacity, and who is known to me, acknowledged before me on this day that, being informed of the contents of the foregoing, he executed the same voluntarily on the day the same bears date for and as an act of said _____.

GIVEN under my hand and seal on this the _____ day of _____ 2026.

_____
Notary Public
My Commission Expires

BALDWIN COUNTY ANNEX V
REVENUE COMMISSION BUILDING
1705 U.S. HWY – 31 S.
BAY MINETTE, ALABAMA 36507

FOR

BALDWIN COUNTY COMMISSION
312 COURTHOUSE SQUARE
BAY MINETTE, ALABAMA 36507

BY

H. M. YONGE & ASSOCIATES, INC.
CONSULTING ENGINEERS
253 ST. ANTHONY STREET
MOBILE, ALABAMA 36603
(251) 690-7446

MAY 2026

SECTION 01030 – DESCRIPTION OF WORK, ALTERNATES AND PHASING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This project is for the upgrade of the air distribution system in the Revenue Commission Building. The description of work for this project is as follows:

1. Modify two existing central station variable volume air handling units.
2. Remove and replace the existing direct digital control systems.
3. Remove 23 variable air volume air terminal units and replace new.
4. A redundant circulation pump shall be added to the chilled water system.
5. A redundant circulation pump shall be added to the heating hot water system.

1.2 DESCRIPTION OF ALTERNATES

A. There are not any Additive Alternates for this project.

B. Installation of the redundant pumps for the chilled and heating hot water systems shall be identified as Additive Alternate #1.

1.3 DESCRIPTION OF PHASING PLAN

A. This project shall commence once a contract has been awarded. It is intended work shall proceed though completion without delays. A specific time frame has not been established for this project relative to holidays, vacations and equipment deliveries. The construction period for this project shall be 150 days from the date of notice to proceed including 90 days of construction once the equipment is available.

B. Mechanical contractor shall be responsible for coordinating a shut-down of the chilled water system with Baldwin County Commission Facility Maintenance. A shut-down shall be coordinated prior to beginning any work for the shut-down to occur over a weekend or holiday. The extent of the shut-down shall be for a maximum of three days (72 hours). Mechanical contractor shall be responsible for providing chilled water for building operations through the use of a temporary chiller after the three day shut-down. Acquiring a temporary chiller with power and operation shall be the responsibility of the mechanical contractor. Additive Alternate #1, on the bid form, shall identify the cost of a temporary chiller for use to supply chilled water to the building until the building chiller is operational.

C. Liquidated damages shall be applied to this project. Liquidated damages shall be applied based on the number of days the project is delayed beyond completion of the construction schedule for installing and having the chilled and heating hot water systems operational. The first 5 days of delay shall be for $750.00 per day, the next 5

days (day 6 through day 10) shall be for $1,500.00 per day and from day 11 and on shall be $2,000.00 per day. The construction schedule beyond the chilled and heating hot water system becoming operational is sufficient for completing construction of the project. Failure to complete project construction within the construction schedule shall initiate a second phase of liquidated damages.

END OF SECTION 01030

SECTION 15100 - GENERAL REQUIREMENTS FOR MECHANICAL WORK

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Scope of Section: Include all materials, equipment, and labor necessary for a complete and properly functioning mechanical installation in accordance with local and state codes, contract drawings and as specified in all 15000 series of these specifications.

B. Scope of Work: Contractor will be responsible for the demolition and installation of all new work indicated on plans. Coordination shall be required with all existing systems remaining in place as indicated not to be disturbed or reused as a part of the new systems. These systems include plumbing, HVAC, and controls.

1.2 DRAWINGS

A. Mechanical drawings are diagrammatic and indicate the general arrangement and extent of work. Exact locations and arrangements of materials and equipment shall be determined as work progresses to conform in the best possible manner with the surroundings and with the adjoining work of other trades.

1.3 COORDINATION OF WORK

A. Prior to installation, coordinate all work with work of other trades in detail to preclude interferences between the work of different trades and to insure necessary clearances at crossovers and equipment. Work requiring necessarily fixed locations such as graded piping shall take precedence over work not requiring such fixed locations and shall establish permissible routing of services associated with the latter. Should work be performed without adequate coordination so that interferences occur between work of different trades, Contractor shall eliminate such interferences by requiring necessary rework by the trades involved. Such rework shall meet approval of Engineer and shall incur no additional cost to Owner.

B. Careful coordination shall be made between all new pipe routing shown on plans.

1.4 CODES, PERMITS, TAXES

A. Governing Law: Refer to "General Conditions". Work shall meet requirements of applicable codes, ordinances, rules and regulations, in effect at time of signing contract of any body or bodies having jurisdiction, including utilities.

B. Correction of Work: Work done contrary to above requirements shall be corrected at no additional cost to Owner.

C. Permits, Fees, and Taxes: Refer to "General Conditions". Secure and pay for all necessary permits, inspections, licenses, meters, connections, etc., that may be required; pay all required taxes. Owner shall pay any environmental impact fee incurred.

1.5 DISCREPANCIES

A. In case of differences between drawings and specifications or where drawings and/or specifications are not clear or definite, the subject shall be referred to Engineer for clarification and instructions. Such items should be directed to Engineer prior to taking bids.

1.6 SUBMITTALS

A. Refer to Section. "General Requirements".

B. Material List: Within thirty (30) days of award of contract submit a complete list of materials to be provided for the mechanical work. List shall include manufacturer's name and catalog number or series for each item on list.

C. Detail Drawings: Before commencing work, submit other drawings or diagrams, dimensioned and in correct scale, requested by Engineer to clarify the work intended to show its relationship to adjacent work or work of other trades. Drawings shall clearly indicate all characteristics, special modifications or features, and exceptions to or deviations from contract requirements.

D. Order of submittal shall correspond to sequence of specification by section number and paragraph number. Provide dividers at each specification section.

E. Samples: Submit samples of materials as listed elsewhere herein. Samples shall duplicate materials, workmanship, and finish of products intended for installation.

F. Product Data: Submit manufacturer's technical product data for circulating pumps showing dimensions, capacities, certified ratings, performance curves with operating point clearly indicated, motor electrical characteristics, pressure gauges, and installation instructions.

G. Equipment Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, weight loadings, required clearances, construction details, and field connection details of all mechanical materials and equipment to be furnished under this contract.

H. Construction Shop Drawings: Submit for approval by General Contractor and Engineer construction shop drawings showing all floor and wall penetrations from below grade up through roof. These drawings shall be dimensioned per architectural drawings. Shop drawings shall be submitted by all trades responsible for work under Section 15000 for the specifications which include the Mechanical Contractor.

I. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to mechanical equipment. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

J. Maintenance Data: Submit maintenance instructions, including instructions for lubrication, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings, and wiring diagrams in Operation and Maintenance manuals; in accordance with requirements of Division 1.

1.7 RECORD DRAWINGS

A. Provide in accordance with architectural "General Requirements" section. In addition, location elevations, type and material of construction of all utility lines uncovered during installation of new piping shall be recorded.

1.8 INSTRUCTIONS

A. Personnel: After completion of installation, competent personnel shall be furnished to instruct Owner's personnel in operation and maintenance of systems.

B. Written: Furnish three (3) copies of instructions for operating various systems, including complete description of functions and operations of each piece of equipment, automatic control system, and diagrams indicating automatic control hook-up. Control devices shall be identified and their actual location in building noted on diagrams. Include cleaning, oiling, and greasing instructions of each item of equipment. Spare parts list and source of supply shall be identified for each item of equipment. Furnish in loose leaf hardboard 3-ring binders to Architect/Engineer (for delivery to Owner).

1.9 FINAL CHECK

A. Before submitting proposals, each bidder shall examine all drawings and specifications issued by the Engineer and shall examine the site of work. He shall be fully informed as to character of his work and coordination of his work with that of other trades. No consideration will be given at a later date for alleged misunderstandings as to requirements of work, materials to be furnished or conditions required by nature of site.

1.10 FOUNDATIONS

A. The Contractor shall furnish all special foundations and supports for equipment which he installs and which are separate and distinct from building construction as shown by architectural drawings. Support equipment from building structures in a manner acceptable to the Architect.

1.11 SAFETY PROVISIONS

A. Belt, pulleys, chains, gears, couplings, projecting set screws, keys and other rotating parts located so that any person may come in close proximity thereto, shall be fully enclosed or properly guarded.

1.12 RELATED WORK

A. The following items of material and labor incidental to or related to the work will be provided as follows:

1. Cutting and patching of building structure shall be allowed for installation of pipes, air ducts, etc., by this Contractor. Patching and finishes shall be performed by affected trades. Coordinate all locations requiring core drilling and/or cutting with Construction Manager Superintendent prior to beginning any work. Structural beams, columns, and concrete joists (tees) shall not be penetrated without prior approval of Structural Engineer.
2. Furring around pipes, ducts, etc., shall be by General Contractor.
3. Masonry openings for outside air intakes and for exhaust outlets, louvers, etc., including

curbs and flashing of roof structure shall be provided by the General Contractor.

4. All electrical power wiring, conduit, etc., for motors and motor starters shall be furnished and installed by the electrical contractor. Electrical automatic control devices, relays, etc., required for electrical interlock for operation of system shall be furnished complete by this Contractor in strict accordance with all requirements of wiring specifications as a part of the control system. Motor starters shall not be provided under this section of this specification, except as provided as an integral part of the equipment.

PART 2 - PRODUCTS

2.1 QUALITY

A. Conform to the quality and features specified and indicated by drawings. Where material or equipment is indicated or necessary, but not specifically described in the specifications or drawings, such shall conform to the quality and features of similar items so described or otherwise indicated.

2.2 SLEEVES

A. Pipe Sleeves:

1. Walls and Partitions: Sleeves 8" Diameter and Smaller (Above Grade): Mild steel or plastic built into wall, partition or beam sized to pass pipe and covering, leaving a clear space of 1/4" minimum between covering and sleeves.
2. Floors (Above Grade): 14-gauge galvanized steel or plastic, set before floor is poured, sized to pass pipe and covering, leaving a clear space of 1/4" between covering and sleeve, and shall extend 1/2" above finished floor.
3. Exterior (Below Grade): PVC pipe, size and weight indicated, for passage of piping and conduit under paving and walks. Set at a depth to prevent damage by traffic, and mark location (so that they may be recovered when necessary).
4. Duct Sleeves: Sleeves or openings sized to pass mechanical ducts and coverings of framed construction in roof, walls and partitions.

B. Sealing of Sleeves:

1. Below Grade: Caulk annular space between pipe and sleeve using oakum and poured lead both sides minimum 1" deep to make floor penetration watertight.
2. Above Grade: Make openings around pipes, etc., passing through sleeves draft-free and vermin-proof by packing solidly using mineral wool or glass fiber.

2.3 SUPPORTING DEVICES

A. Inserts:

1. Preset Type: Malleable iron with removable interchangeable nuts having lateral adjustment of not less than 1 5/8". Continuous inserts shall have a capacity of 2000 lbs. per foot and shall be hooked over reinforcing. Acceptable: C-B Universal Fig. 282; Unistrut Products Co., P-300; Binkley B-32-1.
2. Afterset Types: Self-drilling style expansion shields shall be used in concrete and brick. Toggle bolts shall be used on block walls and partitions.

B. Steel Framing:

1. Steel framing provided with the building structure shall not be used for support of any equipment or piping.
2. Steel framing, as pipe supports and/or beams shall be provided as indicated on plans and as needed for proper support. The Engineer shall direct additional pipe supports to be installed subject to field conditions.

C. Stud Partitions:

1. All anchorage shall be to studs or solid blocking built into the wall.
2. Equipment, Piping and Duct Hangers:
3. Provide angles, brackets, clamps, anchors, braces, frames, rods and other miscellaneous steel items as necessary for support of equipment and piping specified herein.
4. All piping, ducts, etc., shall be run parallel with the lines of the building, unless otherwise shown or noted on the drawings. The different service pipes, valves, fittings, etc., shall be so installed that after the covering is applied there will be not less than 1/2" clear space between the finished covering and other work, and between the finished covering of parallel adjacent pipes. Hangers shall be so spaced to prevent sag and to permit proper drainage. Exact location of piping, ducts, etc., shall be coordinated between subcontractors so that there will be no interference.

2.4 BELT DRIVES

A. Each motor driven machine not direct connected shall be equipped with OSHA approved V-belt drive. Belts shall be of correct cross section to fit properly in sheave grooves. Belts for each drive shall be carefully matched. Sheaves shall be of cast iron or steel, bored to fit properly on shafts and secured with keys of proper size. Variable and adjustable pitch sheaves shall be furnished for fans and shall be selected to that required rpm will be obtained with sheave set approximately in mid-position. Once equipment has been tested and balanced and a final setting determined by the test and balance agency, a fixed sheave shall replace the adjustable sheave. Final size of fixed sheave shall be determined by test and balance agency. Rating of each drive shall be as recommended by manufacturer for service, but shall be at least 1.5 times nameplate rating of motor.

2.5 BELT AND COUPLING GUARDS

A. Equip each belt drive with a guard constructed of #12 U.S. standard gauge 3/4" diamond mesh steel wire screen or equivalent, welded to 1/2" steel angle frames which shall enclose all belts and sheaves. Tops and bottoms of guards shall be of #18 U.S. standard gauge steel. Braces or supports must not "bridge" sound and vibration isolators. Guards shall be designed with adequate provision for movement of motor required to adjust belt tension. Provide means to permit oiling, use of speed counters, and other maintenance and testing operations with guard in place. All direct drive equipment shall have coupling guards in accordance with Florida Department of Business Regulation safety regulations.

2.6 PAINTING AND MARKING

A. Painting: Painting of equipment, pipe, and ducts (insulated or uninsulated) shall be as specified in Section "Painting". Touch-up of shop coats shall be performed under section furnishing equipment and shall match equipment factory finishes.

B. Marking:

1. Pipes: Exposed piping shall be stenciled with name of service to indicate the use of pipe and with arrows to indicate direction of flow. Stencils shall be applied after final painting is completed. In lieu of stencils, pipe identification labels similar to "Brady" may be used. Bands shall be color coded. Markings shall be in accordance with ANSI St'd A-13.1.
2. Equipment: Fans, ducts, etc., shall be stenciled as specified above. Small equipment such as starters, control devices, etc., shall be neatly labeled with small engraved laminated plastic labels. Labels shall be permanently attached to equipment.

2.7 ELECTRICAL

A. General: Unless specified otherwise, motors and control devices shall be furnished under the division of the specifications that covers the driven equipment. Motor starters shall be provided and installed by the electrical contractor except where as an integral part of the equipment. All electrical power wiring, conduits, and connections shall be provided under the Electrical Section. Contractor furnishing driven equipment shall coordinate wiring diagrams with contract requirements and shall furnish coordinated wiring diagrams for installation.

B. Motors: Unless otherwise specified, each motor shall have sufficient capacity to start and operate the machine it drives without exceeding the motor nameplate ratings the speed required. (Except that the NEMA standard service factor may be applied to motors that are water or refrigerant cooled.) The horsepowers specified are those estimated to be required by the equipment when operating at specified duties and efficiencies. If the actual horsepower for the equipment to be furnished differs from that specified or indicated on drawings, it shall be the responsibility of the Section furnishing equipment to insure that proper size feeders, breakers, etc., are provided at no change in contract cost. Motors shall be rated for continuous duty, at 100% of nameplate rating with a service factor of 1.15. Squirrel cage induction motors shall have normal starting torque, full voltage low starting current, constant speed continuous duty type. Motors shall be wound for specified voltage.

C. Starters to be furnished under this section of the specification shall be as an integral part of the equipment.

D. General: Starters shall have proper rating for motors controlled.

E. Overcurrent Protection: Contacts shall break each ungrounded line to the motor. A thermal overcurrent device shall be provided in each ungrounded line. All contacts shall open simultaneously upon tripping of any overcurrent device.

F. Magnetic Starters: All motors of ½ HP or larger. Each starter shall have a control transformer with fused 120 volt maximum control circuit. Control transformer shall be of adequate capacity for all controls on the circuit. Starters shall have on-off-automatic switches in cover.

PART 3 - EXECUTION

3.1 TESTS

A. General: All systems shall be inspected, tested, given a trial run, and demonstrated to Engineer's satisfaction that they are complete and ready for operation.

B. Piping: Unless required otherwise by code or other sections of specifications, test at a pressure of 150 percent of normal working pressure.

C. Air Conditioning Systems: Operate equipment and log readings of energy consumed, water flow, air flow and temperatures to permit evaluation of equipment capacities. Refer to Section "Test and Balance".

3.2 ACCEPTANCE

A. Prior to requesting final inspection:

B. Complete work required by drawings and specifications.

C. Balance air conditioning systems in accordance with Section "Test and Balance".

D. Acceptance will be by Architect on basis of tests and inspection of project. Contractor shall furnish necessary mechanics to operate system, furnish test instruments and equipment as required, make necessary adjustments and assist with final inspection.

END OF SECTION.

SECTION 15200 - SYSTEM TEST, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All General Provisions, including (but not limited to) General and Supplementary Conditions and General Requirements, apply to the Work specified in this section.

1.2 DEFINITIONS

A. Where specifically referred to in these specifications, the following terms are defined as follows:

1. Owner: Baldwin County Commission
2. TAB: Test, Adjusting, Balancing
3. Contractor: TAB Contractor
4. Engineer: H.M. Yonge & Associates, Inc. Consulting Engineers

1.3 SCOPE OF WORK

A. The Mechanical Contractor shall be responsible for the services of this testing and balancing contractor. The Mechanical Contractor shall include the cost of these professional services in their bid. Included with this responsibility shall be the coordination of the Testing and Balancing Contractor.

System Test and Balance shall be performed by a contractor certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB) and approved by the Engineer. All work done by this Contractor shall be by qualified technicians under the full-time direct on-site supervision of a Certified Test and Balance Engineer who is under the full time employ of the Contractor.

B. System balance shall be performed in accordance with the latest edition of AABC National Standards and in accordance with the requirements specified herein. In case of conflict, most stringent shall apply.

C. System balance shall not begin until systems are completely installed and operational. Report inability to begin system balance in writing to the Engineer, listing justification for same.

D. Upon completion of the Work, the TAB Contractor shall submit three (3) copies of the complete TAB Report to the Engineer for approval.

E. One TAB Contractor shall be responsible for all phases of system balance.

F. Contractor shall permanently mark the settings of all valves, dampers, and other adjustment devices in a manner that will allow the settings to be restored. If a balancing device is provided with a memory stop, it shall permit closing and reopening the valve to its balanced position.

G. System shall be balanced for full performance in cooling mode of operation.

H. In Progress Inspections: The Test and Balance Agency shall be furnished with plans and specifications by the Engineer as soon as TAB contract is awarded.

I. Plans and specifications shall be reviewed by the TAB Contractor prior to bid and if any discrepancies are noted which would hinder TAB services the Engineer shall be notified.

1.4 QUALIFICATIONS OF TAB CONTRACTOR

A. The TAB Contractor shall be certified by the AABC and/or the NEBB, and shall possess current certification of same at time of bid. TAB Contractor shall have been in business full time performing services as defined herein for three (3) years prior to bid opening.

B. Field technicians performing TAB services under the contract shall themselves be AABC certified for at least twelve (12) months prior to bid. Non-qualified field technicians shall not be acceptable.

1.5 TEST INSTRUMENTS

A. Test instruments shall be first quality and designated as a "test" quality whenever so offered by equipment manufacturer. TAB shall certify in writing to Engineer that instruments were inspected and calibrated within thirty (30) days to use.

B. The following represents test instruments required for use. Manufacturer substitutions shall be approved prior to use by Engineer:

1. Flow Hoods (Shortridge Model CFM-83)
2. Velometer (Alnor)
3. Incline Manometers (Weiss)
4. Magnehelic Gauge (Weiss)
5. Pitot Tubes (Johnson) Various sizes
6. O-250 PSI Test Gauge (VS Gauge) 2% accuracy
7. Digital Tachometer (5% accuracy)
8. Digital Thermometer (5% accuracy) ASTM
9. Digital VOM (Fluke)
10. Sound Level Meter
11. Vibration Analyzer

1.6 TAB SUBMITTALS

A. TAB Contractor shall submit following to Engineer for approval within thirty (30) days after contract award:

1. Detailed TAB procedures
2. Agenda
3. Resumes of project staff

B. Test and Balance Forms: The following is a list of equipment requiring Test and Balance forms, reference National Standards, AABC, Fourth Edition, 1982, for inclusion in the Test and Balance submittal. Each line item of the forms must be completed prior to acceptance of project completion.

1. General Data T & B Equipment Data

2. Air Handling Units
3. Air Cooled Chiller
4. Heating Boiler
5. Circuiting Pumps
6. Chilled Water
7. Heating Water

C. An approved copy of each of the above must be returned by the Engineer to the TAB Contractor before Systems Balance is begun.

D. If a complete submittal is not received within the specified time, the Engineer reserves the right to furnish the TAB Contractor with approved TAB procedures for use by the Contractor with no cost to increase to Owner.

1.7 COORDINATION AND WORK PERFORMED BY OTHER TRADES

A. It shall be the responsibility of the TAB Contractor to coordinate work with the Prime Construction Contractor only, if other trades are involved with project.

B. In order that all systems may be properly tested, balanced, and adjusted as required herein by these specifications, the General Construction Contractor shall operate said systems at his expense for the length of time necessary to properly verify their completion and readiness for TAB.

C. Project contract completion schedules submitted by the Prime Construction Contractor shall provide sufficient time to permit the completion of TAB services prior to Owner occupancy.

D. The scope of the TAB Work as defined herein is included in order that Prime Construction Contractor will be appraised of the coordination, adjustment, and system modification which will be required under the project work in order to complete the Owner's requirement for final TAB. The TAB Contractor will not have a contractual relationship with this Contractor, but will be responsible to the Engineer for the satisfactory execution of the TAB work. The Prime Construction Contractor shall allow sufficient funds in his project cost estimate and bid proposal to cover all work which may be required of him in the TAB phases as defined herein and as may be necessary for the completion of the TAB work as defined by the TAB specifications.

1.8 RESPONSIBILITIES OF PRIME CONSTRUCTION CONTRACTOR FOR TAB WORK

A. As a part of their project contract, the Prime Construction Contractor shall make or cause to be made any changes in the sheaves, belts, dampers, and/or control system elements required for correct balance as required by the TAB firm, at no additional cost to the Owner.

B. The plans and specifications have indicated valves, dampers and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of others to install these devices in a manner that will leave them accessible and readily adjustable. Should any such device not be readily accessible, the TAB Contractor shall notify the Engineer. Also, any malfunction encountered by TAB personnel shall be reported to the Engineer of the Construction Inspector.

C. After completion of the mechanical work, the TAB Contractor shall notify the Owner in writing, certifying that the work has been accomplished and that the building and the air conditioning systems are in readiness for testing, adjusting, and balancing.

D. The Architect/Engineer shall furnish one (1) complete set of as-built Plans and Specifications prior to TAB work, including:

1. Addenda
2. Change Orders
3. Approved Shop Drawings
4. Approved Submittals
5. Approved Temperature Control Diagrams

E. The Prime Construction Contractor is responsible for start-up and operation of systems during System Balance. Start-up shall include (but not be limited to) the following:

1. All equipment operable in safe and normal condition.
2. Temperature control systems installed complete and operable.
3. Proper thermal overload protection in place for electrical equipment.
4. Hydronic Systems:
    a. Flushed, filled, and vented
    b. Proper strainer baskets clean and in place
    c. Temporary start-up strainer baskets remove
    d. Service and balance valves open

1.9 LIAISON AND EARLY INSPECTION

A. TAB Contractor shall inspect the installation of mechanical piping systems, sheetmetal work, temperature controls, and all other component parts of the exhaust and ventilation systems during the construction stage for the purpose of reviewing that part of the work relating to proper arrangement and adequate provisions for testing and balancing.

B. During the balancing process, if or when abnormalities and malfunctions of equipment or components are discovered by the TAB Contractor, the Engineer shall be advised in writing by the Contractor so that the condition can be corrected by the prime construction contractor. Data from malfunctioning equipment shall not be recorded in the final TAB report. The TAB Contractor will not instruct or direct the Prime Construction Contractor in any of the work, but will make such reports as are necessary direct to the Owner.

1.10 TAB REPORT

A. The activities of described above will culminate in a final TAB report to be provided to the Engineer or his delegated representative. The intent of the report is to provide a reference of actual operating conditions for the Owner's operating personnel.

B. All measurements and recorded readings (of air, water, electricity, etc.), that appear in the reports must be done on-site by the permanently employed technicians or engineers of the TAB Contractor, under the direct field supervision of the TAB Engineer.

C. At the option of the Engineer, all data sheets tabulated each day by TAB personnel may be reviewed. Those work sheets so reviewed, or copies thereof, shall be included in the final TAB report as a supplement, not as the report itself.

D. The report shall be certified and approved by the test and balance engineer of the TAB Contractor and his seal shall appear on the first page of each copy. The report shall be recorded on standard AABC or NEBB forms approved by Engineer.

E. The TAB measurements and report shall include the following as a minimum:

1. PREFACE: A general discussion of the system, any idiosyncrasies, any problems encountered, an outline of normal and ventilation cycles of operation, any noise problem not corrected.
2. PITOT TUBE TRAVERSES: For use in future trouble-shooting by maintenance personnel, all exhaust ducts, shall have air velocity and volume measured and recorded by the traverse method. Locations of these traverse test stations will be described on the sheet containing the date.
3. AIR VOLUMES & VELOCITIES: As measured at each exhaust air grille. It shall be the obligation of the Prime Construction Contractor to furnish or revise fan drive and/or motors, if necessary, without cost to the Owner, to attain the specified air volumes.
4. EXHAUST FANS: Fans checked for rotation, amperage, static pressure. Field set for maximum and minimum CFM balanced to within 10% + to design.
5. CHILLED WATER: Record total flow, test and set pressure differential to submittal specifications. Measure and set flow. Record verification of building system operation for each building mode of operation. Insure automatic control valves are operational and that variable frequency drives are operating properly. Equipment operation shall correspond to static pressure variations.
6. STATIC PRESSURE DROPS: As measured across each supply fan, cooling coil, air handling unit filter and exhaust fan. Relate these readings to the particular fan curve in terms of CFM handled.
7. WATER TEMPERATURE: Shall be taken under maximum load conditions at all temperature sensors.
8. WATER PRESSURE: At all gauge connections. Pressure readings shall be related to water pressure drop submitted in terms of GPM handled and confirmed by GPM flow through flow measuring stations. The flow of water shall be adjusted by manipulating valves until the total water flow is verified.
9. BUILDING ENTRANCE: Water temperatures and pressures entering and leaving building shall be recorded. Water flow entering building shall be measured at venturi flow meter.
10. ELECTRICAL CURRENT/VOLTAGE: Measurements to be taken at the drive motor on each piece of equipment.
11. FAN SPEEDS: To be measured in RPM and discharge CFM (all exhaust and supply).
12. INSTRUMENTATION LIST: A list of instruments by type and make used in gathering the TAB data, together with date of most recent calibration.
13. TEMPERATURE CONTROLS: Verify proper sequencing, proper calibration, measure temperature at each sensor, note any sensor not controlling to within 2% of set point.
14. DRAWINGS: The drawings furnished to TAB Contractor will have the mechanical system components numbered and/or lettered by the TAB Contractor to correspond to the numbers and letters used on the report data sheets so that data in the report can be correlated with each specific supply air opening in the building.

F. Only one such marked up set of drawings need be provided with the three (3) copies of the TAB Report.

G. Before final acceptance of the TAB Report, the report data, at the discretion of the Engineer, shall be verified on the job site, by selection of check points at random, in the presence of the Owner's

representatives. Representatives of the testing firm doing the work shall be present and provide the necessary equipment for test data verification. The Owner shall notify the TAB Contractor of the acceptance of the report after clarification of any questions on the data recorded therein. If the balancing operation is delayed significantly through no fault of the TAB Contractor during the performance of their work, said firm shall be entitled to an interim payment which shall not exceed the value of the work accomplished at that time. This payment amount shall have the concurrence of the General Contractor.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 GENERAL

A. The TAB Contractor shall check, adjust, and balance with testing all components of the ventilation, exhaust, hydronic systems which will result in optimum noise, temperature, air and water flow in the building while the equipment of the system is operating. This is intended to be accomplished after the system components are installed and operating as provided for in the contract documents, which is the responsibility of the Prime Project Contractor.

B. The TAB Contractor shall be responsible for inspecting, adjusting, balancing, and logging the data on the performance of fans, the flows of water through all piping, and the power consumption of all motors.

C. During the TAB work, the temperature regulation will be adjusted for proper relationship between controlling instruments. The Engineer will be advised of any instruments out of calibration so that the controls subcontractor may come in to recalibrate, using data supplied by the balancing firm. After recalibration, room temperatures shall be retaken as described in "Temperature Tabulation" paragraph.

D. TAB services shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation latest edition.

3.2 SERVICES

A. Provide the following minimum services (including but not limited to):

B. Pre-construction plan and specification review for assurance of system balanceability.

C. Project visits and reports of inspection of fabrication and erection procedures of system installing contractor(s) on periodic basis as specified herein during construction for conformance with contract requirements. Expedite any required corrective measures.

D. Coordinate with Engineer on system modifications. Revise balancing procedures to accommodate changes in intended space usage.

E. Balance water systems for actual usage within the limits of the design criteria.

F. Balance systems for maximum efficiency at minimum energy usage.

G. Final balancing shall provide comfortable conditions to the satisfaction of the Owner.

H. Provide performance guaranty along with final TAB Reports.

3.3 GENERAL PROCEDURES

A. The TAB Contractor shall cooperate with the Engineer and all contractors to perform the work in such a manner as to meet the job schedule, providing that sufficient lead time for Test and Balance has been allowed.

B. The TAB Agency shall leave all system components clean and in proper working order, such as replace belt guards, close access doors, close doors to electrical switch boxes, and restore equipment thermostats to specified settings.

C. All recorded data shall represent a true, actually measured, or observed condition.

D. Any abnormal conditions in the mechanical systems or conditions which prevent System Balance, as observed by the TAB Contractor shall be reported as quickly as possible to the individual responsible.

3.4 SYSTEM READINESS PRIOR TO TEST AND BALANCE

A. The TAB Contractor shall, at minimum, inspect hydronic and temperature control system(s) prior to TAB work to verify system readiness for TAB work. TAB Contractor shall check the following items:

1. Water Circulating Systems:
   a. Open all valves to full open position, close bypass stop valves. Set mixing valves to full flow through systems components. Remove and clean all strainers. Repeat operation until circulating water is clean.
   b. All water circulating systems shall be full and free of air; all air vents installed at high points of systems and operating freely.
2. Automatic Controls:
   a. Verify that all control components (including EMCS hardware and software) are installed in accordance with project requirements and functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats.
   b. All controlling instruments calibrated and set for designed operating conditions.
3. Tabulated Data:
   a. The motor amperages and voltages indicated in above shall be recorded showing "actual" and "nameplate" voltage and amperage. This applies to each piece of electrically driven air conditioning and heating equipment in the system including all fans.

END OF SECTION.

SECTION 15800 - HEATING, VENTILATION, AND AIR CONDITIONING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The General Conditions, Supplementary Conditions and Division 1, General Requirements, apply.

1.2 CODES, FEES, PERMITS

A. The Contractor shall comply with all county, district, municipal, or local building code, interpretations, building permits and assessments of fees for building permits, and ordinances.

B. The Contractor shall obtain and pay for all required permits, inspections, and certificates of inspection. Certificates of inspection shall be delivered to the Architect upon completion of the job.

C. The Contractor shall comply with the latest revisions of all county, district, municipal, or local building codes, interpretations, buildings permits to include but not be limited to:

1. ASHRAE, 2012 "HVAC Systems and Equipment" - Chapter 19, Duct Construction SMACNA Standards for Duct Construction
2. International Building Code – 2021
3. International Mechanical Code – 2021
4. International Plumbing Code – 2021
5. International Fuel Gas Code – 2021
6. ASHRAE 90.1
7. ASHRAE 62.1
8. NFPA-90A - Installation of Air Conditioning and Ventilation Systems
9. NFPA-101 Life Safety Code
10. Local Municipal Codes

1.3 RELATED WORK SPECIFIED ELSEWHERE IN THE SPECIFICATIONS

A. General Requirements for Mechanical Work - Section 15100.

B. Test and Balance - Section 15200.

C. Automatic Temperature Controls System (ATCS) - Section 15950.

D. Electrical - Division 16000.

1.4 RESPONSIBILITY OF BIDDER

A. Each bidder shall visit the site of the proposed work and fully acquaint himself with conditions relating to the construction requirements so that he may fully understand the facilities, difficulties and restrictions contingent upon the execution of the work under this contract. The failure or omission of any bidder to receive or examine any form, instrument, addendum or other document shall in no way relieve any bidder from his obligations with respect to his bid

or the contract. The submission of a bid shall be taken as prima facia evidence of compliance with this paragraph and that he has included in his proposal every item of cost necessary for a complete installation of air conditioning, heating and ventilation operations strictly as planned, specified, and intended.

1.5 SUB-DIVISIONS OF WORK

A. Each sub-division of work includes furnishing and installing all materials to make that part of work complete, and shall comprise all auxiliaries, setting of equipment, sleeves through building construction where required and etc., all in complete coordination with General Contractor and in cooperation with other trades. It is contemplated that all sub-divisions of work when completed will form heating, air conditioning, and ventilation system for this project.

1.6 DRAWINGS

A. The drawings for the Heating, Ventilating and Air Conditioning for this job are diagrammatic. The Contractor shall make his own measurements at the site and in the buildings during construction and install the systems as the work progresses in such a manner that the equipment, piping, conduit, panels, and ductwork will fit into the finished space provided maintaining headroom and maintenance accessibility; and be neatly installed.

B. Contractor shall provide all fittings and accessories as necessary for a complete installation, whether or not specifically mentioned or shown.

1.7 FOUNDATIONS

A. The Contractor shall furnish all special foundations and supports for air devices and ductwork which he installs.

1.8 SAFETY PROVISIONS

A. Contractor shall be required at all times to perform his work in strict accordance with the Williams-Steiger Occupational Health and Safety Act of 1970.

1.9 NOISE AND VIBRATION

A. This Contractor shall be held responsible for elimination of all noises or vibrations transmitted to occupied areas from air devices and ductwork which he may install. This applies particularly to airborne noises in ductwork.

1.10 PAINTING

A. Any air device finish that is damaged or chipped, shall be spot painted to match existing surface. Any rusty or corroded finishes shall be thoroughly cleaned and painted two coats of paint - one prime and one finish coat.

1.11 TESTS AND GUARANTEES

A. After completion of his work, and when the building is ready for occupancy, this Contractor shall operate the air conditioning or heating system for a period of two days. During the tests,

the Contractor shall adjust outlets, etc.

B. The Contractor shall repeat operational sequence during heating and/or cooling season, whichever had not been subject to prior test period.

1.12 SHOP DRAWINGS

A. Materials and equipment schedules shall be submitted (at least one hard copy) as soon as practicable but not later than thirty (30) days after the date of award of contract, and before commencement of installation of any material or equipment. A complete schedule of the material and equipment proposed for installation shall be submitted for approval. The schedule shall include catalogs, cuts, diagrams, drawings, specifications and such other descriptive data as may be required by the Engineer. All materials required to be submitted for approval under this section shall be submitted at one time. Partial submittals will not be considered. They will be returned as "not approved".

B. Shop drawings shall be submitted for approval on the following items of equipment. Subject drawings shall include all data pertinent to the performance and installation of all equipment.

1. Insulation Materials
2. Variable Air Volume Air Terminal Unit
3. Fan Powered Variable Air Volume Air Terminal Unit
4. Pumps
5. Piping
6. Hydronic Piping Systems
7. Temperature Controls
8. Heat Tracing (Coordinate with Piping Schematics)

1.13 QUALITY OF MATERIALS AND EQUIPMENT

A. It is not the intent of these specifications to limit material and/or equipment selections to one manufacturer; however, the Engineer reserves the right to be the final and sole judge with regard to equals.

B. Approvals of equipment are based on capacities, equality of workmanship and components, or general and special construction features. Approval of equipment does not relieve the Contractor of coordination responsibility with other trades.

1.14 SUBMITTALS

A. Product Data: Submit manufacturer's latest published product data for all materials for approval. See Section 15100.

1.15 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver distribution devices in individual wrappings to prevent damage to finish surface of device. Store in a dry, protected area until installed. After installation of devices, clean soiled finishes.

PART 2 - PRODUCTS

2.1 AIR TERMINAL UNITS

A. Variable Air Volume Unit with Electric Heat

1. Furnish and install single duct, variable air volume terminal units with electric heat of the sizes and capacities shown in the plans.
2. Interior surface of unit casing shall be acoustically and thermally lined with 1-inch, 1.8 lb/ft3 (25.4 mm, 16.0 kg/m3) density glass fiber with foil facing. Insulation R-Value shall be 4.2. Insulation shall be UL listed and meets NFPA-90A and UL 181 standards and bacteriological standard ASTM C 665. There shall not be any exposed edges of insulation (complete metal encapsulation).
3. Inlet collar is constructed of 18-gauge galvanized steel sized to fit standard rectangular duct. An integral multiple-point, averaging flow-sensing ring provides primary airflow measurement within +/-5% of unit cataloged airflow. Damper is 16-gauge galvanized steel. The damper blade assembly is connected to a cast zinc shaft supported by self-lubricating bearings. The shaft is cast with a damper position indicator. The valve assembly includes a mechanical stop to prevent over-stroking. See Table 20, p. 21 for air leakage performance data.
4. Terminal units shall be provided with standard with slip and drive connection.
5. The electric heater shall have factory-provided and installed, open-coil, resistance-wire type heater with airflow proving switch. Include a disc-type automatically resetting pilot duty thermal primary cutout, and manually resettable thermal secondary cutout that is either load carrying or pilot duty with a backup contactor. Heater element material shall be type C nickel-chromium-iron. The line voltage end of the unit's control box shall be provided with triple-sized knockouts for customer power connection. Terminal connections to resistance-wire heating elements shall have plated steel with ceramic insulators. Provide with heating coils, a heat transformer (Transformer is an integral component of heater control panel {dependent on unit load requirements} to provide class 2 24 Vac for controls. There is 19 VA available for controls.), a solid state relay (electric 24 Vac solid-state contactor for use with direct digital controls), air flow switch (an air pressure device designed to disable the heater), and disconnect switch (a factory-provided door interlocking disconnect switch on the heater control panel disengages primary voltage to the terminal).
6. Unit controller shall continuously monitor zone temperature against its setpoint to vary primary airflow as required to meet zone temperature and ventilation setpoints. Airflow shall be limited by minimum and maximum airflow setpoints. Upon further call for heat after the air valve reaches the heating minimum airflow setting, electric heat associated with the unit is enabled.
7. Microprocessor-based terminal unit controllers provide accurate, pressure-independent control through the use of proportional integral control algorithm and direct digital control technology.
    a. Controllers monitor zone temperature setpoints, zone temperature, zone temperature rate of change, and valve airflow. Controller shall

also monitor supply duct air temperature, CO2 concentration and discharge air temperature via appropriate sensors. Controller shall be provided in an enclosure with 7/8-inch (22mm) knockouts for remote control wiring. Zone sensor or Receiver Interface Module paired with a Wireless Communications Sensor (WCS) is required.

8. The controller senses zone temperature through a sensing element located in the zone sensor. In addition to the sensing element, zone sensor options may include an externally-adjustable setpoint, communications jack for use with a portable edit device, and an override button to change the individual controller from unoccupied to occupied mode. The override button has a cancel feature that will return the system to unoccupied. Wired zone sensors utilize a thermistor to vary the voltage output in response to changes in the zone temperature. Wiring to the controller must be 18- to 22-awg. Twisted pair wiring. The setpoint adjustment range is 50 to 88°F (10 to 31°C). Depending upon the features available in the model of sensor selected, the zone sensor may require from a 2-wire to a 5-wire connection. Wireless zone sensors report the same zone information as wired zone sensors, but do so using radio transmitter technology. Therefore with wireless, wiring from the zone sensor to the controller is unnecessary.
    a. Digital display zone sensor contains a sensing element, which signals the controller. A Liquid Crystal Display (LCD) displays setpoint or zone temperature. Sensor buttons allow user to adjust setpoints, and allow zone temperature readings to be turned on or off. Digital display zone sensor also includes a communication jack for use with a portable edit device, and an override button to change from unoccupied to occupied. Override button cancel feature returns system to unoccupied mode.
    b. The Controller is designed to send and receive data from system controllers. Current unit status conditions and setpoints shall be monitorable. The network type shall be a twisted wire pair shielded serial communication.

B. Fan Powered (Parallel Type) Variable Air Volume Unit with Hot Water Reheat Coil

1. Furnish and install fan powered variable air volume terminal units with hot water heat of the sizes and capacities shown in the plans.
2. Unit shall be constructed of 22-gage galvanized steel. Hanger brackets, bottom access, and plenum filter are to be provided.
3. Units shall be listed in accordance with UL as terminal units and be AHRI 880. Additionally, insulation materials shall pass UL 25/50 smoke and flame safety standards.
4. Interior surface of unit casing is acoustically and thermally lined with 1-inch, 1.8 lb/ft3 (25.4 mm, 16.0 kg/m3) density glass fiber with foil facing. Insulation R-Value is 4.2. Insulation is UL listed and meets NFPA-90A and UL 181 standards and bacteriological standard ASTM C 665. There are no exposed edges of insulation (complete metal encapsulation).
5. Inlet collar is constructed of 18-gauge galvanized steel sized to fit standard

rectangular duct. An integral multiple-point, averaging flow-sensing ring provides primary airflow measurement within +/-5% of unit cataloged airflow. Damper is 16-gauge galvanized steel. The damper blade assembly is connected to a cast zinc shaft supported by self-lubricating bearings. The shaft is cast with a damper position indicator. The valve assembly includes a mechanical stop to prevent overstroking.

6. Fan drives shall be a electrically commutated motor (ECM) designed for high-efficient operation with over 70% efficiency throughout the operating range.
7. The Variable Speed Control Switch (SCR) speed control device shall be provided as standard.
8. Provide unit with a transformer factory installed in the fan control box to provide 24 Vac for controls.
9. Provide each unit with toggle on/off switch to turn the unit on or off by toggling to the appropriate setting.
10. Unit shall have a flanged connection – Rectangular opening on unit discharge to accept 90° flanged ductwork connection.
11. Unit shall have a 1-inch (25 mm) filter on the plenum inlet that attaches with a filter frame.
12. Unit shall have an integral suppressor attenuator installed on plenum air inlet. Suppressor casing is constructed of 22 gauge galvanized steel, and lined with 1-inch glass density fiber with foil facing. The insulation shall be UL listed and meet NFPA 90A and UL 181 requirements. Foil faced insulation shall also meet bacteriological standard ASTM C 665.
13. Unit shall have a hot water coil factory installed on the fan discharge. Hot water coils shall have 144 aluminum-plated fins per foot. The 3/8-inch seamless copper tubes shall be 3/8-inch OD and be mechanically expanded into the fin collars. Coils are to be proof tested at 450 psig and leak tested at 300 psig air pressure under water. Coil connections shall be brazed. Top and bottom gasketed access panels shall be provided.
    a. Provide unit with a hot water coil control valve. The control valve shall be three-way configuration. The actuator shall be a synchronous motor drive. The valve shall be driven to a predetermined position by the controller using a proportional plus integral control algorithm. If power is removed, the valve stays in its last position. The actuator shall be rated for plenum applications under UL 2043 and UL 873 standards. Valve motor basis of design is Belimo.
        - Pressure and temperature ratings: The valve shall be designed and tested in full compliance with ANSI B16.15 Class 250 pressure/temperature ratings, ANSI B16.104 Class IV control shutoff leakage, and ISA S75.11 flow characteristic standards.
        - Flow capacity: 0.70 Cv, 1.7 Cv, 2.7 Cv, 5.0 Cv
        - Overall diameter: 1/2-inch NPT
        - Maximum allowable pressure: 300 psi (2068 kPa)
        - Maximum operating fluid temperature: 201ºF (94°C)
        - Maximum close-off pressure: 60 psi (0.4 MPa)
        - Electrical rating: 3VA at 24 Vac

- 8-inch plenum rated cable with AMP Mate-N-Lok connector

14. Microprocessor-based terminal unit controllers are to provide accurate, pressure-independent control through the use of proportional integral control algorithm and direct digital control technology. Controllers monitor zone temperature setpoints, zone temperature, zone temperature rate of change, and valve airflow. Controller shall also monitor supply duct air temperature, CO2 concentration and discharge air temperature via appropriate sensors. Provide controller in an enclosure with knockouts for remote control wiring. A zone sensor paired with a wireless communications sensor is required.
    a. The controller senses zone temperature through a sensing element located in the zone sensor. In addition to the sensing element, zone sensor options may include an externally adjustable setpoint, communications jack for use with a portable edit device, and an override button to change the individual controller from unoccupied to occupied mode. The override button has a cancel feature that will return the system to unoccupied. Wired zone sensors utilize a thermistor to vary the voltage output in response to changes in the zone temperature. Wiring to the controller must be 18- to 22-awg. twisted pair wiring. The setpoint adjustment range is 50 to 88°F (10 to 31°C). Depending upon the features available in the model of sensor selected, the zone sensor may require from a 2-wire to a 5-wire connection. Wireless zone sensors report the same zone information as wired zone sensors, but do so using radio transmitter technology and does not require interconnecting wiring from the zone sensor to the unit controller.

2.2 SHEETMETAL DUCTWORK

2.2.1 DUCTWORK – LOW PRESSURE

A. Ductwork - Low Pressure

1. This part of the specification shall apply to all low pressure rectangular shop fabricated ductwork, for all constant air volume air distribution systems and return air systems. Ductwork shall be constructed of galvanized steel sheets, furnished and installed in sizes as indicated and located where shown on the drawings. This part of the work shall include all ductwork, manual dampers, access panels, louvers, etc., with all accessories to make a complete air distribution system. Noise, vibration or drumming of air in ductwork, noises at air outlets or returns, excessive air leaks, malfunctioning of dampers, etc., will be cause for rejecting affected parts of the ductwork. Duct sizes shown on plans are net and must be increased for total insulation thicknesses as herein specified.
2. The Mechanical Contractor shall coordinate with the General Contractor all ductwork penetrations of walls which require lintels per the architectural plans.
3. The following weights of materials, types of joints and bracing shall be followed for sheetmetal ductwork.

{TABLE ON NEXT PAGE}

Steel U.S. Std. Gauge	Maximum Size Inches	Type of Transverse Joint Conn.	Bracing
24	up to 12	S-Drive, pocket or bar clips on 7"-10" centers	None
24	13 to 24	S-Drive, pocket or bar clips on 7"-10" centers	None
24	25 to 30	A-Drive, pocket or bar clips on 7"-10" centers	1x1x1/8" angle
20	30 and greater	S-Drive, pocket or bar clips on 7"-10" centers	1x1x1/8" angle

4. The following details of duct construction shall be adhered to without deviation:
5. Longitudinal seams for metal shall be Pittsburgh lock.
6. Sweep elbows shall be made with inside radius equal to width of ducts, except as shown on the drawings. Square elbows must be provided with approved turning vanes to assure good air flow to outlets.
7. Provide vanes at all elbows. Provide splitter dampers and turning vanes at duct tees.
8. Horizontal ducts shall be hung at intervals not exceeding 8'-0" with 18-gauge galvanized iron hangers extending the full height of the duct.
9. Shop drawings of all ductwork when for any reason different from drawings shall be submitted to the Architect for approval.
10. All ductwork shall be fabricated in strict accordance with SMACNA Construction
11. Standards for Low Velocity Ductwork. All seams shall be caulked or taped to prevent air leakage.

2.2.2 DUCTWORK – MEDIUM PRESSURE

A. This part of the specification shall apply to all medium pressure ductwork used in heating, air conditioning and ventilating systems for air delivery to the variable air volume units. Ductwork shall be constructed of galvanized steel, furnished and installed in sizes as indicated and located where shown on the drawings. This part of the work shall include all ductwork, fittings, transitions, etc., with all accessories to make a complete system. Noise, vibration or drumming of air in ductwork, air leaks, etc., will be cause for rejecting affected parts of the ductwork. Duct sizes shown on the plans are internal and must be increased for total insulation thicknesses as herein specified.

B. Manufacturers of ductwork and associated products shall be by Monroe Metal, United McGill Corp., Spiral Pipe of Texas, or Semco.

C. Flat oval ductwork shall be installed and of sizes as indicated on drawings for all medium pressure ductwork. However, at the Contractor's option, with prior approval, round ductwork may be installed where space is available. Rectangular ductwork may also be used to transition from discharge opening through first fitting to accommodate installation of flat oval ductwork. All medium pressure ductwork shall be externally insulated with 2" thick, 1 lb density fiberglass blanket (min. R=6) with reinforced aluminum foil.

1. All round and flat oval ductwork shall be manufactured by the same firm to assure tight fit of all ductwork and components. The Contractor shall submit with his bid the name of the manufacturer of the spiral ductwork and fittings.

D. The duct manufacturer shall provide data covering leakage rate, bursting strength, collapsing

strength, seam strength, and friction loss. Friction loss test data shall cover both the duct and the assembled coupling joints.

E. Fitting test data shall be provided which shall cover the friction loss tests of die-stamped elbows in diameters 3" through 8", 5 - piece gored elbows in diameters 9" through 30", reducers, and divided flow fittings of tee, lateral, and conical types, plus the coefficients of abrupt turn fittings, including Y-branch, cross, and mitered elbow fittings.

F. Installation manuals shall be submitted to the Contractor. These manuals shall provide detailed instructions on:

1. Assembly
2. Joint Sealing
3. Erection
4. Reinforcement of Flat-Oval Duct
5. System Pressure Testing for Leaks

G. Round duct shall be manufactured of galvanized steel meeting ASTM A- 527-67 by the following methods and in the minimum gauges listed:

Diameter	Minimum Gauge	Method of Manufacture
3" thru 8"	24	Spiral Lockseam
9" thru 22"	24	Spiral Lockseam
23" and greater	22	Spiral Lockseam

H. The spiral duct shall have locked seams so made as to eliminate any leakage under pressure for which this system has been designed.

I. Longitudinal seam duct shall have a fusion-welded butt seam.

J. Fittings and couplings shall be 20-gauge.

K. All fittings shall have continuous welds along all seams. All divided flow fittings are to be manufactured as separate fittings, not as tap collars welded into spiral duct section.

L. All 90° tees and 45° laterals (wyes) up to and including 12" diameter tap size shall have a radiused entrance into the tap, produced by machine or press forming. The entrance shall be free of weld build-up, burrs, or irregularities.

M. Elbows in diameters 3" through 8" shall be two section stamped elbows. All other elbows shall be gored construction with all seams continuous-welded. Elbows shall be fabricated to a centerline radius of 1.5 times the cross-section diameter.

N. Bell Mouth connections shall be used at each round take-off.

O. Galvanized areas that have been damaged by welding shall be coated with corrosion resistant aluminum paint.

P. Couplings for Round Medium Pressure Duct: Pipe-to-pipe, joints in diameters to 30" shall be the use of sleeve couplings, reinforced by rolled beads.

1. Pipe-to-fitting joints in diameters to 30" shall be by slip-fit of projecting collar of the fitting into the pipe.
2. Insertion length of sleeve coupling and fitting collar shall be 2".
3. The flat oval duct and fittings shall be supplied by a company who has had as its principal business the manufacturer of medium pressure duct and fittings for at least 10 years.
4. Flat oval duct shall be supplied as spiral flat oval duct in the following U.S. Standard gauge galvanized steel:

Maximum Width	Gauge
to 24"	24
25" and greater	22

5. All flat oval duct shall be adequately braced by the installing contractor to limit the amplitude of all vibration to plus/minus 0.088 and the maximum wall deflection to 0.52" at 6" S.P.
6. Matching flat oval fittings shall be manufactured from 20-gauge galvanized steel with continuous welded seams.

Q. Sealer for Medium Pressure Ductwork: Sealer shall be applied to the male end of the couplings and fittings. After the joint is slipped together, sheetmetal screws shall be placed 1/2" from the joint bead for mechanical strength. Sealer shall be applied to the outside of the joint extending 1" on each side of the joint bead and covering the screw heads. Sealer shall be by United "Hardcast" or approved equal.

1. The duct sealer shall be specifically formulated for the job of sealing the field joints for spiral round and flat oval duct systems. The sealer shall be compatible with plastic backed duct tape so the two shall cure and bond together. Samples of sealer and tape and the specifications data sheets shall be submitted to the Engineer for approval.
2. Flanged joints shall be sealed by neoprene rubber gaskets. Sealer shall be acceptable by the spiral and flat oval duct manufacturer.

R. Flexible Ductwork Connections: All duct connections to air handling units, fans, etc., shall be made through a 4" flexible connection of fire resistant neoprene coated glass fiber cloth as manufactured by Clevaflex or approved equal. Connection shall meet pressure classification of system where used.

1. Push rods shall be provided with dampers at all branch connections to main headers in accordance with SMACNA Standards.
2. Flexible ductwork shall be equal to Thermaflex type M-KE with 1" - 1 lb. density insulation (minimum “R” value =6) with metaized vapor barrier and conform to UL-181 as a class 1 duct for low and medium pressure systems. Provide sealant and sheet metal screws for connections to outlets and ductwork. Methods of connection shall be in accordance with SMACNA Construction Standards and plan requirements. Maximum length of flex duct shall be 8'-0". Provide round rigid galvanized duct up to within 8 feet of air device locations where required.
3. Spin-in taps for connection runouts to trunk duct shall be provided with damper and scoop.

2.3 DAMPERS

A. Dampers of same materials as duct, as least one gauge heavier than duct, reinforced where directed, shall have an accessible location indicating quadrant, locking device for adjusting and locking dampers in position. Stiffen duct at damper location, install damper in manner to prevent rattling.

B. Manual volume dampers shall be of the opposed blade type. They shall be furnished in sizes shown on plans. Frame and blades shall be 16-gauge galvanized steel with mill galvanized finish. Equal to Ruskin Model MD35.

C. Automatic (motorized) dampers shall be of the parallel blade type. They shall be furnished in sizes shown on plans. Dampers shall be provided with solid stops for tight closing with seals on the blade edges and the sides of the damper frame which will stand a temperature of up to 220°F. These stops shall be so assembled that they may be easily replaced if they become damaged. Dampers shall be tight closing and shall be capable of less than 1% leakage based on an approach velocity of 1500 feet per minute. Equal to Ruskin No. DC350BES or Ruskin No. CD50 areoblade style.

D. Stiffen duct at damper location, install damper in manner to prevent rattling.

E. Fire Dampers: Shall be curtain type with fusible link. Curtain shall be mounted out of air stream. Dampers shall be UL approved & equal to Ruskin.

F. Manufacturers: Dampers may also be manufactured by Air Balance, Arrow United Industries, Greenheck, Industrial Louvers, Louvers and Dampers, or Nailor-Hart.

2.4 CIRCULATING PUMPS (END SUCTION TYPE)

A. Furnish and install pumps with performance characteristics as shown on plans. Pumps shall be base mounted, single stage, end suction design with a foot mounted volute to allow removal and service of the entire rotating assembly without disturbing the pump piping, electrical motor connections or pump to motor alignment.

B. Pump volute shall be Class 30 cast iron with integrally-cast pedestal support feet. The impeller shall be cast bronze enclosed type, balanced to ANSI/HI 1.1-1.5-1994, section 1.4.6.1.3.1, figure 1.106, balance grade G6.3 and keyed to the shaft and secured by a locking capscrew.

C. The liquid cavity shall be sealed off at the pump shaft by an internally-flushed mechanical seal with ceramic seal seat and carbon seal ring, suitable for continuous operation at 225°F (107°C). A replaceable bronze shaft sleeve shall completely cover the wetted area under the seal.

D. Pump shall be rated for minimum of 175 psi (12 bar) working pressure. Volute shall have gauge tappings at the suction and discharge nozzles and vent and drain tappings at the top and bottom.

E. The pump(s) vibration limits shall conform to Hydraulic Institute ANSI/HI 1.1-1.5-1994, section 1.4.6.1.1 for recommend acceptable unfiltered field vibration limits (as measured per HI 1.4.6.5.2, Figures 1.108) for pumps with rolling contact bearings.

F. Baseplate shall be of structural steel or fabricated steel channel with fully enclosed sides and ends, and securely welded cross members. Grouting area shall be fully open. The combined

pump and motor baseplate shall be sufficiently stiff as to limit the susceptibility of vibration. The minimum baseplate stiffness shall conform to ANSI/HI 1.3.4-1997 for Horizontal Baseplate Design standards.

G. The seismic capability of the pump shall allow it to withstand a horizontal load of 0.5g, excluding piping and/or fasteners used to anchor the pump to mounting pads or to the floor, without adversely affecting pump operation.

H. A flexible type, center drop-out design coupler, capable of absorbing torsional vibration, shall be employed between the pump and motor. Pumps for variable speed application shall be provided with a suitable coupler sleeve. The coupling shall be shielded by a dual rated ANSI B15.1, Section 8 & OSHA 1910.219 compliant coupling guard and contain viewing windows for inspection of the coupling.

I. Motor shall meet NEMA and Premium efficiency specifications and shall be of the size, voltage and enclosure called for on the plans. Pump and motor shall be factory aligned, and shall be realigned by the contractor per factory recommendations after installation.

J. The pump(s) selected shall conform to ANSI/HI 9.6.3.1 standards for Preferred Operating Region (POR) unless otherwise approved by the engineer. The pump NPSH shall conform to the ANSI/HI 9.6.1-1997 standards for *Centrifugal and Vertical Pumps for NPSH Margin*.

K. Each pump shall be factory hydrostatically tested per Hydraulic Institute standards. It shall then be thoroughly cleaned and painted with at least one coat of high grade paint prior to shipment.

L. The pump(s) shall be manufactured, assembled and tested in an ISO 9001 approved facility.

M. Pumps shall be FI Series as manufactured by Taco or equal. Equivalent manufacturers shall be ITT Bell & Gossett, Armstrong, and Aurora.

2.5 IN-LINE CIRCULATING PUMPS

A. Furnish and install pumps with capacities as shown on plans. Pumps shall be split-coupled in-line, single stage design, for installation in a vertical position motor up, capable of being serviced without disturbing piping connections.

B. Pump volute shall be of Class 30 cast iron. It shall be designed with a base ring matching an ANSI 125# flange for pump support.

C. The impeller shall be of cast bronze, enclosed type, balanced to Hydraulic Institute Standards (ANSI/HI 9.6.4.5- 2000, figure 9.6.4.15B). The allowable residual imbalance conforms to ANSI grade 6.3, keyed to the stainless steel shaft and locked. The pump shaft shall be guided by a carbon graphite lower throttle bushing.

D. The combination motor bracket and volute cover plate shall be properly designed unit to ensure concentric alignment of the motor to the pump casing. The liquid cavity shall have a tapped flush line with manual valve to remove air from the seal chamber for fast initial start-up.

E. The mechanical seal shall have a compact Rotating Unitized Seal Head design with EPR elastomer bellows and a positive metal to-metal drive system to reduce the torsional stress on the bellows. The bellows will be pressure supported without creases or folds for long life.

F. The spacer coupling shall be of high tensile aluminum, split to allow the servicing of the seal without disturbing the pump or motor.

G. The motor bracket shall contain a carbon steel coupler guard conforming to both ANSI B15.1 2000 and OSHA 1910.219 standards for safety.

H. Pumps shall be rated for continuous operation at a minimum of 175 psi working pressure and 250ºF. The volute shall have gauge tapings at the suction, and discharge nozzles and vent and drain tapings at the top and bottom.

I. Motor shall be NEMA Premium Efficient (NEMA MG-1 Table 12-12; 1 HP and up; three phase) complying with NEMA or IEC specifications and shall be the size, voltage and enclosure called for on the plans. It shall have heavy-duty grease-lubricated ball bearings, completely adequate for the maximum load for which the pump is designed.

J. Each pump shall be hydrostatically tested at the factory per Hydraulic Institute standards. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

K. Pumps shall be Series e-80SC as manufactured by Bell & Gossett. Equivalent units as manufactured by Taco, Armstrong or Patterson may be submitted as alternates. Pumps shall meet types, sizes, capacities, and characteristics as scheduled on the Equipment Schedule drawings.

2.6 SUCTION DIFFUSER

A. Furnish and install as shown on plans, an angle pattern flow straightening fitting equipped with a combination diffuser-strainer-orifice cylinder, flow straightening vanes, start-up strainer, permanent magnet, and adjustable support foot. The combination diffuser-strainer-orifice cylinder shall be designed to withstand pressure differential equal to the system pump shut-off head and shall have a free area equal to five times the cross section area of the pump suction opening. The length of the flow straightening vanes shall be no less than 2+ times the diameter of the system pump suction connection.

B. The flow straightening fitting shall be of cast iron construction with flanged system and flanged pump connections. The fitting shall have a carbon steel combination diffuser-strainer-orifice cylinder with 3/16" diameter perforations to protect the system pump. The full length carbon steel flow straightening vanes shall provide non-turbulent flow to the suction side of the system pump. The magnet shall be positioned in the flow stream to protect the pump seal(s). The start-up strainer shall be of 16 mesh bronze and the adjustable support foot shall eliminate pipe strain at the flow fitting/pump connection. All internal components shall be replaceable.

2.7 CHILLED AND HOT WATER PIPING

A. Provide Schedule 40 black steel pipe, Grade A, except Grade B for bending purposes.

B. End Connections:

1. Steel Piping: 2-1/2" and larger shall be flanged or butt welded.

C. Flanged Joints:

1. Bolting of Flanges: Material used for bolts and studs shall conform to ASTM A307, Grade B, and material for nuts shall conform to ASTM A194, Grade 2. Bolts or studs shall extend completely through the nuts and may have reduced shanks of a diameter not less than the diameter at root of threads. Carbon steel bolts shall have American Standard regular square or heavy hexagon heads and shall have American Standard heavy semi-finished hexagonal nuts.
2. Gaskets: Fluorinated elastomers, suitable for the pressure and temperature ranges encountered, and compatible with grooves in flange faces.
3. Butt Weld Joints: Ferrous rings shall be of good weldable quality and not exceed 0.05 percent sulfur; for alloy pipe, backing rings shall be of material compatible with the chemical composition of the parts to be welded and preferably of the same composition. Backing rings shall be of the continuous machined or split band type.
4. Valves, Gate, Angle, Check, Special, and Related Equipment: Shall conform to the following paragraphs. End connections shall conform to paragraph "End Connections". Valves shall have rising stems and shall open when turned counterclockwise.

D. Gate Valves (Larger Than 2"):

1. Steel Gate Valves: Class 150, outside screw and yolk type with solid wedge or flexible wedge disc, with trim of heat- and corrosion-resistant steel as recommended by the manufacturer for the service indicated.

E. Angle Valves:

1. Steel: Class 150 with heat- and corrosion-resistant trim as recommended by the manufacturer for the service indicated, and provided with tapped drains and brass plugs.

F. Check Valves:

1. Steel, 2-1/2" and Below: Class 150 with heat- and corrosion-resistant trim as recommended by the manufacturer conditions indicated.
2. Swing Check Valves: Shall have bolted caps.
3. Cast Iron Check Valves 2-1/2" and Larger: Class 150, with bronze trim. Provide non-slam, eccentric disc type for centrifugal pump discharge service.
4. Plug Valves: Cast iron or steel, Type II non-lubricated, lift-plug, Style A Class 150, Pattern-No. 4, Size 2" and larger, End Connection No. 2-Threaded. Replaceable valve seat is not required.
5. Ball Valves, 2" and Smaller: Stationary Seat Ring and Floating Ball, Class A - Copper Alloy, Style I, Valve Design which permits inspection and repair of seats and seals without removing the valve body from the line; End Connection B, threaded. Flanged ball valve shall conform to MSS SP-72, Class 150, bronze.
6. Drain Valves: Gate valves conforming to MSS SP-80, Class 150, manually operated 3/4" pipe size, and above with threaded ends. Provide hose nipple adapters for connecting a hose to lead a convenient floor drain.
7. Butterfly Valves: Type I tight shutoff valve, and valve ends shall be flanged, threaded or flange less. The valve body material shall be cast iron or bronze and bubble tight for shut off at 150 psig. Flanged and flangeless type valves shall have 300 series corrosion resistant steel stems and discs or bronze discs with molded elastomer disc seals. Flow conditions shall be for the regulation from maximum flow to complete shutoff by the throttling effect. Valves smaller than 8" shall be throttling handles. Valves shall have a minimum of seven locking positions. Provide with motorized valves where indicated on

plans.

G. Automatic Flow Control Valves:

1. The flow cartridge's non-clogging single orifice design shall include no metal-to-metal contact, no segmented ports, and incorporate a flow nozzle and metering disk controlled by a pressure compensating spring.
2. The flow cartridge shall be a single assembly, constructed with stainless steel moving parts and be accessible without removing the valve from the piping.
3. The flow cartridge shall be factory flow tested and calibrated to maintain accuracy of ±5%; the accuracy shall be maintained over an operating range of 2 – 45 PSID.
4. Manufacturer shall provide cartridge exchange for up to one (1) year from date of delivery at no charge. Exchange shall be provided for flow rate changes within same valve body.
5. The flow cartridge shall carry a 5 year material warranty.
6. Valves 1½" and smaller shall be a forged brass Y-pattern body and valves 2" shall be a cast brass y-pattern body with integrated ball valve, (2) pressure/temperature test ports, a tag indicating the model, flow rate and PSID range, blowout proof stem with dual Viton o-ring seals, interchangeable union end with Viton o-ring seal, hard chrome plated ball with Teflon seats, and rated at 600 PSI WOG, 325 degrees F. Valves shall be available with NPT, SWT OR PRESS connections.
7. Valves 2½" and larger shall be a wafer style cast iron body with pressure and temperature test plugs across the flow cartridge; a tag indicating the model, flow rate and operating control range; able to incorporate a drain and or vent as required and rated at 150 PSI, 275° F.
8. Manufacturers: Nexus UM and UMW, Bell & Gossett Circuit Sentry, Griswold Isolator "R".

H. Miscellaneous Components for Piping System:

1. Instrumentation: Locate gauges and thermometers as indicated. Provide scale range suitable for the intended service.
2. Pressure and Vacuum Gauges: With restriction located as indicated.
3. Indicating Thermometers: Liquid-in-glass.
4. Remote Reading Thermometers: Class C, separable well type with the insertion length and sensitive portion length of the well and socket suitable for the piping and service intended.

2.8 PIPING INSTALLATION

A. Pipe shall be cut accurately to measurements established at the building, and shall be worked into place without springing or forcing, properly clearing all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted. All changes in direction shall be made with fittings. All pipes extending through the roof shall be flashed by this Contractor, but counter flashed by the roofing contractor. Piping connections to equipment shall be in accordance with details shown on the drawings. All open ends of the pipe lines or equipment shall be properly capped or plugged during installation to keep dirt or other foreign material out of the system.

B. Install piping and components to ensure proper and efficient operation of the equipment, and controls and in accordance with manufacturer's printed instructions. Provide proper supports

for the mounting of vibration isolator, stands, guides, anchors, clamps and brackets. Arrange piping connections to equipment so that removal of equipment or components of equipment including tube withdrawal from chillers, pump casing, shaft seals and similar work can be accomplished with the least amount of disassembly or removal of the piping system. Provide piping connected to equipment with vibration isolators with flexible connections which shall conform to vibration and sound isolation requirements for the system. Electric isolation shall be provided between dissimilar metals to reduce the rate of galvanic corrosion.

C. Fabrication and Assembly of Piping and Components: Horizontal runs of piping shall pitch toward water chiller at not less than one inch in twenty feet. Provide sufficient pitch to assure adequate drainage and venting. Drain valves at low points of piping system. All piping shall follow the general arrangement shown, cut accurately to measurements established for the work by the Contractor, and worked into place without springing or forcing, except where cold-springing is indicated. All piping and equipment within buildings shall be entirely out of the way of electrical conduit, lighting fixtures, equipment and doors, window, and other openings. Run overhead piping in buildings in the most inconspicuous positions. Provide adequate clearance form walls, ceilings, and floors to permit the welding of joints; at least 6" for pipe sizes 4" and less, 10" for pipe sizes over 4", and in corners provide sufficient clearance to permit the welder to work between the pipe and one wall. Provide for expansion and contraction of pipe lines. Make changes in size of water lines with reducing fittings. Do not bury, conceal, or insulate until inspected, tested, and approved. Protect materials and equipment from the weather. Run all pipe to be insulated as shown and as required with sufficient clearance to permit application of insulation. Do not miter pipe to form elbows, or notch straight runs to form full-sized tees, or utilize any similar construction. Except where shown otherwise, run vertical piping plumb and straight and parallel to walls. Thoroughly clean each section of pipe, fittings, and valves to be free of all foreign matter before erection. Prior to erection, hold each piece of pipe in an inclined position and thoroughly tap to loosen sand, mill scale and foreign matter. Before all final connections are made to apparatus wash the interior of all piping thoroughly with water. Blow out piping with high pressure steam or compressed air to remove rust scale, oil and debris. Plug or cap open ends of mains during all shutdown periods. Do not leave lines open at any place where foreign matter might accidentally enter.

D. Service valves shall be installed where required for the proper servicing of the equipment. All joints between sections of pipe and between pipe and fittings 2 1/2" and larger shall be fusion welded. The welding shall be in accordance with the recommendations of the American Welding Society. Certification number and skill level shall be submitted. Welder shall specialize in pipe welding. All such changes in direction and intersections of lines shall be made with welding fittings, except as otherwise specifically permitted hereinbefore. Mitering of pipe to form elbow, notching straight runs to form tees, or any similar construction will not be permitted.

E. Threadolets and weldolets may be used where branch size is less than one-half the main size.

F. Joints: All screw joints shall be made with tapered threads properly cut. Screw joints shall be made perfectly tight with a stiff mixture of graphite and oil, applied with a brush to the pipe threads only, and in no case to the fittings. All flange joints shall be faced true, packed and made up perfectly square and tight.

G. All piping systems shall be pressure tested to system operating pressure as hereinafter specified.

1. This Contractor shall provide for expansion and contraction of all piping installed by him and must make proper provisions so that there will not be undue strain on any part of the piping or any work installed by others.

H. All lines shall be of sizes indicated, shall run approximately where shown on plans. Water lines shall grade downward against the direction of flow 1" in 30 lineal feet of run.

I. The high points of all forced water mains and branches shall be automatically vented. Copper drain lines from air vents shall be extended to nearest floor drain.

J. All changes in pipe size shall be made with reducing fittings or couplings. No bushings will be allowed.

K. Unions shall be provided adjacent to all valves and mechanical equipment receiving screwed pipe and companion flanges shall be provided on all flanged valves, pumps, and other mechanical equipment.

L. All piping systems shall be flushed with clean water and all strainer baskets thoroughly cleaned before placing into operation. Flushing shall be witnessed by Engineer.

M. Piping Materials: Piping materials to be of domestic standards, new and free of defects. Piping certification shall be provided upon request of Engineer.

N. The following classification of piping shall be used on the following services:

1. Chilled Water Piping - Schedule 40 black steel, ASTM A53, Grade B.
2. Hot Water Piping - Type "L" hard drawn copper.
3. Make-up Water Piping - Type "L" hard drawn copper.

O. Fittings: All fittings shall be new, free of defects and of the following types for service listed:

1. For chilled water piping - 2 1/2" and larger, steel welding fittings, long radius type.
2. For hot water piping - wrought copper sweat pattern.

P. Unions: Unions shall be installed at all locations shown on drawings. Welded systems, use 150# flanges.

Q. Pressure and Vacuum Gauge: Provide a shutoff valve or pet cock between pressure gauges and the pipe line.

R. Thermometers: Provide thermometers and thermal sensing elements of control valves with a separate socket. Install separable sockets in pipelines in such a manner to sense the temperature of the flowing fluid and minimize obstruction to flow.

S. Pump Gauge Manifold Valve: Brass, spring return push-button manifold valve with ports for connection to system and test port for gauge calibration, with bracket for mounting to system piping. Provide 3 system ports unless otherwise indicated. Flow Conditioning Corporation, Trumpet Valve. Refer to detail on plans.

T. Test Plugs: Brass body with neoprene core; brass cap; 1/4" NPT connection. Install in 1/4" threadolet in locations shown. Universal Lancaster, "Petes" Plug, Texas Fairfax, Sisco.

U. Make-up Water Piping: Provide make-up water piping to chilled and condenser water piping systems as indicated on drawing and in Specification Section 15400.

2.9 PIPE HANGERS, SUPPORTS, ETC.

A. Support all piping from building floor structure with pipe stands and support beams. Do not support any piping from building structure. Pipe stands shall be located on points not to exceed the following maximum span. This does not apply to PVC piping.

1.	1 1/4" pipe and smaller	Max. span 7', hanger rod 3/8"
2.	1 1/2" pipe	Max. span 9', hanger rod 3/8"
3.	2" and larger pipe	Max. span 10', hanger rod 1/2"
4.	3" and larger pipe	Max. span 12', hanger rod 5/8"

B. Pipe stands may be support beams for hanging pipe. Hanger selection and application shall conform to the Manufacturer's Standardization Society of the Valves and Fittings Industry Publication SP-69, Materials Design, and Manufacturer's Publication SP-58. See "Mechanical General Requirements" for additional requirements.

C. Supports used on steel or cast iron pipe shall be malleable iron or steel.

D. Where necessary to prevent transmission of vibration, supports with vibration suppressors shall be installed as required. Refer to pipe sleeve details on plans.

E. Wherever pipe passes through existing walls above grade, 10-gauge galvanized steel sleeves of the proper size and length shall be provided. Where pipe is insulated, sleeves shall be large enough to accommodate insulation. Refer to pipe sleeve details on plans.

F. Anchors shall be installed on pipe lines where necessary to control direct expansion or contraction.

G. Hangers on insulated lines shall be large enough to accommodate the insulation.

H. Insulation protector shields of 20-gauge steel, 18" long and extending half around insulated pipe shall be used at all hanger points. Provide wooden spacers of thickness equal to insulation between pipe and hanger.

2.10 SPECIALTIES, PIPING SYSTEM

A. Strainers shall be provided before each control valve and each pump. Strainers to be Sarco Type AT with brass mesh for water operation.

B. Thermometer wells shall be stainless steel 3/4" NPT with extension neck, cap and chain equal to Trerice #5370.

C. Gauge Cocks shall be Trerice Model 380, 1/4" size with union connection. Provide 1/4" plug in gauge openings.

D. Thermometers: Pipe thermometers to be 9" adjustable angle type with aluminum case. Size to be 3/4" brass separable socket type with extension neck type stainless steel well. Unit to be Trerice AX Series.

E. Range to be 0-100°F for chilled water and 30 - 240°F for hot water. Duct thermometers to be Trerice B 80,000, range 09-180°F, 5" dial.

F. Gauges: Gauges to be 4 1/2" dial cast aluminum cast with range from 30" vacuum to 60 psi. Provide Trerice #835 needle valve at each gauge. Unit to be equal to Trerice Series 500 X. Vents on water system - Hoffman No. 79 or approved equal.

G. At Contractor's option suction diffusers may be used at all pumps to replace valves and strainers.

2.11 VALVES AND COCKS

A. Valves shall be the products of Dunham-Bush, Stockham, Crane, OIC, Walworth, Rockwell, Jenkins, or approved equal. Valves on chilled water service shall be equal to the following:

1. Isolation Butterfly Valves: 2" and Larger - 125#, Stockham
2. Ball Valves: 2" and Smaller - 150#, Stockham
3. Gate Valves: 2 1/2" and Larger - 125#, Stockham
4. Check Valves:
   a. 2 1/2" and Larger - 150#, Stockham
   b. 2" and Smaller- 200#, Stockham

Note: Other valves shall be as shown on plans.

B. Provide extended handles with valves to prevent interference with piping and/or valve insulation.

C. Provide chain operators on all valves located 8'-0" or greater above finished floor.

D. Each valve shall be identified with a metal tag secured to valve with chain. Identifier of valve shall be correlated to mechanical piping plans. As-built drawings shall indicate valve identifiers.

2.12 ELECTRIC HEAT TRACING

A. Heat trace all chilled and heating hot water piping exposed to weather with electric heat cable. Cable to be 277 volt self-regulating type with 3.8 watts per linear foot. Cable shall be rated for 500°F and shall be 15-gauge outside diameter with teflon insulation. Cable shall be equal to Raychem Type XL and shall be installed in accordance with manufacturer’s requirements. Coordinate power requirements with Electrical Contractor.

2.13 EXPANSION TANKS

A. Construction shall be fabricated steel designed and constructed per ASME code requirements. Bladder shall be heavy duty and shall be removable for horizontal mounting and operation up to 125 psig working pressure and 240° F operating temperature. Manufacturer shall be Armstrong, Bell and Gossett, Taco or Wheatley.

2.14 AIR SEPARATORS

A. Construction shall be fabricated steel designed and constructed per ASME code requirements.

Air separator shall have NPT or flanged connections as required. Provide with removable, stainless steel strainer with 3/16" diameter perforations and a free area of not less than five times the cross-sectional area of the connecting pipe. Air separator shall have separate top fittings for connection to system expansion tank and for air vent. There shall be a separate bottom connection for blowdown cleaning. Manufacturer shall be Armstrong, Bell and Gossett, Taco or Wheatley.

2.15 PIPE AND VALVE MARKERS

A. Contractor shall furnish and install pipe markers on the following services in all exposed locations with flow direction indicators:

Service	Code	Background Color	Letters
Chilled water supply	CWS	Green	White
Chilled water return	CWR	Green	White
Hot water supply	HWS	Yellow	Black
Hot water return	HWR	Yellow	Black

B. Pipe markers shall be the vinyl type and meet ANSI Standards and shall be equal in all respects to Sexton Name Plate Corporation's Setmark System.

2.16 INSULATIONS

A. General: All insulation work shall be done by workmen thoroughly competent in this trade and employed by a full-time insulation contractor. Failure to finish work neatly, failure to vapor proof joints, ragged edges, failure to cover all fittings, valves, dents on surface, etc., shall be proper cause to reject this work. This Contractor shall call same to the attention of the Architect before such work has progressed beyond the point of economical correction.

B. All material used shall be new and of first line quality and shall be as recommended by the manufacturer for the service intended. All insulation materials, including sealer material, adhesive, finishes, etc., shall be non-combustible. Complete installation shall be in accordance with manufacturer's requirements.

C. This Contractor shall be responsible for the removal from the site of all excess materials, cartons, scrap, etc. He shall protect equipment installed by others, cleaning such equipment should mortar, plaster, adhesive, etc., fall on same.

D. The following service shall be insulated with the listed thickness of materials:

{TABLE ON NEXT PAGE}

Service	Insulation Material	Thickness	Finish
Chilled Water Expansion Tank & Water Box of Chilled Water Pumps	Sheet Armaflex	3/8"	Paint with acrylic protective paint where exposed to sun
Drain Piping	Armaflex Type ER	3/8"	Paint with acrylic protective paint where exposed to sun
Single Wall Ductwork	1 lb. density blanket type fiberglass duct	2"	Reinforced aluminum foil
Chilled Water Supply & Return Above Grade	Foamglass sectional	1 1/2"	FRJ jacket
Hot Water Supply & Return Above Grade	Fiberglass sectional	2”	FRJ jacket

E. All Armaflex insulation shall be slipped over piping with all joints sealed with an approved mastic.

F. All insulation shall be installed as per material manufacturer's printed instructions. All valves, fittings, strainers, pete's plugs, etc., shall be insulated with molded fittings of same material as piping and plastic fitting covers installed over all fittings. Insulation shall be Owens-Corning Fiberglass, or approved equal, as scheduled above. All materials, jackets, adhesives, etc., shall meet smoke developed ratings and fire classifications of UL.

G. Insulation subcontractor shall submit complete product data brochures on insulation materials, jackets, finishes, mastics, cements, etc., for approval along with complete installation brochures for all materials used on this project. Installation methods shall be in accordance with printed instructions from material manufacturers.

H. It shall be the responsibility of the insulating subcontractor to coordinate hanger locations and prevent crushing or breaking finishes.

I. All insulation materials, jackets, adhesives, coatings, etc., shall meet the Underwriters' Laboratories fire hazard classification (UL 723), for flame spread rating of 25, smoke developed rating of 50, and fuel contributed rating of 50.

J. Insulation contractor shall insure all valves with insulation have extended handles. Length of extended handles shall allow operation of handle not to interfere with valve or piping installation.

K. Exterior duct insulation shall be applied outside of all heating and air conditioning ductwork in accordance with SMACNA Standards. Insulation shall be constructed of glass fiber and shall be 2.2 pound density, 1-1/2" thick and comply with NFPA Bulletins 90A and 90B (minimum R value = 6). Insulation shall be wrapped and shall be secured with duct bands. All joints in insulation shall be butted together and brushed with adhesive.

2.17 AC MOTOR VARIABLE FREQUENCY CONTROLLERS

A. Variable frequency drives (VFDs) shall be manufactured by Graham and provided for new variable air volume air handling units with motors 10 HP and larger. Each variable torque AC drive shall consist of an adjustable frequency controller capable of driving a standard high efficiency AC induction motor. Variable frequency drive shall be housed in an all steel hinged NEMA-1 enclosure.

B. The VFD shall include a full-wave diode bridge rectifier. VFD shall maintain .95 displacement power factor regardless of speed or load.

C. The inverter section of the VFD shall be sine-coded pulse width modulated (PWM). The VFD shall incorporate the use of IGBTs to reduce motor noise. VFDs incorporating Darlington transistors shall provide output line reactors.

D. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be listed by a nationally recognized testing agency such as UL, CUL, ETL, or CSA.

E. Power line noise shall be limited to a voltage distortion factor and line notch depth as defined in IEEE Standard 519-1981, Guide for Harmonic Control and Reactive Compensation of Static Power Converters. The total voltage distortion shall not exceed 5%.

F. Motor noise as a result of the VFD shall be limited to three dB over across the line operation, measured at three feet from the motor's center line.

G. The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall have a continuous 110% overload rating and a 115% overload rating for 60 seconds.

H. Protective Features:

1. Individual motor overload protection for each motor controlled.
2. Protection against input power under voltage, over voltage and phase loss, output current overload and instantaneous over current, over temperature within the VFD enclosure, over voltage on the DC bus, output short circuit, and motor winding shorting to case faults.
3. Protect VFD from sustained power or phase loss. The VFD shall incorporate a two second power loss ride through for control circuitry only to eliminate nuisance tripping.
4. The VFD shall incorporate semi-conductor rated fuses for the input. The fuses shall be UL/CSA listed and incorporated in the standard NEMA-1 enclosure. Fuses shall be rated for 200,000 amp interrupting capacity (AIC).

I. Interface Features:

1. Door mounted Hand/Off/Auto selector switch to start and stop the VFD. Provide open collector outputs for remote indication of Hand/Off/Auto.
2. Digital manual speed control. Potentiometers not acceptable.
3. Local/Remote selector switch to determine source speed reference.
4. The VFD shall include the following door mounted status indicators: Power On, Drive Ready, Run, Hand/Off/Auto, Local, Remote, Keypad Lockout On and Reverse.
5. The VFD shall be equipped with a door mounted panel to provide individual fault

indications for the following: Under voltage, High Line, Phase Loss, Bus Over voltage, Over current, Ground Fault, Overload, Over temperature, External Fault, and Output Open. Fault codes not acceptable.

6. The VFD shall store in memory the previous three faults.
7. Digital meter with selector switch to indicate the following: Percent Speed, Percent Load, Output Frequency, Input kW, Output Voltage, and Output Current.
8. A set of form-C, dry contacts to indicate when the VFD is in the Run and Fault mode.
9. A 4 to 20 mA output signal to vary in direct proportion to the controller's speed (frequency) and controller's load (amps).
10. VFD to have terminal strip to accept N.C. safety contacts such as freezestats, smoke alarms, etc. VFD to safely shut down in drive or bypass mode when contacts open.
11. VFD to accept an additional N.C. contact to interface with the Hand/Off/Auto switch for remote Stop/Start control.
12. VFD shall accept a direct acting or reverse acting 4 to 20 mA, 0 to 5 Vdc, 0 to 10 Vdc, or a 3 to 15 psi pneumatic signal (if required).
13. The VFD shall have two programmable resonant frequency lockouts with adjustable frequency band widths.
14. The VFD shall be able to start in a rotating load in either direction.

J. Adjustments:

1. Maximum and minimum speed, independently adjustable from 10 to 100% base speed.
2. Acceleration and deceleration time, independently adjustable 2 to 300 seconds with override circuit to prevent nuisance trips if decel time is set too short.
3. Current limit, adjustable 0 to 115%.
4. Overload trip set point that is infinitely variable based upon motor amperage. The overloads in drive and bypass should be factory set for the connected load.
5. Preset speed, activated upon a contact closure.
6. If VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: Line Under voltage, Phase Loss, Bus Over voltage, Over current, Ground Fault, Overload, Over temperature, External Fault, and Motor Open.
7. The automatic reset time shall be programmable.
8. The VFD shall provide a N.O. contact for enable or disable of reversing.

K. Service Conditions:

1. Ambient temperature 32 to 104°F (0 to 40°C).
2. 0 to 95% relative humidity, non-condensing.
3. Elevation to 3,300 feet (1,000 meters) without derating.
4. AC line voltage variation, -10 to +10% of nominal.

L. Special Features:

1. Provide a four-position Drive/Off/Line/Test switch for complete manual bypass and disconnect functions. The manual switch shall be door interlocked and padlockable in the off position. A motor starter shall be provided in the bypass circuit. Mount the bypass in a separate portion of the VFD enclosure with its own door. The VFD and bypass assembly shall carry the UL panel shop listing. Separate bypass panels that require field mounting and wiring are not acceptable.

M. Quality Assurance:

1. To ensure quality and minimize infantile failures at the job site, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.
2. All optional features shall be functionally tested at the factory for proper operation.

N. Submittals:

1. Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD's FLA rating, certification agency file numbers, and catalog information.
2. The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specifications are identified, the supplier shall be bound by the specification.

O. Variable Frequency Drive Start-up

1. The manufacturer shall provide start-up commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that will provide the factory service and warranty repairs at the customer's site. Sales personnel and other agents who are not factory certified technicians for VFD field repair shall not be acceptable as commissioning agents.
2. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options, and its interface wiring to the building automation system. Start-up shall include customer operator training at the time of the equipment commissioning.
3. Warranty: The VFD shall be warranted by the manufacturer for a period of 36 months from date of shipment. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized on-site service.

2.18 STARTERS

A. Starters (Low Voltage):

1. The motor starter shall be a star delta closed transition. Motor starter shall have NEMA 1A gasketed enclosure. Enclosure shall be constructed of 12-gauge steel minimum with the exception of doors which shall be 14-gauge steel minimum.
2. Starter shall be unit mounted with ventilating louvers.
3. Motor starters shall include incoming line provisions for the number and size cables shown on the drawings. Incoming line lugs shall be aluminum mechanical type. Connection directly to the contactors is not permissible.
4. Contactors shall be sized properly to the chiller full load and locked rotor currents. Contactors shall have double break main contacts with weld resistant silver cadmium faces. Auxiliary interlocks that interface with the control panel shall be low resistance having palladium silver contacts.
5. Each motor starter shall include a control power transformer with fused primary and secondary. Current transformers of the proper size, ratio and burden capacity shall be provided to provide a signal to the control panel and optional devices. Control relays shall be provided within the motor starter to interface with the control panel.
6. Power wiring within the starter shall be type MTW copper stranded 90°C. Power wire

bends shall show no evidence of nicking or insulation degradation. Control wire shall be type MTW copper stranded 90°C 14-gauge minimum.

7. Starter shall include an advanced motor protection system incorporating electronic three phase overloads and current transformers. This electronic motor protection system shall monitor and protect against the following conditions:

a. Three phase overload protection
b. Overload protection during start-up
c. Phase imbalance
d. Phase loss
e. Phase reversal
f. Low voltage
g. Distribution fault protection consisting of three-phase, current sensing devices that monitor the status of the current. Distribution faults of 1-1/2 electrical cycle duration's shall be detected and the compressor motor shall be disconnected within six electrical cycles.
h. Under/over voltage protection

B. Installation: Install in accordance with manufacturer's instructions. Provide for connection to electrical service. If oil pump is electric, include the connection of the oil pump to emergency power.

1. On units without unit mounted starters, provide for connection of electrical wiring between starter and chiller control panel, oil pump, and purge unit.
2. Furnish and install necessary auxiliary water piping for oil cooling units and purge condensers.
3. Arrange piping for easy dismantling to permit tube cleaning.
4. Provide piping from chiller relief valve to outdoors. Size as recommended by manufacturer.

C. Manufacturer's Field Services: Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit(s). Representatives shall provide leak testing, evacuation, dehydration, and charging of the unit(s) as required. Chiller manufacturers shall maintain service capabilities no more than 60 miles from the jobsite.

1. A start-up log shall be furnished by the manufacturer to document the chiller's start-up date and shall be signed by the Owner or his authorized representative prior to commissioning the chillers.
2. The manufacturer shall furnish complete submittal of wiring diagrams of the chiller(s), starter(s), and associated components like cooling towers, pumps, interlocks, etc. as applicable.

2.19 CONTROLS

A. Coordinate controls of system with controls specification section 15950.

2.20 BUILDING AUTOMATION CHILLER PLANT CONTROL SYSTEM

A. Reference Specification Section 15950, "Energy Management Control" and Direct Digital Control Systems" for required chiller plant control and monitoring points.

2.21 CHILLED AND HOT WATER CHEMICAL TREATMENT SYSTEMS

A. Capable of automatically feeding chemicals, and bleeding system water to prevent scale, corrosion, and biological growths. Systems shall include chemical feed pump, tank, bleed-off solenoid valve, electric impulse water meter, electric timer, and conductivity controller. Provide a polyethylene tank and injection valve assembly for each feed pump. Entire systems shall be warranted for one full year including parts, labor and chemical supplies.

B. Note that there are a total of two systems requiring chemical treatment. System one is the closed-loop chilled water system. System two is the closed-loop hot water system.

C. Feed Pumps: Positive displacement type with an adjustable capacity and discharge pressure not less than 1.5 times the line pressure at the point of connection. Provide with pressure relief valve, and check valve mounted in the pump discharge.

D. Tanks: Construct of high density polyethylene, cylindrical in shape, and with a hinged cover. Tanks shall have sufficient capacity to require recharging only once per 7 days during normal operation. Provide tanks with a valved cold water line and, if necessary, a valved hot water fill line with suitable air gap. Provide tanks with device to indicate quantity of solution in the tank. Provide electric mixing device with tank.

E. Valve Injection Assemblies: Provide for each feed pump. Construct of bronze or material suitable for chemicals being used and install in condenser water line common to all pumps. Injection fittings shall have male pipe threads. Assemblies shall include shut-off valve and check valve provided close to condenser water line.

F. Bleed-Off Solenoid Valves: Provide in bleed-off line. Valves shall normally be in closed position and be opened by a 120-volt waterproof solenoid coil. Connect bleed-off line to condenser water line and include a gate valve ahead of solenoid valve. Extend a discharge line from solenoid valves to sewer drain.

G. Water Meters: Provide with electric contacting register, and remote accumulative counter and installed in make-up water line near cooling tower. Meters shall be standard product used in water treatment.

H. Timers: Automatic reset, adjustable type, and electrically operated. House in metal NEMA type cabinet with a hinged front. Timers shall be suitable for 120 volt current.

I. Conductivity Controllers: Controllers shall measure total dissolved solids in system water by conductivity. Conductivity sensors shall consist of epoxy insulated carbon electrodes and shall not require platinizing. Controllers shall have a meter with a visual readout, set point adjustment with a range between 200 micro ohms/cm and 4000 micro ohms/cm and a red pilot light indicating water conductivity above set point. Units shall operate from a 120-volt power source.

J. Control Panels: Provide a factory-wired, NEMA 12, control panel for each system. Construct of steel with hinged door and lock, and suitable for surface mounting. Pre-wire controls to numbered terminal strips. Provide laminated plastic nameplates identifying the switch function. Include the following with the panel:

1. Main power switch and indicating lamp;
2. MAN-OFF-AUTO selector switch;

3. Indicating lamp for bleed-off valve;
4. 120 Volt, heavy-duty, grounded duplex receptacle;
5. Conductivity controller;
6. Electric timer; and
7. Accumulative counter.

K. Sequence of Operation:

1. Conductivity Controllers: Provide to open the bleed-off solenoid valve when conductivity of cooling water rises above set point of controller. When conductivity falls below set point, valve shall close.
2. Water Meters: Provide to start timer after a pre-set volume of make water has been measured.
3. Timers: Provide to turn feed pumps on for a pre-set amount of time.
4. Piping: Provide plastic piping and fittings conforming to ASTM D 2996 for water treatment system. Piping for feed pump suction shall contain a foot valve and strainer.
5. Water Analysis: Provide make-up water analysis in accordance with the methods of tests of ASTM. Analysis shall include test results for the following:

Description

Silica (Si02)
Insoluble
Iron and Aluminum Oxides
Calcium (Ca)
Magnesium (Mg)
Sodium and Potassium (Na and K)
Carbonate (C03)
Bicarbonate (HC03)
Sulfate (S04)
Chloride (C1)
Nitrate (N03)
Turbidity
pH
Residual Chlorine
Total Alkalinity
Non-carbonate Hardness
Total Hardness
Dissolve Solids
Fluorine
Conductivity

L. Chemicals: Provide same chemicals used for treatment at station's other towers.

1. New chemical feed system shall duplicate existing system currently in use in the utility plant. Contractor shall contact existing equipment supplier ("NALCO") and utilize products to meet existing conditions.

2.22 WARRANTY

A. One full day of instruction as to proper care, operation, and instrumentation of unit. Start-up and instruction dates shall not coincide. Instruction date shall be set by Owner after start-up.

B. Include with one-year warranty complete chemical treatment services for supplying, treating, monitoring, etc. of condenser water system installed for the new cooling tower.

PART 3 - EXECUTION

3.1 PROTECTION OF EQUIPMENT

A. Deliver equipment to site in sealed containers or weatherproof wrap. Mechanical equipment spaces shall be ready to receive units prior to shipment. Follow manufacturer's printed instructions for unloading and moving equipment. Handle and place equipment with care to avoid damage to casing or structural components. Protect equipment during construction with coverings, and build temporary catwalks over units when workmen require overhead access in unit location.

3.2 ELECTRICAL WIRING

A. Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.3 PIPING CONNECTIONS

A. Provide piping, valves, accessories, gauges, supports, and flexible connectors as indicated. Flexible pipe connectors shall not be used to correct for misalignment of piping to unit connections. Offset in flexible pipe connectors shall not exceed 1/4". Provide trapped, insulated, copper condensate drain piping from each drain connections as shown and extend independently to disposal point as part of this section's work.

3.4 TESTING OF PIPING SYSTEMS

A. General: Contractor shall notify Architect of tests twenty-four hours in advance. All tests shall be witnessed by the Architect or his representative. Contractor shall provide a minimum 6" dial pressure gauge to indicate all test pressures and the scale shall be not more than 0 to 160 psi and 1 psi graduations. Test shall be held for a minimum of five (5) hours with no apparent loss of pressure.

B. The following systems shall be tested at pressures indicated:

1.	Chilled water piping	System Pressure
2.	Drain piping	System Pressure

C. All tests shall be verified by a test record maintained on the site and witnessed by the signature of inspector.

D. Any portion of system failing to pass test shall be retested until proven acceptable.

3.5 AIR SYSTEM TESTING

A. Upon completion of installation of the equipment, start-up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning units, then retest to demonstrate compliance. Equipment shall not be operated during construction or for contractor comfort.

3.6 TESTING OF PIPING SYSTEMS

B. General: Contractor shall notify Architect of tests twenty-four hours in advance. All tests shall be witnessed by the Architect or his representative. Contractor shall provide a minimum 6" dial pressure gauge to indicate all test pressures and the scale shall be not more than 0 to 160 psi and 1 psi graduations. Test shall be held for a minimum of five (5) hours with no apparent loss of pressure.

C. The following systems shall be tested at pressures indicated:

1.	Chilled Water Piping	150 psi for eight hours with no leaks
2.	Hot Water Piping	150 psi for eight hours with no leaks

D. All tests shall be verified by a test record maintained on the site and witnessed by the signature of inspector.

E. Any portion of system failing to pass test shall be retested until proven acceptable.

3.7 CLOSEOUT MANUALS

A. Operating and maintenance information shall be provided to the building owner. This information shall include, but not be limited to, the information specified.

B. Construction documents shall require that an operating manual and a maintenance manual be provided to the building owner or the designated representative of the building owner within 90 days after the date of system acceptance. These manuals shall be in accordance with industry-accepted standards (see Informative Appendix E) and shall include, at a minimum, the following:

1. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
2. Operation manuals and maintenance manuals for each piece of equipment and system requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
3. Names and addresses of at least one service agency.
4. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments.
5. A complete narrative of how each system is intended to operate, including suggested setpoints.

3.8 GUARANTEE

A. The Contractor shall guarantee, in writing, the work of this project when completed to be free from any and all defects and shall guarantee the work of this project, controls and other equipment against defective materials and workmanship for a period of one (1) year from date of completion and acceptance.

B. Upon receipt of notice from the Owner of the failure or any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly repaired or replaced with new parts by and at the expense of the Contractor.

END OF SECTION.

SECTION 15950 - AUTOMATIC TEMPERATURE CONTROLS SYSTEM (ATCS)

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. All control system components shall be new and the latest products of the manufacturer and been manufactured and installed for at least 2 years

B. The Automatic Temperature Control System for Baldwin County Annex V shall be installed by the requirements of this specification section. In order to efficiently manage the existing HVAC equipment, all required control systems for this bid shall report to the existing Countywide Niagara N4 supervisor. No separate workstations, gateways or software are allowed in order to make the system 100% operational or compatible with the Counties existing system. The software for this bid shall be **100% Honeywell N4 compatible** and with the latest software revisions w/ the new controls.

1. The contractor shall be authorized, licensed and trained on Tridium Niagara systems to provide the software for interfacing the new system being installed under this contract. Previous completed must be supplied upon request. Failure to comply shall be means of rejection with no compensation.
2. The contractor shall have been in business and have been working on WEBS N4 DDC systems for at least 5 years and have a locally staffed office within 60 miles for the last 5 years. Controls shall be provided and installed by the branch or Authorized Controls Integrator (ACI) responsible for the warranty and servicing of the system. The Honeywell contractor currently servicing the county system is Walters Controls, Inc.

D. The control system shall be installed by competent control mechanics and electricians regularly employed or supervised by the ATCS contractor.

E. The drawings and general provisions of the Contract, including General and Supplementary Conditions of Section 1, apply to the work of this section.

F. The control system specified is based on an electric/electronic design of direct digital control (DDC). It is the intent of this specification to describe the basic architecture and performance requirements of the ATCS. The ATCS shall be based on a distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on a true peer-to-peer, token passing Local Area Network (LAN), called the Controller LAN. The ATCS shall include all workstation software and hardware, DDC controllers, DDC programming, Local Area Networks (LAN's), sensors, control devices, actuators, installation and calibration, supervision, adjustments and fine tuning necessary for a complete and fully operational system. Provide a system made up of one or more digital controllers. Required climate control and energy management functions for complete operation of an HVAC System shall be provided by DDC from digital controllers. No conventional control devices (pneumatic or electronic) such as receiver-controllers, thermostats, and logic units shall be used unless specifically indicated. Provide digital controllers in a system linked in a communications network composed of one or more levels of local area networks (LAN's). ATCS system as installed shall be capable of the following energy management and control functions:

1. Proportional, integral, derivative (PID) control.
2. Night setup/setback control.
3. Analog alarm limits and reporting.
4. Digital alarm reporting.
5. Event and time-initiated programs.
6. Point trending.
7. Custom, Owner-usable database and DDC programming, including predefined DDC modules, Boolean logic and mathematical calculations and point definitions.

1.2 SUBMITTALS AND COORDINATION

A. Submit manufacturer's specifications for each control device. Submit wiring connection details to each electrical device and system control flow diagrams showing all control devices and mechanical equipment controlled. Submit printed bill of material describing each component and referencing its unique identifier as shown on the flow diagrams. Submit printed sequence of operations conforming to the specifications and referencing control device identifiers as shown on the flow diagrams.

B. Coordinate power requirements with Division 16 contractor. Where power supplies or transformers integral with other equipment are used for control power, it shall be the responsibility of this contractor to ensure that the connected loads do not exceed the rated capacity of the power supply or transformer.

C. Maintenance data and spare parts lists for each type of control device shall be submitted before the close of the project in a separately bound binder titled "Operation and Maintenance Manuals".

D. Final "As Built" drawings shall be provided prior to project close-out.

1.3 DESCRIPTION OF WORK

A. The ATCS shall consist of all thermostats, temperature transmitters, controllers, software, relays, transformers, automatic valves and dampers, damper operators, switches, control panels, and other necessary equipment along with a complete system of electrical control wiring to fulfill the intent of the specifications and provide for a complete and operating system. Installation of control components shall conform to manufacturers' recommendations. Where manufacturer's recommendations conflict with the specifications, the ATCS contractor shall obtain the Engineer's prior approval for any deviations.

B. Combination magnetic starters for HVAC equipment shall be furnished by the Mechanical contractor for installation by the Electrical contractor. Starters shall include hand-off-auto switches, control transformers of 24 or 120 volts, matching contactors, and normally open auxiliary contacts. Power from sources outside the starter shall not be used to operate the starter contactor.

C. Electrical work performed by this section shall conform to the Electrical codes of the State and County.

D. Control Wiring: Install control wiring in a neat and workman-like manner, securely fastened. Install in accordance with NFPA 70, NEC and manufacturers' recommendations. Install circuits over 30 volts with # 16 AWG, 600V wire or larger in electric metallic tubing ("EMT").

Install circuits under 25 volts using # 18 AWG wire or larger with 300V insulation on each conductor. Where low voltage, open wiring is used in accessible air plenums, cable shall be protected by a plenum-rated, polymer jacket. Open, low voltage non-plenum wiring is approved where codes allow. For all exposed and inaccessible locations, wire shall be installed in conduit. All mechanical rooms shall be installed with conduit. All conduit, less thermostat drops in walls, shall be ¾" EMT minimum.

E. Installation by Others: all valve bodies, dampers, flow measuring stations, control sensor wells and other pipe sensors etc. shall be installed by the Mechanical contractor. Except for dampers, each of these items shall be provided by the controls contractor as required for this project. All dampers shall be provided and installed by the Mechanical contractor. VAV Application Specific Controllers (ASC'S) shall be furnished by the ATCS contractor and installed by the Control contractor in the field.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide control products in sizes and capacities indicated and as required to accomplish control functions, conforming to manufacturers' standard materials and components as published in their product information. All devices shall be selected for the load and UL listed for the application. Control devices specially built or modified for this project are not acceptable without prior approval from the Engineer.

2.2 AUTOMATIC TEMPERATURE CONTROLS SYSTEM (ATCS)

A. User Interface Terminal (UIT): Not required

B. DDC Controllers: Provide Honeywell XL50, Stryker, Spyder, Cipher30, Cipher 50, Otimizer and Honeywell JACE N4 controllers or equal as required and indicated for specified control and monitoring to seamlessly connect to the Owners existing Niagara N4 system. Each AHU controller shall be **fully programmable** and have a minimum of 16 hardware points (except VAV controllers) consisting of AO, DO, AI and AO points. DDC controllers shall function standalone for the local loop functions of the controller. All DDC controllers shall be connected via LAN or sub-LAN to the UIT/ JACE as required. The following point types must be supported by DDC controllers serving air terminal boxes (e.g. VAV'S):

1. Discrete/digital input (contact status).
2. Discrete/digital output (maintained, momentary).
3. Resistance analog input.
4. Pulse Width Modulation (PWM) output capable of producing a pulse anywhere between 0-655 seconds in duration with 0.01 second resolution.
5. Floating control output.

C. The following point types must be supported by DDC controllers serving non-air terminal equipment:

1. Discrete/digital input (contact status).
2. Discrete/digital output (maintained, momentary).
3. Resistance analog input.
4. Pulse Width Modulation (PWM) output.

5. Floating control output.
6. 0-10v DC or 4-20 mA analog output
7. 0-5 VDC, 0-10 VDC or 4-20 mA analog input

D. All DDC programs shall be contained in the DDC controllers in firmware and all database shall be contained on the DDC controllers in nonvolatile RAM (NOVRAM) or be battery-maintained for a minimum of 24 hours.

1. Non-terminal unit controllers: Provide Honeywell programmable, standalone DDC controllers for all applications other than air terminal units. All AHU controllers shall have internal clocks. Controllers shall communicate with the UIT and be capable of sharing data with other connected controllers. Provide a minimum of one fully standalone controller for each three discrete mechanical systems, remote I/O's can only be used for up to 3 systems. Discrete mechanical systems include:
   a. VAV air handler.
   b. Multizone air handler.
   c. Any air handler with more than four connected DDC points.
   d. Heating hot water system.
   e. Chilled water/condenser water system.

E. Temperature Sensors: Provide thermistor, thin film silicon or platinum RTD sensors for all temperature applications except differential chilled water for BTU calculation, where precision matched Platinum RTD'S with transmitters may be used. Solid state sensors shall be linear, drift-free, and require only a one-time calibration. Thermistors or similar non-linear temperature devices shall be linearized by a look-up table in the connected controller. For all temperature sensors, measured accuracy from sensor to UIT display shall be +/- 1 degree F except differential chilled water for BTU calculation, where accuracy from sensor to UIT display shall be +/- 5-degree F. Sensors for liquid or steam service shall be of thermal well insertion type; "strap-on" pipe sensors are permitted only where specifically indicated. Sensors for duct mounting that serve as control points in DDC shall be serpentine averaging type in duct having greater than 20 sq., ft. cross section.

F. Humidity transmitters: Provide 0-5VDC, 0-10VDC or 4-20mA relative humidity transmitters - where indicated or required by the sequence. Measured accuracy shall be +/- 3% RH. Honeywell or ACI

G. Pressure transmitters: Provide 0-5VDC, 0-10VDC or 4-20mA pressure transmitters where indicated or required by the sequence. Measured accuracy from sensor to UIT display shall be +/- 1% of span. Dwyer, Setra, Veris or Senva

H. DDC Thermostat: Provide for all space control locations. Thermostat shall have an integral sensor, setpoint adjustment humidity and CO2 sensor as shown on the plans or required in the sequence of operation.

2.3 CONTROL COMPONENTS

A. Control Valves: Valves used to control hot or chilled water shall be modulating, unless otherwise noted in the sequence of operation or on the plans. Ball or globe valves for automatic control service are acceptable. Provide 2-way or 3-way valves as indicated. Butterfly valves may be used for isolation purposes All valves shall have stainless steel stems and be serviceable without removing the valve from the line. Water valves shall be sized for pressure drops not

greater than 5 PSI at full flow for the service indicated. Valve bodies shall be cast iron or bronze with Teflon packing. Water valve design shall provide for equal percentage flow characteristics with rangeability of 50 to 1. Steam valve design shall provide for linear characteristics with rangeability of 30 to 1. Valves 2" and smaller shall be screwed, valves 2-1/2" or larger shall be flanged. Reheat and FCU type valves for service below 12 GPM may be sweat or flare type, modulating or 2-position as described in the sequence or shown on the plans. Honeywell or Belimo Only

B. Dampers: Provide automatic control dampers (not specified to be furnished with HVAC equipment) as shown. Dampers shall have roll formed, galvanized steel frames, interlocking blades, and spring stainless steel continuous side seal strips. Blades shall have 0.50 inch axles on nylon or oil-impregnated ("Oilite") bearings. Dampers shall have an operating temperature range of -40 to 200 deg. F.

C. Valve and Damper Operators: Valve actuators shall be sized to ensure tight close-off and be sized for smooth modulating or 2-position action as specified. Damper actuators shall be direct-coupled, requiring no external crank-arm linkage. Where "normal" or "fail-safe" position is indicated, furnish spring-return actuators. Valve actuators for other than terminal unit service shall be foot-mounted, oil-immersed and be sized for smooth modulating or 2-position action as specified. Terminal unit valve actuators shall be direct-coupled. Actuators shall be Belimo or Honeywell ML, MN or Mod IV series.

D. Low Limit Freeze stats: Shall be of the manual reset type. All freeze stats shall be provided with a 20 ft. sensing element to cover the duct area, which shall respond to the lowest temperature to which any one-foot portion is exposed. Reuse existing freeze stats if operable. Honeywell, ACI or Johnson Controls

E. High Limit Firestats: Shall be of the 2-position, manual reset type, with an extended helical bimetal element and shall be installed in each air handling unit under 2000 cfm.

F. Air Flow Measuring Station: Furnish thermal dispersion, multi-sensor type manufactured by Ebtron, Inc., or equal where airflow measuring is shown on the plans or required by the sequence. FMS to be provided by Controls Contractor. Gold series is not required unless duct size dictates

G. Electric Thermostats: Shall be rated for line or low voltage as required by the sequences. Line voltage thermostats shall be rated for minimum 19 amps at 277 VAC. Sensing element shall be bimetal and include a long-lasting micro-switch mechanism. Thermostats shall require tools for the removal of covers. Where indicated, furnish heavy duty, clear plastic or metal, tamper-proof guards. T651 Honeywell or equal

H. Remote Bulb Thermostats: Shall have copper remote bulb and capillary tube with duct mounting, outdoor, or pipe insertion hardware. Provide thermostats with temperature ranges suitable for intended service. Thermostats shall have dial-adjustable setpoint and adjustable dead band. Honeywell T775

I. Current Relays: Provide wherever fan or pump status inputs are required or indicated to the ATCS. Current relays shall have normally open contacts that close at adjustable current level and furnish proof of air or water flow in constant or variable speed equipment. Veris H800 or Functional devices RIB XKTF.

J. Local Control Panels:

1. Enclose all DDC controllers except VAV controllers in control panels together with all pressure and flow transducers, output relays, transformers and power supplies.
2. Provide control panels suitable for wall mounting with interior sub-panels for equipment mounting.
3. Route wires inside panels in plastic wire duct.
4. Fabricate panels of steel with baked-on color finish or extruded aluminum alloy, totally enclosed on four sides. Panels shall have hinged doors with key-operated locks.
5. All door and interior mounted equipment shall be installed in a neat manner with identifying engraved plastic nameplates. Provide numbered, double-terminal barrier strips for all wiring to external devices. No more than two wires may be connected to each side of a terminal.

K. Provide, as a minimum, ATCS control panels everywhere shown on the Mechanical Drawings containing DDC controllers and connected points for the local HVAC equipment. No more than 2 systems may be installed in a single panel.

2.4 SEQUENCE OF OPERATIONS

A. General: When occupancy schedule override is initiated by night high or low limit program, the system shall operate normally in the occupied mode. See plans for additional sequences.

B. Provide surge protection on power supply to each panel, where a communication bus leaves a building. Provide a UPS backup for any JACE or router located in this building.

C. IT drops by owner – connection to panel location by controls contractor

D. Minimum DDC Points in addition to the sequence of operations shown on the plans:

1. Start / stop / status per AHU and pump
2. DA sensor per unit
3. Space temperature and (1) space humidity minimum per system
4. Chilled Water supply and return temperature
5. CO2 sensor and Flow measuring station (if shown on plans or sequence)
6. Common OSA temperature sensor
7. VAV box space and DA sensor

2.5 FINAL ADJUSTMENT OF EQUIPMENT

A. After completion of installation, adjust DDC controls, thermostats, control valves, operators and similar equipment provided as work under this section. Final adjustments shall be performed by trained personnel in direct employment of the installing ATCS contractor.

B. After installation and commissioning, furnish one, 4-hour training session for the Owner's representative(s) covering the ATCS system for this particular building. The Owner's representative(s) shall use their copies of the Operation & Maintenance manuals and as-built drawings furnished by the ATCS as training aids.

2.6 GUARANTEE

A. The ATCS contractor shall furnish a one-year parts and labor warranty on all devices and software furnished under this section. Warranty shall include all costs to replace or repair items that fail due to defects in material or workmanship. The ATCS contractor shall respond to warranty calls within 8 hours if notified before noon, or within 24 hours if notified after noon Monday thru Friday.

END OF SECTION.

SECTION 16100 - ELECTRICAL

REFERENCE

ELECTRICAL DRAWINGS

FOR

SPECIFICATIONS

PROJECT

BALDWIN COUNTY ANNEX V
REVENUE COMMISSION BUILDING
HVAC UPGRADE
1705 U.S. HWY-31 S.
BAY MINETTE, ALABAMA 36507

FOR

BALDWIN COUNTY COMMISSION
312 COURTHOUSE SQUARE
BAY MINETTE, ALABAMA 36507

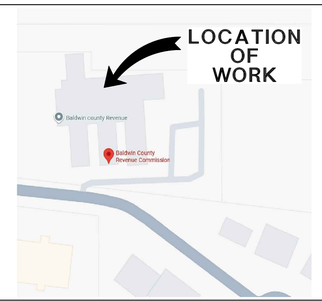
BY

H.M. YONGE & ASSOCIATES, INC.
CONSULTING ENGINEERS
253 ST. ANTHONY STREET
MOBILE, ALABAMA 36603
(251) 690-7446

MAY 2026

DRAWING INDEX

VICINITY MAP



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SEAL:

REVISIONS:

NO.	DATE:

PROJECT:
BALDWIN COUNTY ANNEX V
REVENUE COMMISSION BUILDING
HVAC UPGRADE
1705 U.S. HWY-31 S.
BAY MINETTE, ALABAMA 36507

DRAWING:
TITLE SHEET

DATE: 05.08.26
DRAWN BY: STA
CHECKED BY: HMY
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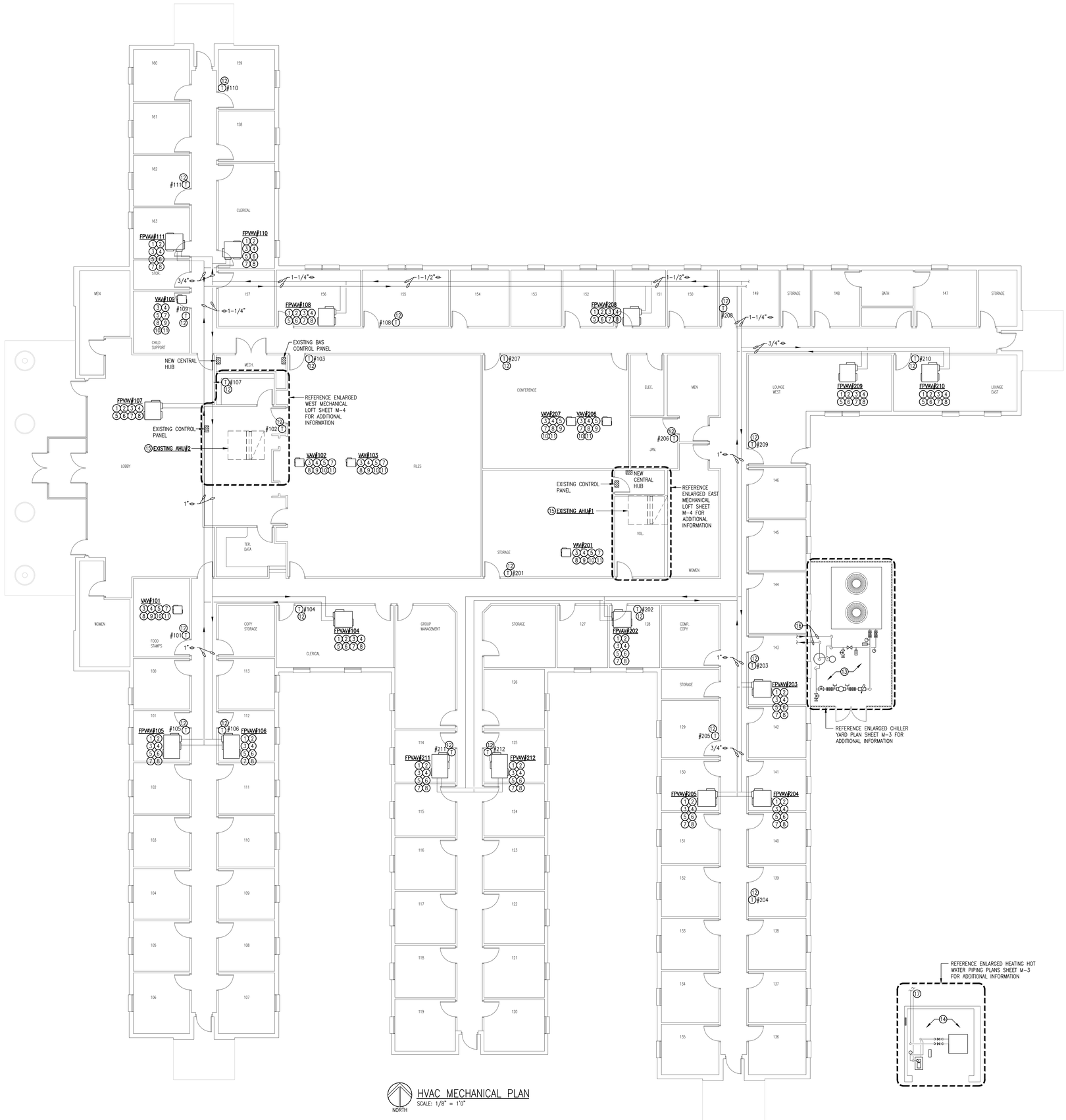

MECHANICAL SPECIFICATIONS:

FAN POWERED PARALLEL VARIABLE AIR VOLUME BOXES SHALL BE SINGLE DUCT TYPE WITH 1.5 LB DENSITY LINER. AIR VALVE AND ACTUATOR SHALL CONTROL AIR FLOW TO WITHIN ± 5% OF DESIGN. THE MAXIMUM LEAK RATE FOR THE AIR VALVE SHALL BE 1%. INTEGRAL FLOW TAPS AND A CALIBRATION CHART SHALL BE PROVIDED ON EACH UNIT. BOXES SHALL BE AS MANUFACTURED BY "TRANE" OR AN APPROVED EQUAL. CONTROLS TRANSFORMER SHALL BE 277V TO 24V. THERMOSTATS SHALL BE WALL MOUNTED (48" A.F.F.). FIELD VERIFY CONTROLS AS DIGITAL. ALL THERMOSTATS SHALL HAVE LOCALLY ADJUSTABLE SET POINTS WITH THE MIN. AND MAX. SET POINT BEING SET BY THE BUILDING ENERGY MANAGEMENT SYSTEM. IN ADDITION, THERMOSTATS SHALL HAVE A DIGITAL READOUT OF THE LOCAL SPACE TEMPERATURE.

A FULL TEST AND BALANCE OF ALL FPVAV AND VAV UNITS SHALL BE PERFORMED BY AN INDEPENDENT TEST AND BALANCE CONTRACTOR. A FULL TEST AND BALANCE REPORT (FIVE COPIES) SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL. THE TEST AND BALANCE SHALL INCLUDE, BUT NOT BE LIMITED TO, AIR FLOWS, WATER FLOWS, AND COIL PERFORMANCES.

DESCRIPTION OF WORK:

THIS PROJECT IS FOR REPLACING AND UPGRADING THE BUILDING DIRECT DIGITAL CONTROLS SYSTEMS AND SUPPLY AIR DISTRIBUTION EQUIPMENT. IN PARTICULAR, NEW DIRECT DIGITAL CONTROLS SHALL BE REQUIRED FOR AIR HANDLING UNITS (2), VARIABLE AIR TERMINAL UNITS (16 FAN POWERED UNITS AND 7 SINGLE DUCT UNITS), HEATING HOT WATER BOILER AND PUMPS (2) AND AIR COOLED WATER CHILLER WITH PUMPS (2). CURRENTLY THERE IS ONLY ONE CHILLED WATER PUMP AND ONE HOT WATER PUMP. A SECOND PUMP IS TO BE ADDED TO EACH HYDRONIC SYSTEM. THE AIR HANDLING UNITS SHALL BE CONVERTED FROM VARIABLE INLET VANE TO VARIABLE FREQUENCY DRIVE. VARIABLE AIR TERMINAL UNITS SHALL BE REMOVED AND REPLACED NEW. HEATING HOT WATER REHEAT COILS ARE INCLUDED WITH 16 OF THE 23 VAV UNITS. EACH OF THE SEVEN AIR TERMINAL UNITS WITHOUT REHEAT COILS SHALL BE PROVIDED WITH ELECTRIC REHEATING COILS. OF THESE SEVEN ONLY FIVE SHALL BE CONNECTED TO ELECTRICAL POWER. THE EXISTING DDC SYSTEM (TRANE SUMMIT) SHALL BE REPLACED WITH A NEW DDC SYSTEM HAVING NEW CONTROL CONNECTIONS FOR THE CHILLER, BOILER AND ASSOCIATED PUMPS, VAV UNITS AND AIR HANDLING UNITS. BALDWIN COUNTY BUILDINGS INTEGRATE BACK TO A NIAGARA N4 SUPERVISOR. THE NEW CONTROLS SYSTEM SHALL TIE BACK INTO the SUPERVISOR VIA A NEW JACE. ALL NEW CONTROLS SHALL FULLY INTEGRATE WITH THE EXISTING N4 SUPERVISOR. ALL JACES SHALL COME WITH A 3-YEAR SMA.

NOTE: ALL WORK SHALL BE PERFORMED DURING UNOCCUPIED HOURS (AFTER HOURS) OF THE BUILDING AND OVER HOLIDAYS. THE BUILDING IS TO REMAIN OCCUPIED DURING THIS PROJECT.

SERVICE OF A MECHANICAL CONTRACTOR, CONTROLS CONTRACTOR AND AN ELECTRICAL CONTRACTOR SHALL BE REQUIRED. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONVERSION OF THE AIR HANDLING UNITS AND INSTALLATION OF THE NEW VARIABLE AIR VOLUME TERMINAL UNITS. FURTHERMORE, THE MECHANICAL CONTRACTOR SHALL INSTALL ALL NEW DUCT MOUNTED SENSORS. COORDINATION BETWEEN THE MECHANICAL, ELECTRICAL AND CONTROLS CONTRACTOR IS REQUIRED.

THE DIRECT DIGITAL CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ALL NEW DDC CONTROL PANELS, DEVICES, LOW VOLTAGE CONTROL WIRING, SYSTEM PROGRAMMING, GRAPHICS AND START-UP.

THE ELECTRICAL CONTRACTOR SHALL BE REQUIRED FOR ALL POWER WIRING, PARTICULARLY, FOR THE ELECTRIC REHEAT COILS AND FOR CONNECTING THE NEW AHU VFD TO THE NEW BLOWER MOTOR.

PRIOR TO BEGINNING ANY WORK, MECHANICAL CONTRACTOR SHALL HAVE AIR SIDE AND WATER SIDE EQUIPMENT TESTED AND BALANCED. SUBMIT A REPORT OF AIR FLOWS WITH COIL PERFORMANCE FROM EACH AIR TERMINAL UNIT (23) AND EACH AHU(2), WATER FLOWS FOR CHILLED AND HEATING HOT WATER PUMPS, BOILER AND CHILLER. INCLUDE IN REPORT EXISTING ELECTRICAL POWER SERVING THE EXISTING AIR TERMINAL UNITS. SUBMIT REPORT TO ENGINEER FOR ADJUSTMENTS TO NEW EQUIPMENT INSTALLED FOR THIS PRODUCT.

HVAC KEY NOTES:

1. EXISTING FAN POWERED VARIABLE AIR VOLUME AIR TERMINAL UNIT TO BE REMOVED AND REPLACED NEW. INCLUDE WITH REMOVAL OF UNIT, DISCONNECTING SUPPLY AIR DUCTWORK (MEDIUM AND LOW PRESSURE), ELECTRICAL POWER, CONTROLS WIRING AND HEATING HOT WATER PIPING. THE REHEAT COIL PIPING ASSEMBLY IS TO BE REMOVED COMPLETELY WITH HEATING HOT WATER CONTROL VALVE. EACH DISCONNECTED UTILITY SYSTEM SHALL BE PREPARED FOR RECONNECTION TO NEW FAN POWERED VARIABLE AIR VOLUME AIR TERMINAL UNIT. COORDINATE LIMITS OF DEMOLITION WITH NEW FAN POWERED VARIABLE AIR VOLUME AIR TERMINAL UNIT TO BE INSTALLED. PRIOR TO ORDERING NEW AIR TERMINAL UNIT MECHANICAL CONTRACTOR SHALL VERIFY ELECTRICAL POWER SERVING UNIT. SUBMIT WRITTEN STATEMENT INDICATING POWER WITH REQUIREMENTS OF CONTROLS TRANSFORMERS. COORDINATE POWER REQUIREMENTS WITH ELECTRICAL AND CONTROLS CONTRACTORS.
2. NEW FAN POWERED VARIABLE AIR VOLUME AIR TERMINAL UNIT TO BE INSTALLED IN SAME LOCATION AS REMOVED UNIT. EACH EXISTING UTILITY SYSTEM DISCONNECTED FROM REMOVED UNIT SHALL BE EXTENDED FOR CONNECTION TO NEW FAN POWERED VARIABLE AIR VOLUME AIR TERMINAL UNIT. NEW UNIT SHALL DUPLICATE EXISTING UNIT, UNLESS OTHERWISE NOTED.
3. EXISTING MEDIUM PRESSURE SUPPLY AIR DUCTWORK TO BE EXTENDED, AS NEW DUCTWORK, FROM FULL SIZE OF REMAINING DUCT WITH TRANSITION FOR CONNECTION TO FULL SIZE OPENING OF NEW VARIABLE AIR VOLUME AIR TERMINAL UNIT.
4. EXISTING LOW PRESSURE DUCTWORK TO BE EXTENDED, AS NEW DUCTWORK, FROM FULL SIZE OF REMAINING DUCT WITH TRANSITION FOR CONNECTION TO FULL SIZE OPENING OF NEW VARIABLE AIR VOLUME AIR TERMINAL UNIT.
5. NEW EXTERIOR DUCT WRAP INSULATION SHALL BE INSTALLED ON NEW AND EXISTING DUCTWORK. EXISTING DUCTWORK INSULATION DISTURBED DURING CONSTRUCTION SHALL BE REPLACED NEW.
6. EXISTING HEATING HOT WATER SUPPLY AND RETURN PIPING SHALL BE EXTENDED, AS NEW PIPING, FOR CONNECTION TO NEW REHEAT COIL ASSEMBLY. THE CONTROL VALVE PIPING ASSEMBLY WITH VALUE AND ACTUATOR TO BE PROVIDED BY CONTROLS CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL INSTALL THE CONTROL VALVE PIPING ASSEMBLY. ALL NEW HOT WATER PIPING SHALL BE INSULATED. INCLUDED WITH NEW PIPING INSULATION, EXISTING PIPING INSULATION DISTURBED DURING CONSTRUCTION SHALL BE REPLACED NEW.
7. EXISTING POWER WIRING ORIGINALLY SERVING REMOVED VARIABLE AIR VOLUME AIR TERMINAL UNIT SHALL BE EXTENDED, AS NEW WIRING, FOR CONNECTION TO NEW UNIT. REFERENCE ELECTRICAL PLANS FOR ADDITIONAL INFORMATION. PRIOR TO ORDERING NEW AIR TERMINAL UNIT MECHANICAL CONTRACTOR SHALL VERIFY ELECTRICAL POWER SERVING UNIT. SUBMIT WRITTEN STATEMENT INDICATING POWER WITH REQUIREMENTS OF CONTROLS TRANSFORMERS. COORDINATE POWER REQUIREMENTS WITH ELECTRICAL AND CONTROLS CONTRACTORS.
8. EXISTING CONTROL WIRING SHALL BE CONNECTED TO NEW VARIABLE AIR VOLUME AIR TERMINAL UNIT. REFERENCE HVAC DIRECT DIGITAL CONTROL PLAN FOR ADDITIONAL INFORMATION. PRIOR TO ORDERING NEW AIR TERMINAL UNIT MECHANICAL CONTRACTOR SHALL VERIFY ELECTRICAL POWER SERVING UNIT. SUBMIT WRITTEN STATEMENT INDICATING POWER WITH REQUIREMENTS OF CONTROLS TRANSFORMERS. COORDINATE POWER REQUIREMENTS WITH ELECTRICAL AND CONTROLS CONTRACTORS.
9. EXISTING SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT TO BE REMOVED AND REPLACED NEW. DISCONNECT SUPPLY AIR DUCTWORK (MEDIUM AND LOW PRESSURE), CONTROL AND POWER WIRING. PREPARE EACH UTILITY SYSTEM FOR CONNECTION TO NEW SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT. PRIOR TO ORDERING NEW AIR TERMINAL UNIT MECHANICAL CONTRACTOR SHALL VERIFY ELECTRICAL POWER SERVING UNIT. SUBMIT WRITTEN STATEMENT INDICATING POWER WITH REQUIREMENTS OF CONTROLS TRANSFORMERS. COORDINATE POWER REQUIREMENTS WITH ELECTRICAL AND CONTROLS CONTRACTORS.
10. NEW SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT TO BE INSTALLED IN SAME LOCATION AS REMOVED SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT. EXISTING UTILITY SYSTEMS DISCONNECTED FROM REMOVED UNIT SHALL BE EXTENDED FOR CONNECTION TO NEW UNIT. NEW UNIT SHALL DUPLICATE EXISTING UNIT UNLESS OTHERWISE NOTED.
11. NEW SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT SHALL HAVE AN INTEGRAL ELECTRIC REHEAT COIL, AS ASSEMBLED BY THE MANUFACTURER. REFERENCE ELECTRICAL PLANS FOR ADDITIONAL INFORMATION ON PROVIDING POWER TO NEW REHEAT COIL. MECHANICAL CONTRACTOR TO COORDINATE POWER REQUIREMENTS OF NEW REHEAT COIL WITH ELECTRICAL AND CONTROLS CONTRACTOR PRIOR TO BEGINNING ANY WORK.
12. EXISTING WALL MOUNTED TEMPERATURE CONTROLLER TO BE REMOVED AND REPLACED NEW. INSTALL NEW CONTROLLER IN SAME POSITION AS REMOVED TEMPERATURE CONTROLLER. CONNECT EXISTING CONTROL WIRING TO NEW CONTROLLER. REFERENCE HVAC DIRECT DIGITAL CONTROL PLAN FOR ADDITIONAL INFORMATION.
13. ADDITIVE ALTERNATE #1: EXISTING AIR COOLED WATER CHILLER PLANT TO REMAIN WITH MODIFICATIONS TO ADD A SECOND CHILLED WATER PUMP. REFERENCE CHILLED WATER PIPING SCHEMATICS FOR DEMOLITION AND NEW WORK REQUIREMENTS. INSTALLATION OF NEW CHILLED WATER PUMP (CWP#2) SHALL BE AS A REDUNDANT PUMP FOR THE EXISTING CHILLED WATER PUMP. INCLUDE WITH INSTALLATION OF NEW DIRECT DIGITAL CONTROLS THE ABILITY TO AUTOMATICALLY ALTERNATE "LEAD-LAG" POSITIONS EVER FOUR (4) WEEKS. ALL INSULATION SHALL BE REMOVED FROM CHILLED WATER SYSTEM COMPONENTS (AIR SEPARATOR/BUFFER TANK, CHEMICAL FEEDER, VALVES, FITTINGS, ETC.) AND REPLACED NEW PER SPECIFICATIONS. INCLUDE AN 18 GAUGE ALUMINUM JACKET OVER ALL INSULATION ON EACH SYSTEM COMPONENT.
14. ADDITIVE ALTERNATE #1: EXISTING HEATING HOT WATER BOILER PLANT TO REMAIN WITH MODIFICATIONS FOR THE INSTALLATION OF A SECOND HEATING HOT WATER PUMP. REFERENCE HEATING HOT WATER PIPING SCHEMATICS FOR DEMOLITION AND NEW WORK REQUIREMENTS. INSTALLATION OF NEW HEATING HOT WATER PUMP (HWP#2) SHALL BE AS A REDUNDANT PUMP FOR THE EXISTING HOT WATER PUMP. ALL PIPING INSULATION IN HOT WATER PLANT TO BE REMOVED AND INSTALLED NEW WITH 18 GAUGE METAL JACKET. INCLUDE WITH INSTALLATION OF NEW DIRECT DIGITAL CONTROLS THE ABILITY TO AUTOMATICALLY ALTERNATE "LEAD-LAG" POSITIONS EVERY FOUR (4) WEEKS.
15. EXISTING CENTRAL STATION AIR HANDLING UNIT TO REMAIN WITH MODIFICATIONS TO REMOVE THE VARIABLE INLET VANES AND INSTALL A NEW VARIABLE FREQUENCE DRIVE. INCLUDE WITH THE INSTALLATION OF THE NEW VARIABLE FREQUENCY DRIVE A NEW BLOWER MOTOR COMPATIBLE WITH THE NEW VFD. MOTOR HORSEPOWER SHALL BE VERIFIED PRIOR TO PURCHASE OF NEW MOTOR. VERIFY HORSEPOWER OF 15HP FOR AHU#1 AND 10HP FOR AHU#2.
16. NEW TEMPERATURE SENSORS IN CHILLED WATER SUPPLY AND RETURN PIPING. MECHANICAL CONTRACTOR TO COORDINATE FINAL LOCATION OF SENSORS WITH CONTROLS CONTRACTOR.
17. NEW TEMPERATURE SENSORS IN HEATING HOT WATER SUPPLY AND RETURN PIPING. MECHANICAL CONTRACTOR TO COORDINATE FINAL LOCATION OF SENSORS WITH CONTROLS CONTRACTOR.

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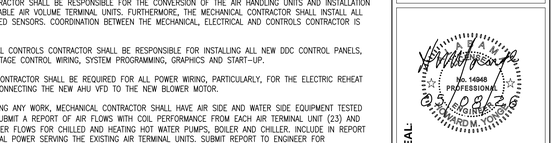


REVISIONS:

NO.	DATE:

PROJECT:

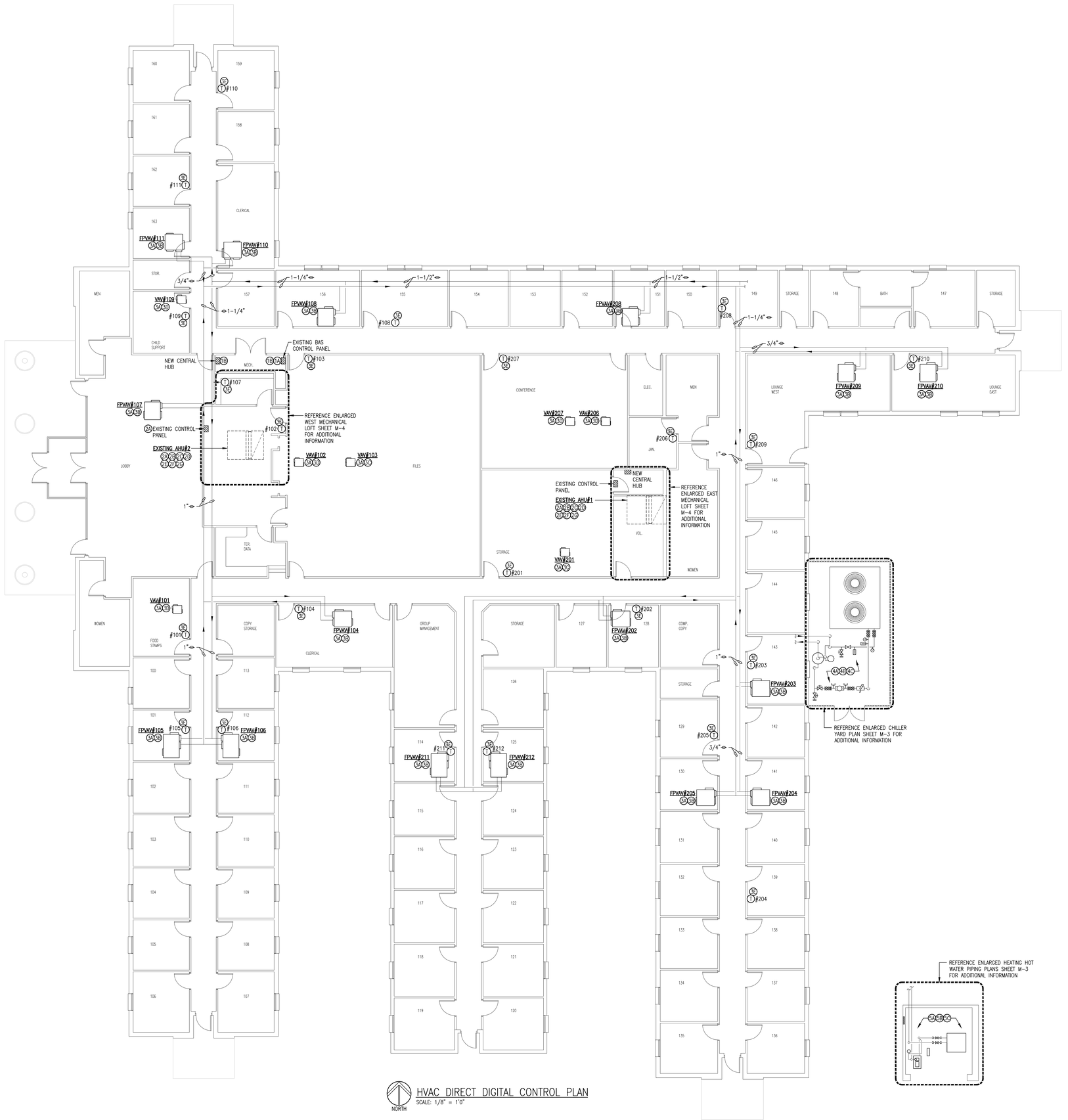
BALDWIN COUNTY ANNEX V
REVENUE COMMISSION BUILDING
HVAC UPGRADE

1705 US HWY-31 S.
BAY MINETTE, ALABAMA 36507

DRAWING: HVAC MECHANICAL PLAN

DATE: 05.08.26
DRAWN BY: STA
CHECKED BY: HMY
JOB NO: 25-146

SHEET NO: M-1



HVAC DIRECT DIGITAL CONTROL PLAN
SCALE: 1/8" = 1'0"

NORTH

KEY PLAN:

MECHANICAL SPECIFICATIONS:

FAN POWERED PARALLEL VARIABLE AIR VOLUME BOXES SHALL BE SINGLE DUCT TYPE WITH 1.5 LB DENSITY LINER. AIR VALVE AND ACTUATOR SHALL CONTROL AIR FLOW TO WITHIN ± 5% OF DESIGN. THE MAXIMUM LEAK RATE FOR THE AIR VALVE SHALL BE 1%. INTEGRAL FLOW TAPS AND A CALIBRATION CHART SHALL BE PROVIDED ON EACH UNIT. BOXES SHALL BE AS MANUFACTURED BY "TRANE" OR AN APPROVED EQUAL. CONTROLS TRANSFORMER SHALL BE 277V TO 24V. THERMOSTATS SHALL BE WALL MOUNTED (48" A.F.F.). FIELD VERIFY CONTROLS AS DIGITAL. ALL THERMOSTATS SHALL HAVE LOCALLY ADJUSTABLE SET POINTS WITH THE MIN. AND MAX. SET POINT BEING SET BY THE BUILDING ENERGY MANAGEMENT SYSTEM. IN ADDITION, THERMOSTATS SHALL HAVE A DIGITAL READOUT OF THE LOCAL SPACE TEMPERATURE.

A FULL TEST AND BALANCE OF ALL FPVAV AND VAV UNITS SHALL BE PERFORMED BY AN INDEPENDENT TEST AND BALANCE CONTRACTOR. A FULL TEST AND BALANCE REPORT (FIVE COPIES) SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL. THE TEST AND BALANCE SHALL INCLUDE, BUT NOT BE LIMITED TO, AIR FLOWS, WATER FLOWS, AND COIL PERFORMANCES.

DESCRIPTION OF WORK:

THIS PROJECT IS FOR REPLACING AND UPGRADING THE BUILDING DIRECT DIGITAL CONTROLS SYSTEMS AND SUPPLY AIR DISTRIBUTION EQUIPMENT. IN PARTICULAR, NEW DIRECT DIGITAL CONTROLS SHALL BE REQUIRED FOR AIR HANDLING UNITS (2), VARIABLE AIR TERMINAL UNITS (16 FAN POWERED UNITS AND 7 SINGLE DUCT UNITS), HEATING HOT WATER BOILER AND PUMPS (2) AND AIR COOLED WATER CHILLER WITH PUMPS (2). CURRENTLY THERE IS ONLY ONE CHILLED WATER PUMP AND ONE HOT WATER PUMP. A SECOND PUMP IS TO BE ADDED TO EACH HYDRONIC SYSTEM. THE AIR HANDLING UNITS SHALL BE CONVERTED FROM VARIABLE INLET VANE TO VARIABLE FREQUENCY DRIVE. VARIABLE AIR TERMINAL UNITS SHALL BE REMOVED AND REPLACED NEW. HEATING HOT WATER REHEAT COILS ARE INCLUDED WITH 16 OF THE 23 VAV UNITS. EACH OF THE SEVEN AIR TERMINAL UNITS WITHOUT REHEAT COILS SHALL BE PROVIDED WITH ELECTRIC REHEATING COILS. OF THESE SEVEN ONLY FIVE SHALL BE CONNECTED TO ELECTRICAL POWER. THE EXISTING DDC SYSTEM (TRANE SUMMIT) SHALL BE REPLACED WITH A NEW DDC SYSTEM HAVING NEW CONTROL CONNECTIONS FOR THE CHILLER, BOILER AND ASSOCIATED PUMPS, VAV UNITS AND AIR HANDLING UNITS.BALDWIN COUNTY BUILDINGS INTEGRATE BACK TO A NIAGARA N4 SUPERVISOR. THE NEW CONTROLS SYSTEM SHALL TIE BACK INTO THE SUPERVISOR VIA A NEW JACE. ALL NEW CONTROLS SHALL FULLY INTEGRATE WITH THE EXISTING N4 SUPERVISOR. ALL JACES SHALL COME WITH A 3-YEAR SMA. EACH VAV UNIT (23) SHALL REQUIRE A DOC CONTROLLER COMMUNICATING BACK TO THE JACE CONTROLLER VIA A BACKNET MSTP OR IP BUS.

NOTE: ALL WORK SHALL BE PERFORMED DURING UNOCCUPIED HOURS (AFTER HOURS) OF THE BUILDING AND OVER HOLIDAYS. THE BUILDING IS TO REMAIN OCCUPIED DURING THIS PROJECT.

SERVICE OF A MECHANICAL CONTRACTOR, CONTROLS CONTRACTOR AND AN ELECTRICAL CONTRACTOR SHALL BE REQUIRED. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONVERSION OF THE AIR HANDLING UNITS AND INSTALLATION OF THE NEW VARIABLE AIR VOLUME TERMINAL UNITS. FURTHERMORE, THE MECHANICAL CONTRACTOR SHALL INSTALL ALL NEW DUCT MOUNTED SENSORS. COORDINATION BETWEEN THE MECHANICAL, ELECTRICAL AND CONTROLS CONTRACTOR IS REQUIRED.

THE DIRECT DIGITAL CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ALL NEW DDC CONTROL PANELS, DEVICES, LOW VOLTAGE CONTROL WIRING, SYSTEM PROGRAMMING, GRAPHICS AND START-UP. ADDITIONALLY, THE CONTROLS CONTRACTOR MUST PULL A COMMUNICATION BUS AND A LOW-VOLTAGE 24V BUS TO ALL VAV UNITS.

THE ELECTRICAL CONTRACTOR SHALL BE REQUIRED FOR ALL POWER WIRING, PARTICULARLY, FOR THE ELECTRIC REHEAT COILS AND FOR CONNECTING THE NEW AHU VFD TO THE NEW BLOWER MOTOR.

PRIOR TO BEGINNING ANY WORK, MECHANICAL CONTRACTOR SHALL HAVE AIR SIDE AND WATER SIDE EQUIPMENT TESTED AND BALANCED. SUBMIT A REPORT OF AIR FLOWS WITH COIL PERFORMANCE FROM EACH AIR TERMINAL UNIT (23) AND EACH AHU(2), WATER FLOWS FOR CHILLED AND HEATING HOT WATER PUMPS, BOILER AND CHILLER. INCLUDE IN REPORT EXISTING ELECTRICAL POWER SERVING EACH OF THE EXISTING AIR TERMINAL UNITS. SUBMIT REPORT TO ENGINEER FOR ADJUSTMENTS TO NEW EQUIPMENT INSTALLED FOR THIS PRODUCT.

CONTROLS SCOPE OF WORK

1. BUILDING AUTOMATION SYSTEM MODIFICATION.
   - A. THE EXISTING DIRECT DIGITAL CONTROL SYSTEM (TRANE SUMMIT) SHALL BE REMOVED. A NIAGARA BASED CONTROL SYSTEM SHALL TIE BACK INTO BALDWIN COUNTYS NIAGARA N4 SUPERVISOR. THE BUILDING AUTOMATION SYSTEM (BAS) SHALL BE FULLY COMPATIBLE WITH AND INTEGRATE SEAMLESSLY INTO THE EXISTING NIAGARA FRAMEWORK SUPERVISOR CURRENTLY IN USE BY THE OWNER. INTEGRATION SHALL BE ACCOMPLISHED WITHOUT THE REQUIREMENT FOR ANY ADDITIONAL PROPRIETARY FRONT-END SOFTWARE OR THIRD-PARTY GATEWAYS. A NIAGARA-BASED FIELD-LEVEL INTEGRATION CONTROLLER (JACE) SHALL BE PROVIDED AND SHALL SERVE AS THE PRIMARY INTERFACE FOR ALL NEW CONTROL SYSTEMS. ALL CONTROL DEVICES SHALL COMMUNICATE USING NATIVE BACNET PROTOCOLS (BACNET/IP OR BACNET MS/TP), AND NO PROPRIETARY COMMUNICATION METHODS THAT RESTRICT FULL SYSTEM INTEGRATION SHALL BE PERMITTED. THE CONTRACTOR SHALL PROVIDE FULL POINT-LEVEL INTEGRATION, INCLUDING BUT NOT LIMITED TO ALL ANALOG AND BINARY INPUTS AND OUTPUTS, SETPOINTS, ALARMS, SCHEDULES, AND TREND DATA, ALL OF WHICH SHALL BE FULLY ACCESSIBLE, VIEWABLE, AND WRITABLE WITHIN THE NIAGARA SUPERVISOR. ALL GRAPHICS, SCHEDULING, ALARM MANAGEMENT, AND TRENDING FUNCTIONS SHALL BE DEVELOPED, HOSTED, AND MANAGED WITHIN THE NIAGARA SUPERVISOR, AND THE SYSTEM SHALL NOT RELY ON ANY MANUFACTURER-SPECIFIC FRONT-END SOFTWARE FOR NORMAL OPERATION. THE OWNER SHALL BE PROVIDED FULL ADMINISTRATIVE ACCESS TO THE NIAGARA SUPERVISOR AND ALL ASSOCIATED JACE CONTROLLERS, INCLUDING ALL PROGRAMMING, GRAPHICS, AND DATABASE FILES NECESSARY FOR COMPLETE SYSTEM OPERATION AND FUTURE MODIFICATIONS.
   - B. NEW DDC COMMUNICATION BUS, WIRING, SENSORS, DDC CONTROLLERS AND OTHER COMPONENTS SHALL BE INSTALLED TO FULLFIL THE SEQUENCE OF OPERATIONS
2. CENTRAL STATION AIR HANDLING UNITS #1 AND #2.
   - A. RETROFIT EXISTING CONTROLS IN NEW CONTROL PANELS FOR START/STOP/STATUS OF AHUS. INCLUDE UPS POWER BACK-UP.
   - B. NEW RETURN AIR DUCT MOUNTED COMBINATION TEMPERATURE, CARBON DIOXIDE AND HUMIDITY SENSORS SHALL BE INSTALLED.
   - C. A NEW AIR FLOW MONITOR (22X14) SHALL BE INSTALLED IN RETURN AIR DUCT.
   - D. NEW SUPPLY AIR DUCT MOUNTED TEMPERATURE SENSOR, HIGH STATIC SAFETY AND STATIC PRESSURE SENSORS SHALL BE INSTALLED.
   - E. INSTALL NEW WIRING FROM EXISTING MOTORIZED OUTDOOR INTAKE DAMPER AND TERMINATE ON NEW CONTROLLER. ADDITIONALLY, NEW CONTROL WIRING SHALL BE INSTALLED FROM THE EXISTING CHILLED WATER VALVE ACTUATOR AND TERMINATED ON THE NEW CONTROLLER. VERIFY OPERATION OF EXISTING DAMPER AND VALVE AND ADVISE OWNER.
   - F. EXISTING VARIABLE INLET VANES FOR EACH AHU SHALL BE DISABLED AND NEW VARIABLE FREQUENCY DRIVES INSTALLED FOR VARIABLE VOLUME CONTROL. INCLUDE NEW ELECTRIC MOTOR (15HP) COMPATIBLE WITH NEW VFD.
   - G. EXISTING FREEZE STATS, FILTER DP'S AND UNIT SAFETIES ARE TO REMAIN. CONTROLS CONTRACTOR TO VERIFY EACH COMPONENT IS OPERATING PROPERLY.
3. VARIABLE AIR VOLUME AIR TERMINAL UNITS
   - A. TWENTY-THREE (23) VAV UNITS SHALL BE REMOVED AND REPLACED NEW. INSTALL WITH EACH VAV UNIT A DDC CONTROLLER AND ACTUATOR, DISCHARGE AIR TEMPERATURE SENSOR, LOW VOLTAGE TRANSFORMER, BAC-NET COMMUNICATION AND WALL MOUNTED DIGITAL ZONE CONTROLLER. THE LOW VOLTAGE (24V) TRANSFORMER SHALL BE INCLUDED IN THE CONTROL ENCLOSURE FOR CONNECTION BY THE CONTROLS CONTRACTOR.
   - B. SIXTEEN (16) OF THE VAV UNITS SHALL HAVE INTEGRAL HEATING HOT WATER REHEAT COILS. VAV UNITS WITH HOT WATER REHEAT COILS SHALL BE PROVIDED WITH STANDARD 3-WAY VALVES AND PIPING ASSEMBLIES WITH FLAT POINT ACTUATION. CONTROLS CONTRACTOR SHALL SELECT THE HOT WATER COIL CONTROL VALVE AND ACTUATOR. BOTH CONTROL VALVE WITH ACTUATOR AND PIPING ASSEMBLY TO BE INSTALLED BY MECHANICAL CONTRACTOR.
   - C. TWO (2) VAV UNITS SHALL BE COOLING ONLY UNITS. ELECTRIC REHEAT COILS SHALL BE PROVIDED WITH THE AIR TERMINAL UNITS BUT NOT CONNECTED TO ELECTRICAL POWER.
   - D. FIVE (5) REMAINING VAV UNITS SHALL HAVE AN ELECTRIC REHEAT COIL.
   - E. EXISTING WALL MOUNTED TEMPERATURE ZONE CONTROLLER TO BE REMOVED AND REPLACED NEW. NEW ZONE CONTROLLER SHALL HAVE LCD (DIGITAL) DISPLAY AND SENSOR. ZONE CONTROLLER SHALL READ TEMPERATURE AND HAVE AN OVERRIDE BUTTON FOR UNOCCUPIED TIME PERIODS.
4. AIR COOLED WATER CHILLER AND CHILLED WATER PUMPS
   - A. NEW CONTROLLER SHALL BE INSTALLED FOR THE TWO CHILLED WATER PUMPS. INCLUDE CONTROL WIRING WITH RELAY AND CURRENT TRANSDUCER FOR EACH PUMP AND TERMINATE ON NEW CONTROLLER.
   - B. NEW TEMPERATURE SENSORS SHALL BE PROVIDED FOR SUPPLY AND RETURN CHILLED WATER PIPING NEAR THE CHILLER. INSTALLATION OF SENSOR WELLS SHALL BE COORDINATED WITH MECHANICAL CONTRACTOR.
   - C. A SECOND CHILLED WATER PUMP SHALL BE INSTALLED AS A REDUNDANT PUMP FOR THE EXISTING PUMP. NEW CONTROL SYSTEM SHALL AUTOMATICALLY ALTER "LEAD-LAG" POSITIONS EVERY FOUR WEEKS.
5. HEATING HOT WATER SYSTEM AND HOT WATER PUMPS
   - A. NEW CONTROLLER SHALL BE INSTALLED FOR THE TWO HEATING HOT WATER PUMPS. INCLUDE CONTROL WIRING WITH RELAY AND CURRENT TRANSDUCER FOR EACH PUMP AND TERMINATE ON NEW CONTROL PANEL.
   - B. NEW TEMPERATURE SENSORS SHALL BE INSTALLED FOR SUPPLY AND RETURN PIPING NEAR THE BOILER. INSTALLATION OF SENSOR WELLS SHALL BE COORDINATED WITH MECHANICAL CONTRACTOR.
   - C. A SECOND HEATING HOT WATER PUMP SHALL BE INSTALLED AS A REDUNDANT PUMP FOR THE EXISTING PUMP. NEW CONTROL SYSTEM SHALL AUTOMATICALLY ALTER "LEAD-LAG" POSITIONS EVERY FOUR (4) WEEKS.

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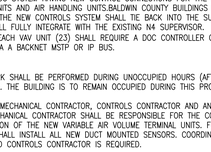


REVISIONS:

NO:	DATE:

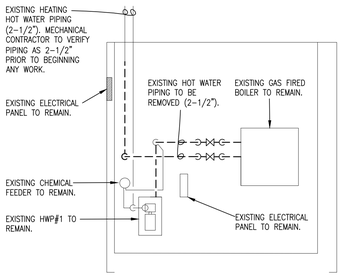
PROJECT:

BALDWIN COUNTY ANNEX V
REVENUE COMMISSION BUILDING
HVAC UPGRADE
1705 U.S. HWY-31 S.
BAY MINETTE, ALABAMA 36507

DRAWING:
HVAC DIRECT DIGITAL CONTROLS PLAN

DATE: 05.08.26
DRAWN BY: STA
CHECKED BY: HMY
JOB NO: 25-146

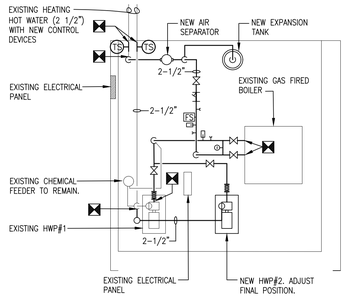
SHEET NO: M-2



HEATING HOT WATER PIPING DEMOLITION PLAN

SCALE: 1/4"=1'-0"

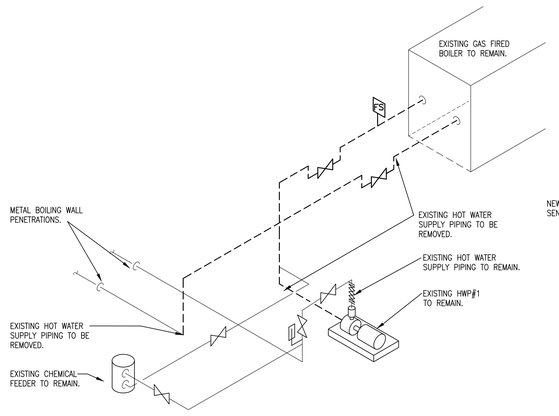
NOTE: REFERENCE PIPING SCHEMATIC FOR ADDITIONAL INFORMATION.



HEATING HOT WATER PIPING NEW WORK PLAN

SCALE: 1/4"=1'-0"

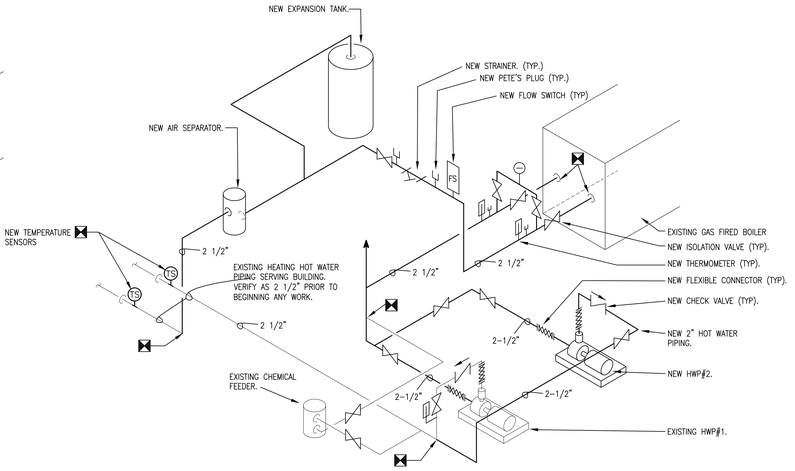
NOTE: REFERENCE PIPING SCHEMATIC FOR ADDITIONAL INFORMATION.



HEATING HOT WATER PIPING DEMOLITION SCHEMATIC (ADDITIVE ALTERNATE #1)

NOT TO SCALE

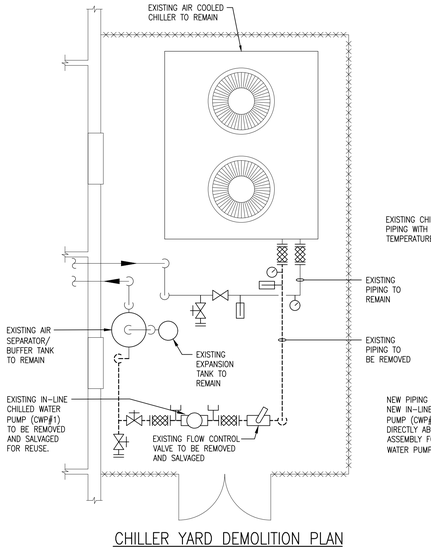
NOTE: ALL HEATING HOT WATER PIPING INSULATION INSIDE OF METAL BUILDING TO BE REMOVED AND REPLACED NEW. PREPARE PIPING FOR INSTALLATION OF NEW INSULATION.



HEATING HOT WATER PIPING NEW WORK SCHEMATIC (ADDITIVE ALTERNATE #1)

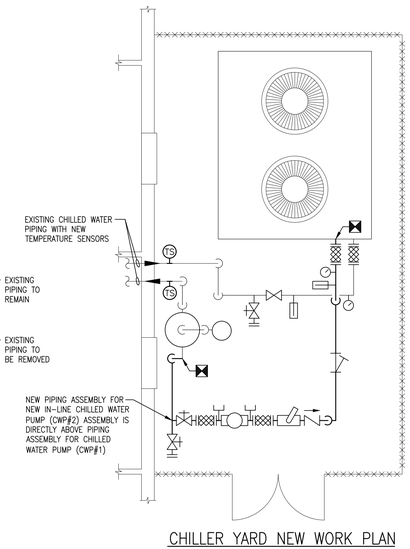
NOT TO SCALE

NOTE: ALL HEATING HOT WATER PIPING INSIDE OF METAL BUILDING TO BE REMOVED AND REPLACED NEW. INCLUDE AN 18 GAUGE ALUMINUM JACKET ON INSULATION. PROVIDE ELECTRIC HEAT TRACE FOR ALL PIPING INSIDE OF METAL BUILDING.



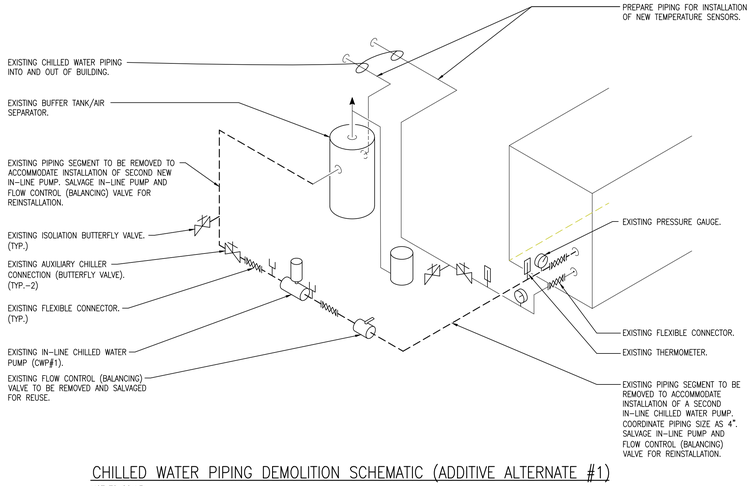
CHILLER YARD DEMOLITION PLAN

SCALE: 1/4"=1'-0"



CHILLER YARD NEW WORK PLAN

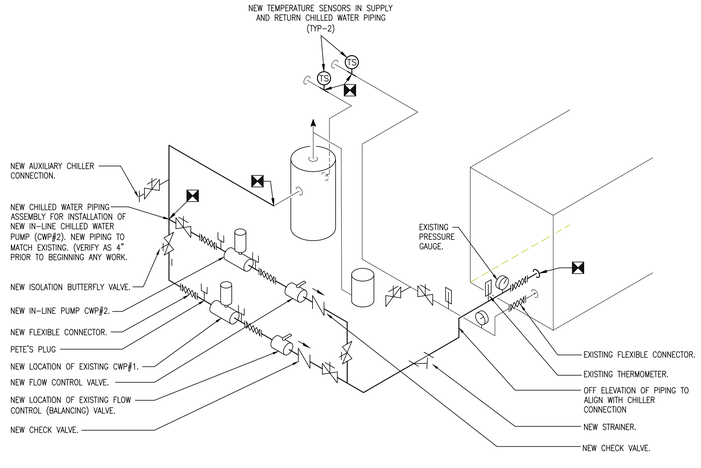
SCALE: 1/4"=1'-0"



CHILLED WATER PIPING DEMOLITION SCHEMATIC (ADDITIVE ALTERNATE #1)

NOT TO SCALE

NOTE: REMOVE ALL INSULATION ON CHILLED WATER SYSTEM COMPONENTS AND PREPARE PIPING SYSTEM FOR INSTALLATION OF NEW INSULATION WITH METAL JACKET.



CHILLED WATER PIPING NEW WORK SCHEMATIC (ADDITIVE ALTERNATE #1)

NOT TO SCALE

NOTE: FINAL ELEVATION OF HORIZONTAL PIPING ASSEMBLIES FOR IN-LINE PUMPS SHALL BE ADJUSTED SUBJECT TO COMPONENT SELECTIONS. VERIFY AVAILABILITY OF VERTICAL SPACE OF SLAB TO WORK WITHIN AS 80" +/-.

NOTE: REMOVE AND REPLACE ALL INSULATION ON CHILLED WATER SYSTEM COMPONENTS WITH NEW INSULATION HAVING 18 GAUGE ALUMINUM JACKET.

NOTE: ALL PIPING EXTERIOR OF BUILDING SHALL HAVE TRACING ON PIPING BEFORE APPLYING INSULATION.

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BALDWIN COUNTY ANNEX V
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BAY MINETTE, ALABAMA 36507

TITLE:

DRAWING:
ENLARGED MECHANICAL PLANS

DATE: 05.08.26
DRAWN BY: STA
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JOB NO: 25-146

SHEET NO:
M-3

CIRCULATING PUMP SCHEDULE

MARK	CAPACITY GPM	TDH FEET	MAX. RPM	MOTOR HP	TYPE PUMP	ELECTRICAL DATA			REMARKS
						VOLTS	Hz	PHASE	
CWP#1	145	65	1750	7.5	IN-LINE MOUNTED	460	60	3	1 2 3
HWP#2	90	35	1750	1.0	BASE MOUNTED END SUCTION	460	60	3	1 2 3

NOTES:
1. PUMP MOTORS TO BE NEMA PREMIUM EFFICIENCY.
2. PUMPS SHALL BE FOR OUTDOOR APPLICATION.
3. PROVIDE ALTERNATOR/CONTROLLER TO ALTERNATE LEAD/LAG POSITION OF PUMPS BETWEEN EXISTING AND NEW PUMPS.

SINGLE DUCT VAV UNIT SCHEDULE (ELECTRIC REHEAT)

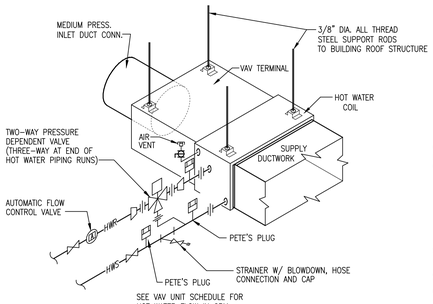
MARK	INLET SIZE	BOX MAX CFM	COOLING DESIGN CFM	COOLING MINIMUM CFM	HEATING MAX. CFM	DESIGN AIR PD	MAX. WPD	BTUH (REAHEAT)	KW	EAT °F	LAT °F	ELECTRICAL			REMARKS (TYPE)
												VOLTS	HZ	PHASE	
101	6"ø	500	165	70	165	0.75"	5.0	8,535	2.5	55	105	277	60	1	1 2 3 4 5 6
102	8"ø	900	600	270	500	0.75"	5.0	25,600	7.5	55	102	277	60	1	1 2 3 4 5 6
103	8"ø	1200	1120	470	500	0.75"	5.0	25,600	7.5	55	102	277	60	1	1 2 3 4 5 6 7
109	6"ø	500	150	70	150	0.75"	5.0	8,535	2.5	55	107	277	60	1	1 2 3 4 5 6
201	8"ø	1200	825	350	500	0.75"	5.0	25,600	7.5	55	102	277	60	1	1 2 3 4 5 6 7
206	8"ø	1200	720	300	500	0.75"	5.0	25,600	7.5	55	102	277	60	1	1 2 3 4 5 6
207	8"ø	1200	730	300	500	0.75"	5.0	25,600	7.5	55	102	277	60	1	1 2 3 4 5 6

NOTES:
1. MAXIMUM CFM IS MAXIMUM OPERATING CAPACITY AVAILABLE FOR VAV BOX OPERATION.
2. DESIGN COOLING CFM IS TO BE THE NOMINAL OPERATING POINT OF THE VAV BOX.
3. DESIGN AIR PRESSURE DROP IS THE DIFFERENCE IN STATIC PRESSURE FROM THE INLET TO DISCHARGE OF THE VAV BOX.
4. PROVIDE PRESSURE INDEPENDENT TERMINAL UNITS (SQUEEZE OFF TYPE).
5. THE 277/24V TRANSFORMER, CONTROLLER ENCLOSURE, SERVICE SWITCH, AND FACTOR MOUNTING OF THE CONTROLLER SHALL BE PROVIDED BY THE VAV VENDOR. THE CONTROLLER WILL BE PROVIDED BY THE CONTROLS CONTRACTOR.
6. BASIS OF DESIGN: TRANE VCEF SERIES.
7. ELECTRIC REHEAT COILS ARE TO BE INCLUDED WITH AIR TERMINAL UNIT. DO NOT CONNECT ELECTRICAL POWER TO ACTIVATE HEATING COIL.

FAN POWERED PARALLEL VAV BOX SCHEDULE

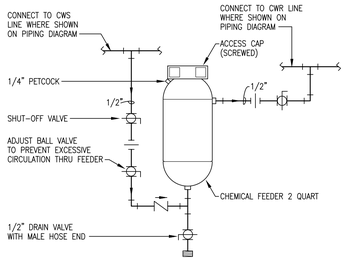
MARK FPVAV#	INLET SIZE	MAX CFM	MINIMUM CFM	DESIGN CFM	HEATING (COIL) CFM	BLOWER MOTOR	HEATING CAPACITY				AIR TEMPERATURE DATA			ELECTRICAL DATA			REMARKS
							GPM	MAX WPD	EWT °F	LWT °F	BTUH	°F ENT. COIL	°F LVG. COIL	°F LVG. FPVAV	VOLTS	HZ	PHASE	
104	8"ø	1,530	170	920	460	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
105	10"ø	2,380	270	1,400	710	1/8 HP	2.5	5.0	160	140	25,000	70	102	88	110	60	1	1 2 3 4 5 6
106	10"ø	2,380	270	1,740	715	1/8 HP	2.5	5.0	160	140	25,000	70	102	88	110	60	1	1 2 3 4 5 6
107	12"ø	3,400	390	2,100	1,380	1/3 HP	4.5	5.0	160	140	45,000	70	N/A	N/A	110	60	1	1 2 3 4 5 6
108	8"ø	1,530	180	820	460	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
110	8"ø	1,530	170	1,045	465	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
111	8"ø	1,530	170	825	400	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
202	8"ø	1,530	170	935	410	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
203	8"ø	1,530	170	925	460	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
204	10"ø	2,380	270	1,325	710	1/8 HP	2.5	5.0	160	140	25,000	70	102	88	110	60	1	1 2 3 4 5 6
205	10"ø	2,380	270	1,480	710	1/8 HP	2.5	5.0	160	140	25,000	70	102	88	110	60	1	1 2 3 4 5 6
208	8"ø	1,530	170	930	460	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
209	8"ø	1,530	170	470	400	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
210	6"ø	850	90	500	310	1/15 HP	1.5	5.0	160	140	15,000	70	100	85	110	60	1	1 2 3 4 5 6
211	10"ø	2,380	270	1,480	710	1/8 HP	2.5	5.0	160	140	25,000	70	102	88	110	60	1	1 2 3 4 5 6
212	10"ø	2,380	270	1,325	710	1/8 HP	2.5	5.0	160	140	25,000	70	102	88	110	60	1	1 2 3 4 5 6

NOTES:
1. MAXIMUM CFM IS MAXIMUM OPERATING CAPACITY AVAILABLE FOR VAV BOX OPERATION.
2. DESIGN COOLING CFM IS TO BE THE NOMINAL OPERATING POINT OF THE VAV BOX.
3. DESIGN AIR PRESSURE DROP IS THE DIFFERENCE IN STATIC PRESSURE FROM THE INLET TO DISCHARGE OF THE VAV BOX.
4. PROVIDE PRESSURE INDEPENDENT TERMINAL UNITS (SQUEEZE OFF TYPE).
5. THE 110/24V TRANSFORMER, CONTROLLER ENCLOSURE, SERVICE SWITCH, AND FACTOR MOUNTING OF THE CONTROLLER SHALL BE PROVIDED BY THE VAV VENDOR. THE CONTROLLER WILL BE PROVIDED BY THE CONTROLS CONTRACTOR.
6. BASIS OF DESIGN: TRANE VPWF SERIES.

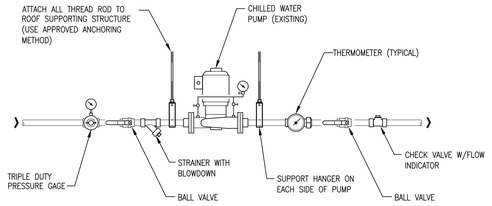


NOTES:
1. THE ENTIRE HOT WATER COIL ASSEMBLY WITH ALL HOT WATER PIPING FROM THE TWO WAY VALVE SHALL BE INSULATED. PROVIDE EXTERIOR DUCT INSULATION ON COIL ASSEMBLY AND 1" THICK FIBERGLASS WITH ALL SERVICE JACKET ON PIPING.

VAV BOX WITH REHEAT COIL DETAIL
NOT TO SCALE

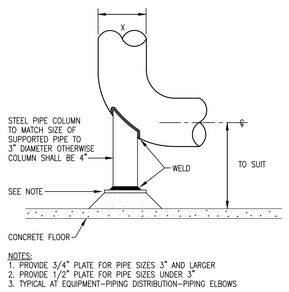


CHEMICAL FEEDER DETAIL
NOT TO SCALE



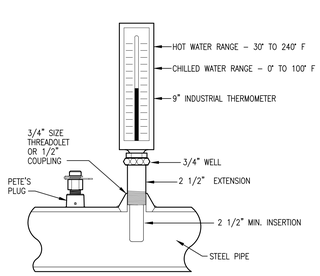
TYPICAL INLINE SUCTION PUMP DETAIL
NOT TO SCALE

TYPICAL PRESSURE GAGE DETAIL
NOT TO SCALE

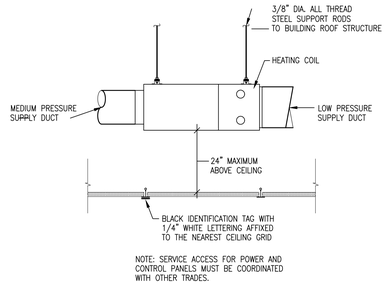


NOTES:
1. PROVIDE 3/4" PLATE FOR PIPE SIZES 3" AND LARGER
2. PROVIDE 1/2" PLATE FOR PIPE SIZES UNDER 3"
3. TYPICAL AT EQUIPMENT-PIPING DISTRIBUTION-PIPING ELBOWS

FLOOR MOUNTED PIPE SUPPORT DETAIL
NOT TO SCALE

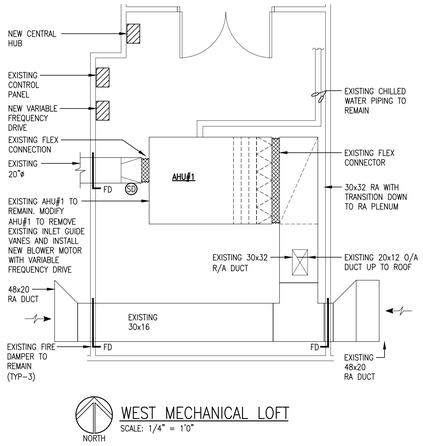


TYPICAL THERMOMETER DETAIL
NOT TO SCALE

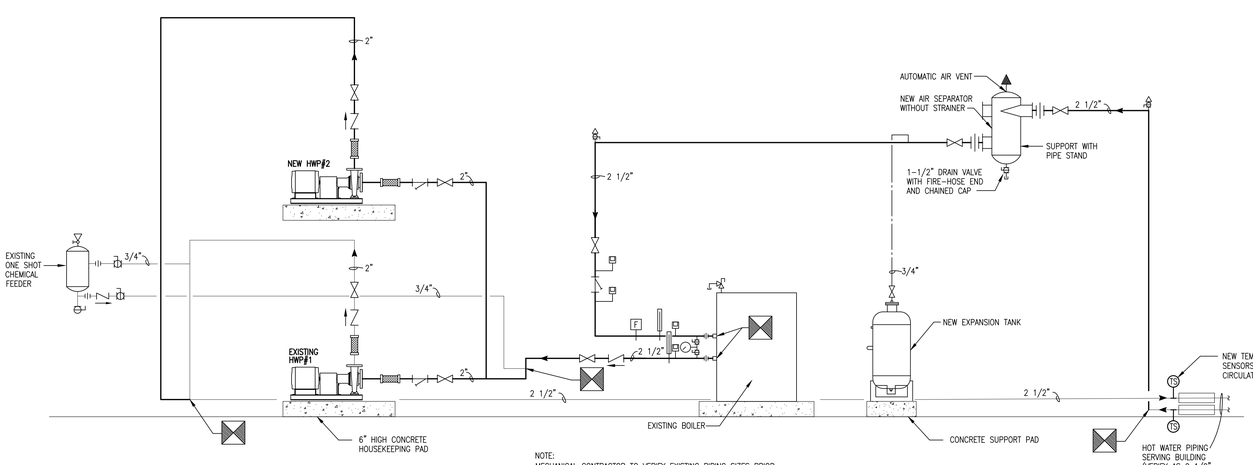


NOTE: SERVICE ACCESS FOR POWER AND CONTROL PANELS MUST BE COORDINATED WITH OTHER TRADES.

VAV BOX DETAIL
NOT TO SCALE

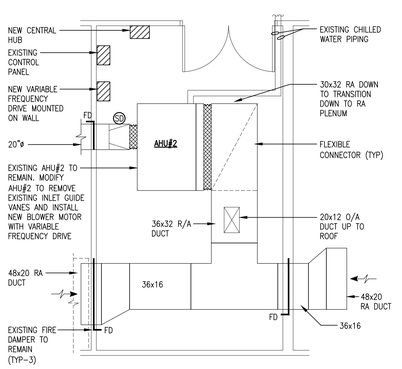


WEST MECHANICAL LOFT
SCALE: 1/4" = 1'0"

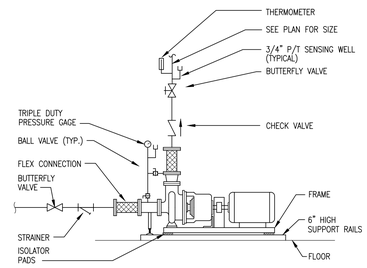


NOTE:
MECHANICAL CONTRACTOR TO VERIFY EXISTING PIPING SIZES PRIOR TO BEGINNING WORK AS 2 1/2 INCHES. EXISTING PIPING SIZES ARE TO BE DUPLICATED.

HOT WATER PIPING FLOW DIAGRAM
NOT TO SCALE



EAST MECHANICAL LOFT
SCALE: 1/4" = 1'0"



TYPICAL END SUCTION PUMP DETAIL
NOT TO SCALE

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PHONE: (251)690-7446

SEAL:
No. 14948 PROFESSIONAL
EDWARD M. YONGE
REGISTERED ENGINEER

REVISIONS:

NO.	DATE:

PROJECT:
BALDWIN COUNTY ANNEX V
REVENUE COMMISSION BUILDING
HVAC UPGRADE
1705 U.S. HWY-31 S.
BAY MINETTE, ALABAMA 36507

DRAWING:
MECHANICAL SCHEDULES AND DETAILS

DATE: 05.08.26
DRAWN BY: STA
CHECKED BY: HMY
JOB NO: 25-146

SHEET NO: **M-4**

HVAC SEQUENCE OF CONTROLS:

MULTIZONE VAV AIR HANDLING UNIT

THE VARIABLE VOLUME AIR HANDLING UNIT CONSISTS OF A MIXED AIR SECTION WITH OUTDOOR AIR AND RETURN AIR DAMPERS, FILTERS, CHILLED WATER COOLING COIL, AND FAN WITH VARIABLE FREQUENCY DRIVE. THE UNIT IS DDC CONTROLLED USING ELECTRIC ACTUATION. ALL SAFETIES (SMOKE DETECTORS, ETC) SHALL BE WIRED INTO BOTH THE HAND AND AUTO MODES.

THE AIR HANDLING UNIT IS SCHEDULED FOR AUTOMATIC OPERATION ON A TIME OF DAY BASIS FOR OCCUPIED AND UNOCCUPIED MODES. IN THE UNOCCUPIED MODE, NIGHT HEATING IS ENABLED WHEN THE MINIMUM SPACE TEMPERATURE (AS SENSED FROM ALL ZONE THERMOSTATS) DROPS BELOW 63 DEGREES F (ADJUSTABLE) AND NIGHT COOLING IS ENABLED WHEN THE MAXIMUM SPACE TEMPERATURE RISES ABOVE 80 DEGREES F (ADJUSTABLE). ALL O/A, EXHAUST AIR AND RELIEF AIR DAMPERS SHALL BE IN THE CLOSED POSITION DURING UNOCCUPIED AND OPTIMUM START MODE.

THE AIR HANDLING UNIT OPERATES IN OCCUPIED, UNOCCUPIED, OPTIMUM START, OPTIMUM STOP AND SAFETY MODES AS FOLLOWS (ALL SUGGESTED SET POINTS AND SETTINGS ARE ADJUSTABLE.):

OPTIMUM START
WITH THE SYSTEM IN THE VENTILATION DELAY MODE, THE OUTSIDE AIR SHALL BE IN THE CLOSED POSITION AND THE EXHAUST FANS OFF. OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED DURING OPTIMUM START UNLESS AN OVERRIDE IS ACTIVATED. THE SYSTEM SHALL RUN USING RETURN AIR AND SHALL START AT LEAST 45 MINUTES BEFORE THE SCHEDULED OCCUPANCY TIME (ADJUSTABLE BY TRENDING) TO BRING THE BUILDING TO THE OCCUPIED COOLING OR HEATING SETPOINTS AS SHOWN ON THE SCHEDULES. WHEN ANY OF THE ZONES OVERRIDE IS ENERGIZED THE VENTILATION DELAY MODE SHALL STOP AND NORMAL OCCUPIED OPERATION RESUMES.

OCCUPIED
UPON INITIAL STARTUP OF THE AIR HANDLING SYSTEM THE VFD IS ENABLED AND THE SUPPLY FAN SPEED SLOWLY RAMPS TO THE DESIRED STATIC PRESSURE SET POINT OF 1.0 INCHES OF WATER (FINAL SETPOINT TO BE DETERMINED BY TEST AND BALANCE). THE CHILLED WATER VALVE IS MODULATED TO MAINTAIN SCHEDULED SUPPLY AIR TEMPERATURE WHEN THE SYSTEM REQUIRES COOLING. RETURN AIR HUMIDITY OVERRIDES CONTROL OF COOLING COIL VALVE TO LIMIT RETURN AIR RELATIVE HUMIDITY AT 60% RH MAXIMUM.

OUTSIDE AIR FLOW IS CONTROLLED TO THE OUTSIDE AIR FLOW SETPOINT BY MODULATING THE OUTSIDE/RETURN AIR DAMPERS AND MEASURED THRU A DDC SIGNAL FROM THE AIR FLOW MEASURING STATION, LOCATED AT THE OUTSIDE AIR DUCT TO MAINTAIN CO2 LEVELS BETWEEN 450 AND 1100 PPM AND TO SATISFY THE REQUIRED OA. QUANTITY REQUIRED BY THE VAV TERMINAL UNITS. OA SHALL NOT EXCEED SCHEDULED MAX OA VALUES.

THE OUTSIDE AIR FLOW SETPOINT SHALL BE CALCULATED BY THE DDC CONTROLLER USING ASHRAE 62.1-2013 EQUATION 6.2.5.4 BY POLLING ALL VAV TERMINAL UNITS STATUS (HEATING/COOLING, OCCUPANCY AND AIR FLOW) IN REAL TIME TO DETERMINE THE MINIMUM REQUIRED O/A FRACTION FOR EACH ZONE.

VAV UNITS SERVING SPACES WITH CO2 SENSORS OUTSIDE AIR RATE WILL BE RESET LINEARLY BETWEEN THE MIN / MAX VALUES AS SHOWN ON THE EQUIPMENT SCHEDULE BASED ON THE HIGHEST CO2 READINGS FROM THE SPACE. IF THE OUTSIDE AIR FLOW LEVEL VARIES BY 10% OR MORE FROM THE DESIGN VALUES, AN ALARM SHALL BE GENERATED VIA THE BUILDING AUTOMATION SYSTEM TO ALERT THE BUILDING OCCUPANTS AND THE BUILDING OPERATOR. THE AIR FLOW MEASURING STATION SHALL HAVE A MINIMUM ACCURACY OF PLUS OR MINUS 15% OF THE DESIGN CFM. STATIC PRESSURE RESET CONTROL WITH THE SYSTEM FAN IN THE RUNNING MODE AND AFTER SYSTEM REACHES A STEADY STATE, THE DDC SHALL POLL ALL THE VAV BOXES AND REDUCE THE FAN SPEED TO MAINTAIN THE MINIMUM SUPPLY DUCT STATIC PRESSURE REQUIRED TO MAINTAIN THE POSITION OF THE MOST DEMANDING VAV TERMINAL UNIT DAMPER AT 95% OPEN IN ALL THE SYSTEM OPERATION MODES.

SAFETY
AHU LOW TEMPERATURE DETECTOR, SMOKE DETECTORS IN THE SUPPLY AND RETURN AIR STREAMS, AND SUPPLY FAN VFD FAULT ALARMS SHALL DE-ENERGIZE THE SUPPLY FAN AND SEND AN ALARM TO THE DDC. ALL DAMPERS AND VALVES MODULATE TO THEIR NORMAL POSITION AFTER THE FAN IS DE-ENERGIZED.

A LOW TEMPERATURE DETECTOR MOUNTED BEFORE THE COOLING COIL DE-ENERGIZES THE SUPPLY FAN WHEN TEMPERATURE BELOW 38 DEGREES F IS SENSED. THE CHILLED WATER VALVE WILL BE DRIVEN TO ITS FULLY OPEN POSITION WHEN THE LOW TEMPERATURE DETECTOR IS TRIPPED, THE OUTSIDE AIR DAMPERS SHALL CLOSE AND SUPPLY FAN SHALL STOP.

A CURRENT SWITCH INSTALLED ON THE LOAD SIDE OF THE SUPPLY FAN VFD. THE DDC SYSTEM USES THE SWITCH TO CONFIRM THE FAN IS IN THE DESIRED STATE (I.E. ON OR OFF) AND GENERATES AN ALARM IF STATUS DEVIATES FROM DDC START/STOP CONTROL.

SPACE DEHUMIDIFICATION
WHEN THE RELATIVE HUMIDITY DURING UNOCCUPIED MODE RISES ABOVE 60%, THE SUPPLY FAN IS ENERGIZED. THE CHILLED WATER CONTROL VALVE MODULATES TO MAINTAIN THE SUPPLY AIR TEMPERATURE SET POINT. EACH AIR TERMINAL UNIT, (ATU) SHALL MAINTAIN THE SUPPLY AIR AT HEATING LEVEL AND MODULATE THE REHEAT VALVE TO MAINTAIN ROOM TEMPERATURE.

EXHAUST FAN INTERLOCKS
THE EXHAUST FANS SHALL BE INTERLOCKED TO ENERGIZE WITH THERE RESPECTIVE AIR HANDLER SUPPLY FAN WHENEVER THE AHU SUPPLY FAN IS OPERATING IN OCCUPIED OR OVERRIDE MODE.

COOLING PLANT SYSTEM:

SYSTEM GENERAL DESCRIPTION:

THE CHILLED WATER SYSTEM CONSISTS OF THE FOLLOWING: ONE (1) AIR COOLED WATER CHILLER. TWO (2) MANIFOLDED CHILLED WATER PUMPS, CONFIGURED AS LEAD / LAG / STANDBY CONTROL.

THE CHILLED WATER SYSTEM CONTROLLER PROVIDES STAND-ALONE CONTROL OR CONTROL FROM A TOP TIER BAS AND PROVIDES LEAD/LAG/STANDBY CONTROL FOR THE CHILLED WATER PUMPS AND CONTROLS THE CHILLED WATER BYPASS VALVE TO MAINTAIN MINIMUM FLOW THROUGH THE CHILLER.

CHILLED WATER SYSTEM ENABLE/DISABLE:

THE CHILLED WATER SYSTEM SHALL BE ENABLED/DISABLED BY A BUILDING AUTOMATION SYSTEM (BAS). WHEN ENABLED, THE CHILLED WATER SYSTEM SHALL RESPOND TO A CONTACT CLOSURE FROM SYSTEM CHILLER. WHEN ENABLED, THE SYSTEM SHALL COMMAND THE ISOLATION VALVE OPEN AND START THE LEAD CHILLED WATER PUMP.

WHEN THE CHILLED WATER SYSTEM IS DISABLED, THE CHILLED WATER PUMP SHALL BE COMMANDED OFF.

CHILLED WATER PUMP START/STOP:

THE SYSTEM SHALL START A CHILLED WATER PUMP THROUGH A CONTACT CLOSURE OF THE PUMPS DRIVE RUN-ENABLE CONTACTS.

CHILLED WATER PUMP LEAD/LAG/STANDBY:

THE CHILLED WATER PUMP(S) LEAD/LAG/STANDBY SEQUENCE SHALL BE ROTATED ON A WEEKLY SCHEDULE. THE SEQUENCE SHALL BE BASED ON CALCULATED RUN TIME WITH THE PUMP HAVING THE LEAST RUN TIME DESIGNATED AS LEAD, THE PUMP WITH THE NEXT LOWEST RUN TIME WILL BE THE SECOND IN THE SEQUENCE (OR LAG PUMP). FROM THE SYSTEM HUMAN-INTERFACE PANEL OR A BAS OPERATOR INTERFACE, AN OPERATOR SHALL BE ABLE TO MANUALLY CHANGE THE LEAD/LAG/STANDBY SEQUENCE.

IF THE PUMP SPEED CONTROL OUTPUT IS BELOW 40% (ADJ.) FOR MORE THAN 5 MINUTES (ADJ.), THE LAST OPERATING PUMP IN THE SEQUENCE SHALL BE DISABLED.

CHILLED WATER PUMP SPEED:

THE SYSTEM SHALL MONITOR THE CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SENSOR. WHEN THE PUMP DRIVE IS ENABLED, THE SYSTEM SHALL MAINTAIN THE CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT OF 15 PSIG (ADJ.).

CHILLED WATER PUMP FAILURE:

IF THE LEAD START/STOP RELAY IS ENABLED AND THE CURRENT SWITCH STATUS IS OFF FOR MORE THAN 30 SECONDS (ADJ.), THE SYSTEM SHALL ANNUNCIATE A CHILLED WATER PUMP FAILURE ALARM TO THE BAS AND START THE NEXT PUMP IN THE SEQUENCE. ONCE THE PROBLEM HAS BEEN CORRECTED, THE OPERATOR SHALL BE ABLE TO CLEAR THE ALARM FAILURE FROM THE BAS OPERATOR INTERFACE OR BY MANUALLY OVERRIDING THE PUMP ON. THIS SHALL RE-ENABLE THE LEAD/STANDBY SEQUENCE.

PRIMARY CHILLED WATER PUMP START/STOP:

THE SYSTEM SHALL DETECT CHILLED WATER PUMP RUN STATUS BY A CURRENT SWITCH.

HEATING PLANT SYSTEM:

GENERAL DESCRIPTION:

THE HOT WATER SYSTEM CONSISTS OF THE FOLLOWING:
A) ONE (1) GAS FIRED BOILER
B) TWO (2) PARALLEL HOT WATER PUMPS. CONFIGURED AS: ONE (1) LEAD, ONE (1) LAG.

THE BUILDING AUTOMATION SYSTEM (BAS) CONTROLLER SHALL PROVIDE STAND-ALONE CONTROL OR BAS WORKSTATION CONTROL OF THE SUPPLY HEATING WATER TEMPERATURE SETPOINT (ADJ.) BY CONTROLLING THE BOILER'S ENABLE/DISABLE BOILER SIGNAL.

HEATING SYSTEM ENABLE/DISABLE:

THE HEATING SYSTEM SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMPERATURE FALLS BELOW 60.0 DEG. F (ADJ.) OR ON A COMMAND FOR DEHUMIDIFICATION. THE BOILER FACTORY CONTROL SHALL OPERATE THE BOILER TO MAINTAIN ITS LOCAL SUPPLY SETPOINT.

HEATING SHALL BE DISABLED WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE 65.0 DEG. F (ADJ.) AND THERE IS NO COMMAND FOR DEHUMIDIFICATION. WHEN HEATING IS DISABLED, THE HOT WATER PUMP AND BOILER SHALL BE COMMANDED TO OFF.

BOILER CONTROL:

THE BOILER CONTROL SHALL BE FROM THE BAS CONTROLLER. AN OPERATOR SHALL BE ABLE TO MANUALLY ENABLE/DISABLE THE BOILER.

IF THE HOT WATER DISTRIBUTION SYSTEM SUPPLY TEMPERATURE FALLS MORE THAN 25.0 DEG. F (ADJ.) BELOW SETPOINT FOR A PERIOD LONGER THAN 15 MINUTES (ADJ.), THE ACTIVE BOILER SHALL SIGNAL A FAILURE ALARM.

HOT WATER RESET:

THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL BE LINEARLY RESET FROM 120.0 DEG. F (ADJ.) TO 180.0 DEG. F (ADJ.) AS THE OUTSIDE AIR TEMPERATURE FALLS FROM 60.0 DEG. F (ADJ.) TO 0.0 DEG. F (ADJ.)

HOT WATER DISTRIBUTION PUMP START/STOP:

THE BAS CONTROLLER SHALL START A HOT WATER PUMP THROUGH A CONTACT CLOSURE OF THE PUMP RUN-ENABLE CONTACTS.

HOT WATER DISTRIBUTION PUMP STATUS:

THE BAS CONTROLLER SHALL DETECT HOT WATER PUMP RUN STATUS BY A CURRENT SWITCH.

HOT WATER DISTRIBUTION PUMP LEAD/LAG:

THE HOT WATER PUMP LEAD/LAG SEQUENCE SHALL BE BASED ON A WEEKLY SCHEDULE. FROM THE BAS CONTROLLER OR A BAS WORKSTATION, AN OPERATOR SHALL BE ABLE TO MANUALLY CHANGE THE LEAD/LAG SEQUENCE.

IF THE LEAD PUMP SPEED FALLS BELOW 40% (ADJ.) FOR FIVE MINUTES (ADJ.) THE LAG PUMP SHALL BE DISABLED.

HOT WATER DISTRIBUTION PUMP FAILURE:

IF THE LEAD START/STOP RELAY IS ENABLED AND THE CURRENT SWITCH STATUS IS OFF FOR MORE THAN 30 SECONDS (ADJ.), THE BAS CONTROLLER SHALL ANNUNCIATE A HOT WATER PUMP FAILURE ALARM TO THE BAS WORKSTATION AND START THE LAG PUMP. WHEN A PUMP FAILURE EXISTS, LEAD/LAG AUTOMATION SHALL BE DISABLED AND THE CURRENTLY RUNNING PUMP BECOMES THE LEAD PUMP. ONCE THE PROBLEM HAS BEEN CORRECTED, THE OPERATOR SHALL BE ABLE TO CLEAR THE ALARM FAILURE FROM THE BAS CONTROLLER OR BAS WORKSTATION. THIS ACTION SHALL RE-ENABLE THE LEAD/LAG SEQUENCE.

HOT WATER DISTRIBUTION PUMP SPEED:

THE BAS CONTROLLER SHALL MAINTAIN A HOT WATER DIFFERENTIAL PRESSURE SETPOINT OF 50.0 PSIG (ADJ.).

FREEZE PROTECTION:

WHEN THE OUTDOOR AIR TEMPERATURE FALLS BELOW 35.0 DEG. F (ADJ.), THE HOT WATER DISTRIBUTION PUMP SHALL OPERATE CONTINUOUSLY TO PROVIDE HOT WATER CIRCULATION TO ALL ASSOCIATED HOT WATER COILS. IF THE HOT WATER SUPPLY TEMPERATURE FALLS BELOW 130.0 DEG. F (ADJ.) DURING UNOCCUPIED PERIODS, THE BOILER SEQUENCE SHALL BE ENABLED TO SAFEGUARD AGAINST LOW WATER TEMPERATURE AND BOILER CONDENSATION.

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PHONE: (251)690-7446

SEAL:
No. 14948 PROFESSIONAL
EDWARD M. YONGE

REVISIONS:

NO:	DATE:	TITLE:

PROJECT:
BALDWIN COUNTY ANNEX V
REVENUE COMMISSION BUILDING
HVAC UPGRADE
1705 U.S. HWY-31 S.
BAY MINETTE, ALABAMA 36507

DRAWING:
HVAC SEQUENCE OF CONTROLS

DATE: 05.08.26
DRAWN BY: STA
CHECKED BY: HMY
JOB NO: 25-146

SHEET NO:
M-5

ELECTRICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION
(hatched rectangle)	PANELBOARD – SEE RESPECTIVE PANELBOARD SCHEDULE.
A/1	BRANCH CIRCUIT CONDUIT RUN CONCEALED IN WALL OR ABOVE CEILING. ARROWS INDICATE CIRCUIT HOMERUN, HASHMARKS INDICATE NUMBER OF CONDUCTORS, ABSENCE OF HASHMARKS INDICATES TWO CONDUCTORS PLUS GROUND. "A" DENOTES PANELBOARD SERVING CIRCUIT, "1" INDICATES CIRCUIT BREAKER SPACE IN PANELBOARD. SEE RESPECTIVE PANEL CIRCUIT SCHEDULE. MINIMUM CONDUCTOR SIZE = #12 AWG.
(disconnect)	NON–FUSED DISCONNECT, HEAVY DUTY (SAFETY) SWITCH – SIZE AND TYPE AS NOTED. TOP OF SWITCH 6'–6" A.F.F. MAX. DISCONNECT SHALL BE PROVIDED WITH PHENOLIC LABELS INDICATING THE SERVING PANEL AND CIRCUIT NUMBER THEY ARE FED FROM.
(motor)	ELECTRIC MOTOR – SEE RESPECTIVE EQUIPMENT SCHEDULE.
(receptacle)	INDICATES GROUND FAULT CIRCUIT INTERRUPTING RECEPTACLE. FLUSH WALL MOUNTED 18" A.F.F. WITH GROUND PIN FACING UP UNLESS NOTED OTHERWISE. EQUAL TO R02–GFNT1–0KW.
WP	INDICATES EXTRA DUTY WEATHER RESISTANT WIRING DEVICE WITH CAST ALUMINUM WEATHER PROOF IN–USE COVER PLATE EQUAL TO MG420CS.

EQUIPMENT ELECTRICAL SCHEDULE

MARK	ITEM	VOLTAGE/Ø	DISCONNECT SWITCH	FEEDER CONDUCTORS	GROUND	CONDUIT
CWP#1	CHILLED WATER PUMP	480/3	INTEGRAL	3#12	#12	0.75"C
HWP#1	HOT WATER PUMP	480/3	30/3 NEMA 3R	3#12	#12	0.75"C
VAV#101	SINGLE DUCT VAV UNIT	277/1	30/1 NEMA 1	2#12	#12	0.75"C
VAV#102	SINGLE DUCT VAV UNIT	277/1	60/1 NEMA 1	2#8	#10	0.75"C
VAV#103	SINGLE DUCT VAV UNIT	277/1	60/1 NEMA 1	2#8	#10	0.75"C
VAV#109	SINGLE DUCT VAV UNIT	277/1	30/1 NEMA 1	2#12	#12	0.75"C
VAV#201	SINGLE DUCT VAV UNIT	277/1	60/1 NEMA 1	2#8	#12	0.75"C
VAV#206	SINGLE DUCT VAV UNIT	277/1	60/1 NEMA 1	2#8	#12	0.75"C
VAV#207	SINGLE DUCT VAV UNIT	277/1	60/1 NEMA 1	2#8	#12	0.75"C
FPVAV#104	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#105	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#106	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#107	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#108	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#110	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#111	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#202	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#203	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#204	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#205	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#207	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#208	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#209	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#210	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#211	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.
FPVAV#212	FAN POWERED VAV BOX	120/1	EXIST.	EXIST.	EXIST.	EXIST.

DEMOLITION NOTES:

1. ALL DASHED SHOWN MECHANICAL UNITS AND CORRESPONDING DISCONNECTS ARE TO BE REMOVED ALONG WITH ASSOCIATED CONDUIT AND WIRING AND BREAKERS, TO BE REPLACED AS PER NEW WORK PLANS, UNLESS OTHERWISE NOTED. FIXTURES ARE TO BE DISPOSED OF IN A MANNER APPROVED BY THE ENVIRONMENTAL PROTECTION AGENCY. 'E' INDICATES EXISTING DEVICE TO REMAIN. PROTECT DURING CONSTRUCTION.
2. ALL HOLES LEFT BY REMOVED MECHANICAL UNITS, DISCONNECTS ETC. IN EXISTING AREA TO REMAIN ARE TO BE FILLED AND FINISHED TO MATCH NEW/EXISTING CONDITIONS.
3. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR SECURING ALL DEVICES, FIXTURES, WIRES, CONDUIT, ETC. ABOVE THE CEILING PRIOR TO CEILING DEMOLITION. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR DAMAGE CAUSED TO SUCH MATERIALS DURING THE CEILING DEMOLITION PHASE.
4. EXACT LOCATIONS FOR EXISTING MECHANICAL UNITS, DEVICES AND BOXES ARE TO BE FIELD VERIFIED.
5. ALL PENETRATIONS (NEW AND EXISTING) OF THE FIRE RATED BARRIERS SHALL BE FIRE STOPPED USING U.L. APPROVED METHODS AND MATERIALS.
6. COORDINATE ITEMS TO BE SALVAGED WITH THE OWNER PRIOR TO COMMENCEMENT OF WORK. ALL UNUSED WALL BOXES (LEFT FROM SWITCHES REMOVED, THERMOSTATS, ETC.) ARE TO BE COVERED WITH A BLANK PLATE (TO MATCH EXISTING).
7. ALL EXISTING PANELS ARE TO REMAIN (UNLESS OTHERWISE NOTED). THE ELECTRICAL CONTRACTOR IS TO VERIFY THE BREAKER SIZES, WIRE SIZES, PANEL SIZES, AND PANEL LOADS IN THE FIELD. ALL PANELS ARE TO BE COMPLETELY LABELED AND UPDATED DIRECTORIES INSTALLED. ALL PANELS ARE TO BE PROPERLY GROUNDED PER THE NATIONAL ELECTRIC CODE.
8. TERMINATED CIRCUITS THAT ARE NOT USED ON THE NEW WORK PLANS SHALL BE LABELED WITH THE SERVING PANEL AND CIRCUIT NUMBER CLEARLY MARKED ON THE TERMINATING JUNCTION BOX.
9. THE PHASING OF ALL WORK IS TO BE COORDINATED WITH OTHER CONTRACTORS (GENERAL, MECHANICAL, ETC.) PRIOR TO PROJECT COMMENCEMENT.
10. THE ELECTRICAL CONTRACTOR IS TO PROVIDE AND INSTALL JUNCTION BOX COVERS AS REQUIRED. ALL WIRE IN THE AREA OF WORK IS TO BE INSTALLED PROPERLY UPON COMPLETION OF THE PROJECT.
11. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR KEEPING ALL DEVICES, LIGHT FIXTURES AND OTHER EQUIPMENT TO REMAIN ACTIVE – CIRCUITS ASSOCIATED WITH BOTH REMOVED ELECTRICAL WORK AND ELECTRICAL WORK TO REMAIN ARE TO BE EXTENDED WITH WIRE, CONDUIT, BOXES, ETC. (SIZE TO MATCH EXISTING) TO KEEP THE WORK TO REMAIN ACTIVE.
12. **THE CONTRACTOR SHOULD MAINTAIN THE INTEGRITY OF THE FIRE ALARM SYSTEM IN THE FACILITY AND IN THE CONSTRUCTION AREA AT ALL TIMES.**

EQUIPMENT COORDINATION GENERAL NOTES:

1. COORDINATE WITH THE MECHANICAL CONTRACTOR TO ENSURE ALL DISCONNECTS AND/OR VFD'S ARE PROVIDED AS REQUIRED.
2. THE ELECTRICAL CONTRACTOR SHALL PROVIDE INTERLOCKING CONNECTIONS FOR ALL HVAC EQUIPMENT AS REQUIRED. REFER TO THE MECHANICAL SCHEDULES FOR EXACT INTERLOCKING INFORMATION.
3. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE EXACT LOCATION, WIRING AND CONNECTION OF ALL EQUIPMENT WITH THE EQUIPMENT INSTALLER PRIOR TO INSTALLATION.
4. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A 4" SQUARE OUTLET BOX WITH SINGLE GANG PLASTER RING FOR EACH THERMOSTAT. PLASTER RING SHALL BE MOUNTED IN A VERTICAL ORIENTATION. 56" A.F.F. TO CENTER UNLESS NOTED OTHERWISE. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A 3/4" CONDUIT FROM THERMOSTAT OUTLET BOX UP IN WALL TO 6" ABOVE CEILING HEIGHT AND OUT OF WALL. EXTEND CONDUIT TO AREA WITH ACCESSIBLE CEILING. LABEL CONDUIT ABOVE ACCESSIBLE CEILING WITH SERVED THERMOSTAT LOCATION. CONDUIT SHALL HAVE NYLON INSULATING BUSHING ON EACH END. PROVIDE PULL STRING IN CONDUIT. REFER TO MECHANICAL DRAWINGS FOR THERMOSTAT LOCATIONS. MOUNT UNIT HEATER THERMOSTATS AS REQUIRED.
5. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A DEDICATED, 20 AMP, 120 VOLT CIRCUIT FOR EACH HVAC CONTROL PANEL. REFER TO MECHANICAL DRAWINGS FOR HVAC CONTROL PANEL LOCATIONS.
6. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE EXACT LOCATION OF ALL EQUIPMENT SITE SWITCHES PRIOR TO INSTALLATION.
7. ALL DISCONNECTS FOR EQUIPMENT SHALL BE MOUNTED SECURELY TO THE FLOOR OR STRUCTURE. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL UNISTRUT AND MOUNTING HARDWARE AS REQUIRED TO MOUNT THE DISCONNECTS. ALL EXTERIOR DISCONNECTS SHALL BE NEMA–3R.
8. CIRCUIT BREAKERS SERVING EQUIPMENT ARE BASIS OF DESIGN ONLY. EXACT CIRCUIT BREAKER AND CONDUCTOR SIZES SHALL BE COORDINATED WITH ACTUAL EQUIPMENT BEING INSTALLED PRIOR TO ORDERING OF PANELBOARD. ANY COST INCREASE ASSOCIATED WITH INCREASED CIRCUIT REQUIREMENTS SHALL BE THE RESPONSIBILITY OF THE EQUIPMENT INSTALLER. ELECTRICIAN SHALL SIZE CIRCUIT BREAKERS, CONDUCTORS, CONDUITS, AND DISCONNECTS IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE AND INDICATE THE APPROPRIATE CHANGES ON AS–BUILT DOCUMENTS.
9. IN ALL MECHANICAL ROOMS, COORDINATE WITH THE MECHANICAL CONTRACTOR TO ENSURE CODE REQUIRED CLEARANCES AND WORKING SPACES ARE MAINTAINED AT ALL ELECTRICAL EQUIPMENT.

ELECTRICAL SPECIFICATIONS:

1. ALL ELECTRICAL WORK SHALL BE IN CONFORMANCE WITH THE NATIONAL ELECTRICAL CODE AND LOCAL CODES AND ORDINANCES.
2. ALL WIRING SHALL BE COPPER CONDUCTORS WITH TYPE THHN OR TYPE THW INSULATION RUN IN CONDUIT. PROVIDE INDIVIDUAL NEUTRAL CONDUCTORS FOR ALL SINGLE–POLE BRANCH CIRCUITS. TIED BREAKER HANDLES ARE NOT ACCEPTABLE.
3. ALL MATERIALS SHALL BE NEW AND UL LISTED FOR THE APPLICATION.
4. PROVIDE TYPED PANELBOARD SCHEDULES IN ALL PANELBOARDS.

5. RACEWAY AND FITTINGS
   - A. RIGID METAL CONDUIT – SHALL HAVE THREADED FITTINGS, GALVANIZED STEEL OR THREADLESS COMPRESSION GALVANIZED STEEL OR THREADLESS COMPRESSION CADMIUM PLATED MALLEABLE IRON. FITTINGS SHALL BE RAIN TIGHT/CONCRETE TIGHT.
   - A. ELECTRICAL METALLIC TUBING (EMT) – MATERIAL OF STEEL OR MALLEABLE IRON IS ACCEPTABLE. COUPLINGS AND CONNECTORS SHALL BE CONCRETE AND RAIN TIGHT, WITH CONNECTORS HAVING INSULATED THROATS. USE GLAND AND RING COMPRESSION TYPE COUPLINGS AND CONNECTORS FOR CONDUIT SIZES 2" AND SMALLER. USE SET SCREW TYPE COUPLINGS WITH FOUR SET SCREWS EACH FOR CONDUIT SIZES OVER 2". USE SET SCREWS OF CASEHARDENED STEEL WITH HEX HEAD AND CUP POINT TO FIRMLY SEAT IN WALL OF CONDUIT FOR POSITIVE GROUNDING. INDENT TYPE CONNECTORS OR COUPLINGS ARE PROHIBITED. DIE–CAST OR PRESSURE–CAST ZINC–ALLOY FITTINGS OR FITTINGS MADE OF "POT METAL" ARE PROHIBITED.
   - B. RIGID NON–METALLIC CONDUIT – SHALL HAVE POLYVINYL CHLORIDE (PVC) FITTINGS SUITED FOR THE PURPOSE AND JOINED TOGETHER BY A METHOD APPROVED FOR THE PURPOSE. SCHEDULE 80 CONDUIT SECTIONS MAY BE JOINED TOGETHER WITH THREADED FITTING CONNECTORS.
   - C. FLEXIBLE METAL CONDUIT – FITTINGS SHALL BE ZINC PLATED STEEL OR CADMIUM PLATED MALLEABLE IRON SCREW TYPE WITH INSULATED THROAT AND ANGULAR WEDGE FITTING BETWEEN CONVOLUTIONS OF CONDUIT.
   - D. LIQUIDTIGHT FLEXIBLE METAL CONDUIT – FITTINGS SHALL BE CADMIUM PLATED, MALLEABLE IRON OR STEEL WITH COMPRESSION TYPE STEEL FERRULE AND NEOPRENE GASKET SEALING RINGS, WITH INSULATED THROAT.
   - E. CONDUITS INSTALLED CONCEALED IN EARTH FILL, CONCRETE OR, SOLID MASONRY STRUCTURES SHALL BE PVC 40. PVC SHALL NOT BE INSTALLED IN ANY EXPOSED LOCATIONS. ALL EXPOSED EXTERIOR CONDUITS SHALL BE GRS. ANY GRS INSTALLED BELOW GRADE OR IN CONCRETE SHALL HAVE BITUMASTIC APPLIED PRIOR TO INSTALLATION.
   - F. CONDUITS USED FOR CONNECTION TO RECESSED LIGHTING FIXTURES SHALL BE FLEX. CONDUITS FOR CONNECTION TO MOTORS OR VIBRATING EQUIPMENT SHALL BE LQFLEX NOT LESS THAN 18" LONG AND NOT OVER 60" LONG. ALL FLEXIBLE CONDUITS ARE TO BE SECURED AT A MINIMUM OF EVERY THREE FEET USING APPROVED METHODS.
   - G. CONDUITS RUN CONCEALED IN THE HOLLOW SPACE OF NON–MASONRY WALLS OR, ABOVE SUSPENDED/HARD CEILINGS SHALL BE EMT. EXPOSED CONDUITS SHALL BE RUN AT RIGHT ANGLES TO OR PARALLEL WITH BUILDING LINES AND EXPOSED STRUCTURE. IN ALL CASES, CONDUIT RUNS SHALL BE GROUPED TOGETHER WHERE POSSIBLE AND SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE, NOT FROM ANY SUSPENDED CEILING SUPPORT SYSTEM.
   - H. PVC 80 SHALL BE USED ONLY AS INDICATED ON THE DRAWINGS AND SHALL BE UL LISTED AS SUNLIGHT RESISTANT. INSTALL CONDUITS PASSING THROUGH BUILDING SIDEWALLS OR THROUGH BEAMS BELOW GRADE WITH EXPANSION/DEFLECTION FITTINGS. INSTALL EXPANSION FITTINGS WHERE CONDUIT CROSSES AN EXPANSION JOINT. WHERE CONDUIT PENETRATES DAMP–PROOFING MEMBRANES, CUT THE MEMBRANE CAREFULLY AROUND THE CONDUIT AND SEAL THE JOINT WITH PRESSURE SENSITIVE TAPE.
   - I. ALL CONDUIT BENDS ARE TO BE MADE WITH A DEVICE MADE FOR THE APPLICATION. ALL CONDUIT RUNS ARE TO BE PARALLEL OR PERPENDICULAR TO THE BUILDING STRUCTURE. CONDUIT OFFSETS ARE TO BE UTILIZED AT JUNCTION BOXES AND DEVICE BOXES AND A STRAP PLACED ON CONDUIT AT THE POINT NEAREST THE BOX FOR SUPPORT.
   - J. SUPPORT RACEWAYS SECURELY WITH PIPE STRAPS, WALL BRACKETS, CONDUIT HANGERS OR CEILING TRAPEZE. FASTENINGS SHALL BE BY WOOD SCREWS OR SCREW TYPE NAILS TO WOOD, BY TOGGLE BOLTS TO CONCRETE BLOCK, EXPANSION BOLTS ON CONCRETE OR BRICK, AND BEAM CLAMP TYPES ON STEEL OR BAR JOISTS. RACEWAYS SHALL NOT BE FASTENED TO SUSPENDED CEILING SUPPORTS BUT MUST HAVE INDEPENDENT SUPPORT FROM THE STRUCTURE. SUPPORTING DEVICES SHALL BE OF MATERIALS HAVING CORROSION PROTECTION AT LEAST EQUAL TO THE RACEWAY. A SUPPORT SHALL BE PROVIDED AS CLOSE AS PRACTICAL TO, AND NOT EXCEEDING 18" FROM AN UNSUPPORTED BOX OR FROM CHANGE OF DIRECTION. IN HORIZONTAL RUNS, THIS SUPPORT MAY BE OMITTED IF THE BOX IS INDEPENDENTLY SUPPORTED AND THE BOX CONNECTION IS NOT MADE WITH CHASE NIPPLE OR THREADLESS BOX CONNECTOR. IN VERTICAL RUNS, LOAD PRODUCED BY WEIGHT OF THE RACEWAY AND CONDUCTORS SHALL NOT BE CARRIED BY THE RACEWAY TERMINAL, BUT MUST BE CARRIED ENTIRELY BY CONDUIT SUPPORTS. INSTALL CONDUIT SUPPORTS IN STRICT ACCORDANCE WITH THE FOLLOWING TABLE, EXCEPT AS REQUIRED BY SUPPORT FOR BOXES AND CHANGES IN DIRECTION:

MAXIMUM SUPPORT TRADE SIZE	LOCATION OF RUNS	SPACING
1/2, 3/4	EXPOSED, HORIZONTAL	7 FEET
1 AND LARGER	EXPOSED, HORIZONTAL	10 FEET
ALL SIZES	CONCEALED, HORIZONTAL	10 FEET
1/2, 3/4	EXPOSED, VERTICAL	7 FEET
1, 1–1/4	EXPOSED, VERTICAL	8 FEET
1–1/2 AND LARGER	EXPOSED, VERTICAL	10 FEET
ALL SIZES	CONCEALED, VERTICAL	10 FEET

   - K. FOR CONDUIT RUNS THAT ARE NOT SIZED ON DRAWINGS, THE MAXIMUM CONDUIT FILL SHALL BE COMPUTED USING THE REQUIREMENTS FOR TYPE THW CONDUCTORS ALTHOUGH THE ACTUAL WIRING IS WITH TYPE THWN OR OTHER TYPE OF CONDUCTORS HAVING SMALLER CROSS–SECTIONS. THIS REQUIREMENT IS MADE TO PROVIDE SPARE CONDUIT CAPACITY.
   - L. INSTALL ALL REQUIRED SLEEVES FOR CONDUITS PASSING THROUGH CONCRETE SLABS. FIRE PROOF SPACE BETWEEN CONDUIT AND SLEEVE AFTER INSTALLATION USING OF MINERAL WOOL AS REQUIRED. ALL FIRE WALL PENETRATIONS ARE TO BE SEALED WITH A U. L. APPROVED METHOD. ANY PENETRATIONS OF THE ROOF MEMBRANE MUST BE SEALED BY A CERTIFIED ROOFING CONTRACTOR USING AN APPROVED METHOD.
   - M. EXPANSION JOINTS:
     1. CONDUITS 3" AND LARGER, THAT ARE SECURED TO THE BUILDING STRUCTURE ON OPPOSITE SIDES OF A BUILDING EXPANSION JOINT, REQUIRED EXPANSION AND DEFLECTION COUPLINGS. INSTALL COUPLINGS IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
     2. PROVIDE CONDUITS SMALLER THAN 3" WITH JUNCTION BOXES ON BOTH SIDES OF THE EXPANSIONS JOINT. CONNECT CONDUITS TO JUNCTION BOXES WITH SUFFICIENT SLACK OF FLEXIBLE CONDUIT TO PRODUCE 5" VERTICAL DROP MIDWAY BETWEEN ENDS. FLEXIBLE CONDUIT SHALL HAVE A GREEN COPPER GROUND–BONDING JUMPER INSTALLED. IN LIEU OF THIS FLEXIBLE CONDUIT, EXPANSION AND DEFLECTION COUPLINGS AS SPECIFIED ABOVE FOR THREE INCHES AND LARGER CONDUITS ARE ACCEPTABLE.
     3. EXPANSION FITTINGS SHALL BE PROVIDED FOR RACEWAYS TO COMPENSATE FOR THERMAL EXPANSION AND CONTRACTION IN CONDUIT RUNS 200FT OR GREATER AND AT BUILDING EXPANSION JOINTS. BONDING JUMPERS SHALL BE PROVIDED FOR ELECTRICAL CONTINUITY OF THE RACEWAY SYSTEM AT THE EXPANSION FITTINGS.
   - N. CONDUCTORS:
     1. ALL CONDUCTORS SHALL BE INSTALLED IN CONDUIT. CONDUCTORS FOR BUILDING WIRING SHALL HAVE THHN/THWN, 600–VOLT INSULATION AND SHALL BE SOFT–DRAWN COPPER OF STANDARD AMERICAN WIRE GAUGE (AWG) SIZE. MINIMUM SIZE SHALL BE NO. 12. 20–AMP BRANCH CIRCUITS MORE THAN 100 FEET IN LENGTH SHALL BE UPSIZED TO NO. 10. PROVIDE INDIVIDUAL NEUTRAL CONDUCTORS FOR ALL SINGLE–POLE BRANCH CIRCUITS. TIED BREAKER HANDLES ARE NOT ACCEPTABLE. ALL WIRE NO. 8 AND LARGER SHALL BE STRANDED. ALL BRANCH CIRCUITS NO. 10 AND SMALLER SHALL BE WIRED WITH COLOR–CODED WIRE WITH THE SAME COLOR USED FOR A SYSTEM THROUGHOUT THE BUILDING. POWER FEEDERS AND BRANCH CIRCUITS LARGER THAN NO. 10 SHALL EITHER BE FULLY COLOR CODED OR SHALL HAVE BLACK INSULATION AND BE SIMILARLY COLOR CODED WITH TAPE OR PAINT IN ALL JUNCTION BOXES AND PANELS. WHERE TAPE OR PAINT IS USED TO IDENTIFY CONDUCTORS, APPLY AT ALL TERMINATIONS, JUNCTION BOXES, PULL BOXES AND WIREWAYS. APPLY TAPE, BUTT LAPPED, OR PAINT FOR A MINIMUM DISTANCE OF 2" AND, WHERE APPLIED TO ENDS OF CONDUCTORS, START AT CUT END OF THE CONDUCTOR INSULATION. TAPE SHALL NOT COVER MANUFACTURERS CONDUCTORS SHALL BE COLOR CODED OR LABELED AS NECESSARY FOR CLEAR IDENTIFICATION. COLOR CODING OF ALL CONDUCTORS SHALL BE AS FOLLOWS:

GROUNDING	BARE OR GREEN
120/208 VOLT THREE PHASE (WYE)	
PHASE CONDUCTORS:	A–BLACK, B–RED, C–BLUE
NEUTRAL:	WHITE
277/480 VOLT THREE PHASE (WYE)	
PHASE CONDUCTORS:	A–BROWN, B–ORANGE, C–YELLOW
NEUTRAL:	NATURAL GREY

     2. ALL CIRCUITS ARE TO BE RUN WITH A NEUTRAL CONDUCTOR: NO SHARED NEUTRAL CONDUCTORS ARE ALLOWED.
     3. SUITABLE BUSHINGS, SHIELDS OR FITTINGS HAVING SMOOTH ROUNDED EDGES SHALL BE PROVIDED WHERE CONDUCTORS PASS BETWEEN WIRE WAYS, THROUGH PARTITIONS, AROUND BENDS, BETWEEN WIRE WAYS AND CABINETS OR JUNCTION BOXES, AND AT OTHER LOCATIONS WHERE NECESSARY TO PREVENT ABRASION OF THE INSULATION OF THE CONDUCTORS. AS A CLARIFICATION, THIS ALSO APPLIES TO CONDUITS STUBBED INTO THE CEILING.

2.8 JUNCTION AND PULL BOXES
   - A. JUNCTION AND PULL BOXES SHALL MEET REQUIREMENTS OF NATIONAL ELECTRICAL CODE. STANDARD MANUFACTURED BOXES SHALL BE LISTED BY UNDERWRITERS' LABORATORIES, INC. WHERE CUSTOM DESIGNED AND FABRICATED BOXES ARE NEEDED, THEY SHALL MEET THE CONSTRUCTION STANDARDS OF UNDERWRITERS' LABORATORIES, INC. AND THE N.E.C.
   - B. JUNCTION AND PULL BOXES SHALL BE INSTALLED WHERE REQUIRED BY NATIONAL ELECTRICAL CODE AND WHERE NECESSARY TO FACILITATE PULLING OF WIRE OR CABLE. CONSIDERATIONS ARE SIZES OF WIRE AND CABLE, NUMBER OF BENDS IN RACEWAY, AND CONDUCTOR SUPPORT REQUIREMENTS IN VERTICAL RACEWAYS. MAXIMUM DISTANCE BETWEEN TERMINATIONS AT JUNCTION OR PULL BOXES, CABINETS, OR OTHER POINTS OF TERMINATION SHALL NOT EXCEED 250 FEET FOR STRAIGHT HORIZONTAL RUNS. THIS LENGTH SHALL BE DECREASED 50 FEET FOR EACH 90 DEGREE BEND. ALL JUNCTION BOXES SHALL BE INDEPENDENTLY AND RIGIDLY SUPPORTED FROM THE BUILDING STRUCTURE. JUNCTION BOX TYPE SHALL CONFORM TO THE AREA IN WHICH IT IS INSTALLED (I.E. WET LOCATION AREAS SHALL BE MOISTURE RESISTANT TYPE JUNCTION BOXES).
   - C. JUNCTION BOXES AND ASSOCIATED CONDUIT FOR FIRE ALARM SHALL BE PAINTED RED. JUNCTION BOXES FOR LOW VOLTAGE CONTROLS, COMMUNICATION, TECHNOLOGY, ETC. SHALL BE PERMANENTLY MARKED INDICATING USE.

EXISTING PANEL H SCHEDULE

400A M.B. 480Y/277V 3Ø 4W — 22,000 AIC RATING

CKT NO.	LOAD DESCRIPTION		BREAKER POLE	BREAKER AMP	KVA	KVA	BREAKER AMP	BREAKER POLE	LOAD DESCRIPTION		CKT NO.
1	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	2
3	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	4
5	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	6
7	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	8
9	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	10
11	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	12
13	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	14
15	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	16
17	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	18
19	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	20
21	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	22
23	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	24
25	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	26
27	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	28
29	EXISTING CIRCUIT	(E)	1	20	·	·	20	1	EXISTING CIRCUIT	(E)	30
31	VAV#101	(N)	1	20	2.5	0.2	40	1	VAV#201	(N)	32
33	VAV#102	(N)	1	40	7.5	7.5	40	1	VAV#206	(N)	34
35	VAV#103	(N)	1	40	0.2	7.5	20	1	VAV#207	(N)	36
37	VAV#109	(N)	1	20	2.5	9.1	20	3	HOT WATER PUMP	(N)	38
39	SPACE		1	·	·						40
41	SPACE		1	·	·						42

TOTAL OF NEW LOADS 37.0 KVA

(E) INDICATES EXISTING CIRCUIT AND BREAKER SHALL REMAIN.
(N) INDICATES NEW CIRCUIT AND BREAKER SHALL REPLACE EXISTING.

EXISTING PANEL CHILLER SCHEDULE

225A M.L.O 480Y/277V 3Ø 4W — 14,000 AIC RATING

CKT NO.	LOAD DESCRIPTION		BREAKER POLE	BREAKER AMP	KVA	KVA	BREAKER AMP	BREAKER POLE	LOAD DESCRIPTION		CKT NO.
1	CHILLER	(E)	3	175	·	·	·	3	SPACE		2
3											4
5											6
7	SPARE	(E)	3	30	·	·	20	3	PUMP	(E)	8
9											10
11											12
13	CHILLED WATER PUMP CWP#1	(N)	3	20	1.7	·	·	3	SPACE		14
15											16
17											18
19	SPACE		3	·	·	·	·	3	SPACE		20
21											22
23											24

TOTAL OF NEW LOADS 1.7 KVA

(E) INDICATES EXISTING CIRCUIT AND BREAKER SHALL REMAIN.
(N) INDICATES NEW CIRCUIT AND BREAKER SHALL REPLACE EXISTING.

EXISTING PANEL AC SCHEDULE

300A M.B. 208Y/120V 3Ø 4W — 42,000 AIC RATING

CKT NO.	LOAD DESCRIPTION		BREAKER POLE	BREAKER AMP	KVA	KVA	BREAKER AMP	BREAKER POLE	LOAD DESCRIPTION		CKT NO.
1	EXISTING CIRCUIT	(E)	3	20	·	·	20	3	EXISTING CIRCUIT	(E)	2
3											4
5											6
7	EXISTING CIRCUIT	(E)	3	20	·	·	20	3	EXISTING CIRCUIT	(E)	8
9											10
11											12
13	EXISTING CIRCUIT	(E)	1	20	·	·	20	3	EXISTING CIRCUIT	(E)	14
15	EXISTING CIRCUIT	(E)	1	20	·						16
17	EXISTING CIRCUIT	(E)	1	20	·						18
19	EXISTING CIRCUIT	(E)	1	20	·	0.6	20	1	HVAC MAINTENANCE RECS	(N)	20
21	EXISTING CIRCUIT	(E)	1	20	·	0.5	20	1	DDC EQUIPMENT	(N)	22
23	EXISTING CIRCUIT	(E)	1	20	·	0.5	20	1	DDC EQUIPMENT	(N)	24
25	SPACE		1	·	·	·	20	1	HVAC MAINTENANCE RECS	(N)	26
27	SPACE		1	·	·	·	·	1	SPACE		28
29	SPACE		1	·	·	·	·	1	SPACE		30
31	SPACE		1	·	·	·	·	1	SPACE		32
33	SPACE		1	·	·	·	·	1	SPACE		34
35	SPACE		1	·	·	·	·	1	SPACE		36

TOTAL OF NEW LOADS ... KVA

(E) INDICATES EXISTING CIRCUIT AND BREAKER SHALL REMAIN.
(N) INDICATES NEW CIRCUIT AND BREAKER SHALL REPLACE EXISTING.

H.M. YONGE & ASSOCIATES, INC.
CONSULTING ENGINEERS // EST. 1988
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253 ST. ANTHONY STREET
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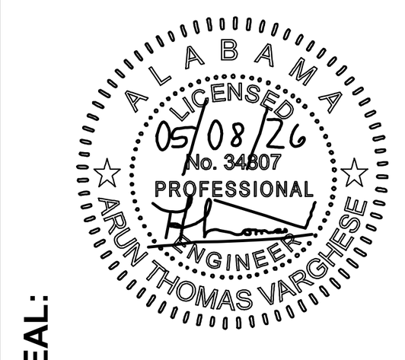
SEAL:



TITLE:

REVISIONS: NO: DATE:

PROJECT:
BALDWIN COUNTY ANNEX V REVENUE COMMISSION BUILDING HVAC UPGRADE
1705 U.S. HWY-31 S.
BAY MINETTE, ALABAMA 36507

DRAWING:
ELECTRICAL LEGEND, SPECIFICATIONS

DATE: 04.24.26
DRAWN BY: CBP
CHECKED BY: ATV
JOB NO: 25-146

SHEET NO:
E-0

ELECTRICAL OVERALL PLAN

NORTH

SCALE: 1/8" = 1'0"

KEY PLAN:

ELECTRICAL OVERALL PLAN KEY NOTES:

1. EXISTING FAN POWERED VARIABLE AIR VOLUME AIR TERMINAL UNIT TO BE REMOVED AND REPLACED WITH NEW. DISCONNECT EXISTING ELECTRICAL POWER AND CONTROLS CONDUIT AND WIRING, AND CONNECT TO NEW UNIT. FURNISH AND INSTALL ADDITIONAL CONDUIT, WIRING, AND CONTROLS WIRING AS REQUIRED FOR CONNECTION TO NEW UNIT.

2. EXISTING SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT TO BE REMOVED AND REPLACED WITH NEW. DISCONNECT EXISTING UNIT FROM EXISTING ELECTRICAL 120V POWER AND CONTROLS CONDUIT AND WIRING. EXISTING 120V CIRCUIT AND CONTROLS CIRCUITS SHALL BE MODIFIED TO CONTINUE PROVIDING POWER TO OTHER UNITS BEING SERVED. FURNISH AND INSTALL ADDITIONAL CONDUIT, WIRING, AND CONTROLS WIRING AS REQUIRED. ADDITIONALLY, FURNISH AND INSTALL A NEW 277V CIRCUIT TO PROVIDE POWER FOR NEW SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT AND ASSOCIATED NEW REHEAT COIL. SEE ELECTRICAL EQUIPMENT SCHEDULE AND ELECTRICAL PANEL SCHEDULES ON SHEET E0 FOR MORE INFORMATION. COORDINATE ALL POWER AND CONTROLS REQUIREMENTS WITH MECHANICAL CONTRACTOR PRIOR TO ANY ROUGH-IN.

3. ADDITIVE ALTERNATE #1: EXISTING AIR COOLED WATER CHILLER PLANT TO REMAIN WITH MODIFICATIONS TO ADD A SECOND CHILLED WATER PUMP. PROVIDE 3 PHASE POWER CONNECTION TO A NEW BREAKER IN EXISTING PANEL 'CHILLER'. SEE ELECTRICAL EQUIPMENT SCHEDULE AND ELECTRICAL PANEL SCHEDULES ON SHEET E0 FOR MORE INFORMATION.

4. ADDITIVE ALTERNATE #1: EXISTING HEATING HOT WATER BOILER PLANT TO REMAIN WITH MODIFICATIONS FOR THE INSTALLATION OF A SECOND HEATING HOT WATER PUMP. PROVIDE 3 PHASE POWER CONNECTION TO A NEW BREAKER IN EXISTING PANEL 'H'. NEW DISCONNECT SHALL BE MOUNTED TO A NEW UNISTRUT FRAME. COORDINATE FINAL LOCATION OF DISCONNECT WITH MECHANICAL CONTRACTOR. SEE ELECTRICAL EQUIPMENT SCHEDULE AND ELECTRICAL PANEL SCHEDULES ON SHEET E0 FOR MORE INFORMATION.

5. EXISTING CENTRAL STATION AIR HANDLING UNIT TO REMAIN WITH MODIFICATIONS TO INSTALL A NEW VARIABLE FREQUENCY DRIVE AND COMPATIBLE BLOWER MOTOR. DISCONNECT POWER AND CONTROL WIRING FROM EXISTING VFD AND CONNECT TO NEW VFD AND BLOWER MOTOR. FURNISH AND INSTALL ADDITIONAL CONDUIT, WIRING, AND PULL BOXES AS REQUIRED FOR RECONNECTION.

6. NEW CENTRAL HUB SHALL BE POWERED WITH A NEW 120V CIRCUIT. COORDINATE FINAL LOCATION WITH MECHANICAL CONTRACTOR.

7. NOT USED.

8. NEW GFCI PROTECTED RECEPTACLE WITH A NEW EXTRA-DUTY LISTED WEATHERPROOF COVERPLATE. FURNISH AND INSTALL CONDUIT, WIRING, AND PULL BOXES AS REQUIRED.

9. POWER CONNECTION FOR NEW HVAC DDC EQUIPMENT. PROVIDE A NEW 20A, SINGLE POLE BREAKER IN EXISTING PANEL 'AC' FOR USE WITH NEW CIRCUIT. FURNISH AND INSTALL CONDUIT, WIRING, AND PULL BOXES AS REQUIRED.

10. EXISTING SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT TO BE REMOVED AND REPLACED WITH NEW. DISCONNECT EXISTING UNIT FROM EXISTING ELECTRICAL 120V POWER AND CONTROLS CONDUIT AND WIRING. EXISTING 120V CIRCUIT AND CONTROLS CIRCUITS SHALL BE MODIFIED TO CONTINUE PROVIDING POWER TO OTHER UNITS BEING SERVED. FURNISH AND INSTALL ADDITIONAL CONDUIT, WIRING, AND CONTROLS WIRING AS REQUIRED. ADDITIONALLY, FURNISH AND INSTALL A NEW 277V CIRCUIT TO PROVIDE POWER FOR NEW SINGLE DUCT VARIABLE AIR VOLUME AIR TERMINAL UNIT. SEE ELECTRICAL EQUIPMENT SCHEDULE AND ELECTRICAL PANEL SCHEDULES ON SHEET E0 FOR MORE INFORMATION. COORDINATE ALL POWER AND CONTROLS REQUIREMENTS WITH MECHANICAL CONTRACTOR PRIOR TO ANY ROUGH-IN. **NEW 277V POWER CIRCUIT SHALL FEED THE MOTOR BLOWER. THE NEW REHEAT COIL SHALL NOT BE CONNECTED TO THE NEW CIRCUIT. FURNISH AND INSTALL DISCONNECT, WIRE SIZE, AND CONDUIT SIZE PER EQUIPMENT ELECTRICAL SCHEDULE ON SHEET E0.**

11. NEW GFCI PROTECTED RECEPTACLE LOCATED ABOVE CEILING FOR USE WITH HVAC MAINTENANCE ONLY.

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SEAL:

ALABAMA LICENSED 05/08/26 No. 34807 PROFESSIONAL ENGINEER THOMAS VARNER

REVISIONS:

NO:	DATE:

PROJECT:

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HVAC UPGRADE
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BAY MINETTE, ALABAMA 36507

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E-1